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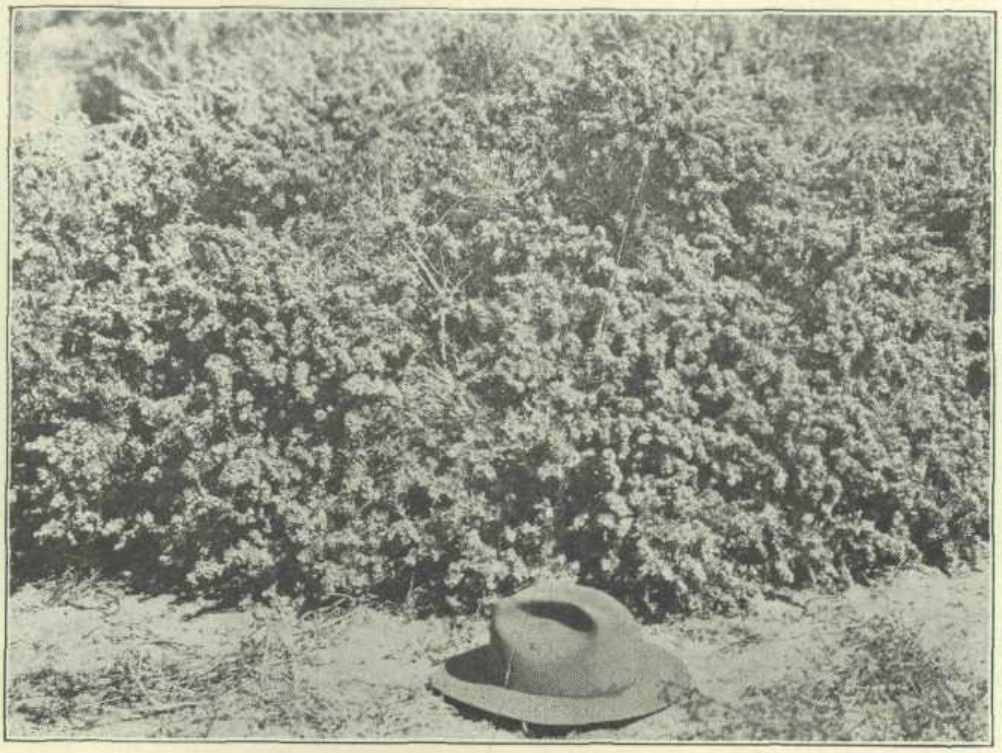

A chamiza (**Atriplex canescens**) bush with a heavy crop of seed.

Chamiza as an Emergency Feed for Range Cattle

By

LUTHER FOSTER, J. L. LANTOW, AND C. P. WILSON

NEW MEXICO AGRICULTURAL EXPERIMENT STATION

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CHAMIZA AS AN EMERGENCY FEED FOR RANGE CATTLE

INTRODUCTION

During the past fifteen or twenty years a large amount of investigational work has been done with various species of grasses, cacti, Yuccas, sotol, salt bushes, and other plants, in the effort to increase the carrying capacity of the ranges of the Southwest. On account of the great and growing importance of the subject, experiments covering many years of time, and some of them on a very large scale, have been conducted by the Experiment Stations of several of the Southwestern States and the United States Department of Agriculture, as well as by some of the stockmen. Valuable results have already been achieved, as set forth in the publications that have, from time to time, been issued; and much of the work is still in progress.

This bulletin is based on data secured from browsing range cows on one of the salt bushes, locally known as chamiza (*Atriplex canescens*); sometimes also referred to as shad scale, though it is a different species from the bush known by that name farther north. It is also often referred to as sage brush, but is not closely related, botanically, to the true sage brush. Chemical analyses of the leaves, seeds, and twigs of the chamiza were also made and the results included in this publication.

There are probably several million acres in New Mexico alone on which species of *Atriplex* are the principal vegetation. According to Water-Supply Paper 343, issued cooperatively in 1915 by the United States Geological Survey and the New Mexico Agricultural Experiment Station, there are over four hundred thousand acres in the Tularosa Basin alone on which chamiza is the dominant vegetation. It grows well on land high in gypsum, but also does well in soil that is low in this salt. As a general rule, it is not found on land that contains much gravel, though sometimes located in quite rocky situations.

Feeding tests by the Nevada Experiment Station* have

*Annual Report for fiscal year ended June 30, 1919.

indicated that this species is slightly poisonous to sheep. Small losses of sheep that had eaten comparatively large quantities of chamiza, particulary during the spring or early summer, have also been reported by some of the New Mexico stockmen. The danger of such loss is said to be increased materially by allowing the sheep to drink freely after eating the chamiza. No injury to cattle or goats from this source has been reported. Range cows were kept on chamiza at this Station for nine and a half months, having access to little other feed the greater part of the time, and no ill effects were noticeable. This was also true of calves that browsed the bush shorter lengths of time. It had a laxative effect, but there was no apparent injury to the alimentary canal.

In spite of the fact that chamiza is slightly poisonous to sheep, it has several characteristics that make it a very valuable emergency feed for range cattle. It is an evergreen and may be browsed at any time, winter or summer, that it is needed; there seldom being sufficient snow, even near the mountains, to cover the bush completely. Considering the comparatively small growth made by the top, the depth to which the roots penetrate the soil is remarkable.* The latter are quite porous, and this deep-rooting habit no doubt has much to do with its drouth-resistant qualities. Even during the past year, when the precipitation at the Experiment Station was only 8.18 inches, bushes of this species made good growth, recovering and putting forth twigs three or four inches long within a few weeks after being browsed off. They did this before the rainy season set in and while few other plants, aside from mesquite bushes, were making any appreciable growth on the unirrigated mesa.

The fact that cattle are not inclined to eat much of the chamiza when there is a fair supply of grass, purslane, pigweeds, or similar forage available is also an advantage, as

*Near one side of a well on the mesa a few hundred yards from the New Mexico Experiment Station there are several chamiza bushes. At this location the water table is approximately fifty-five or sixty feet from the surface. One of the bushes is three feet tall, and at nineteen and a half feet from the surface has two roots, the larger of which is about an inch in diameter. Except where the roots encountered rocks, their courses were practically straight down; as shown by figure 1. It would seem not improbable that they continue to capillary moisture from the water table, which, at this location, is found at fifty feet, or a little more, from the surface.

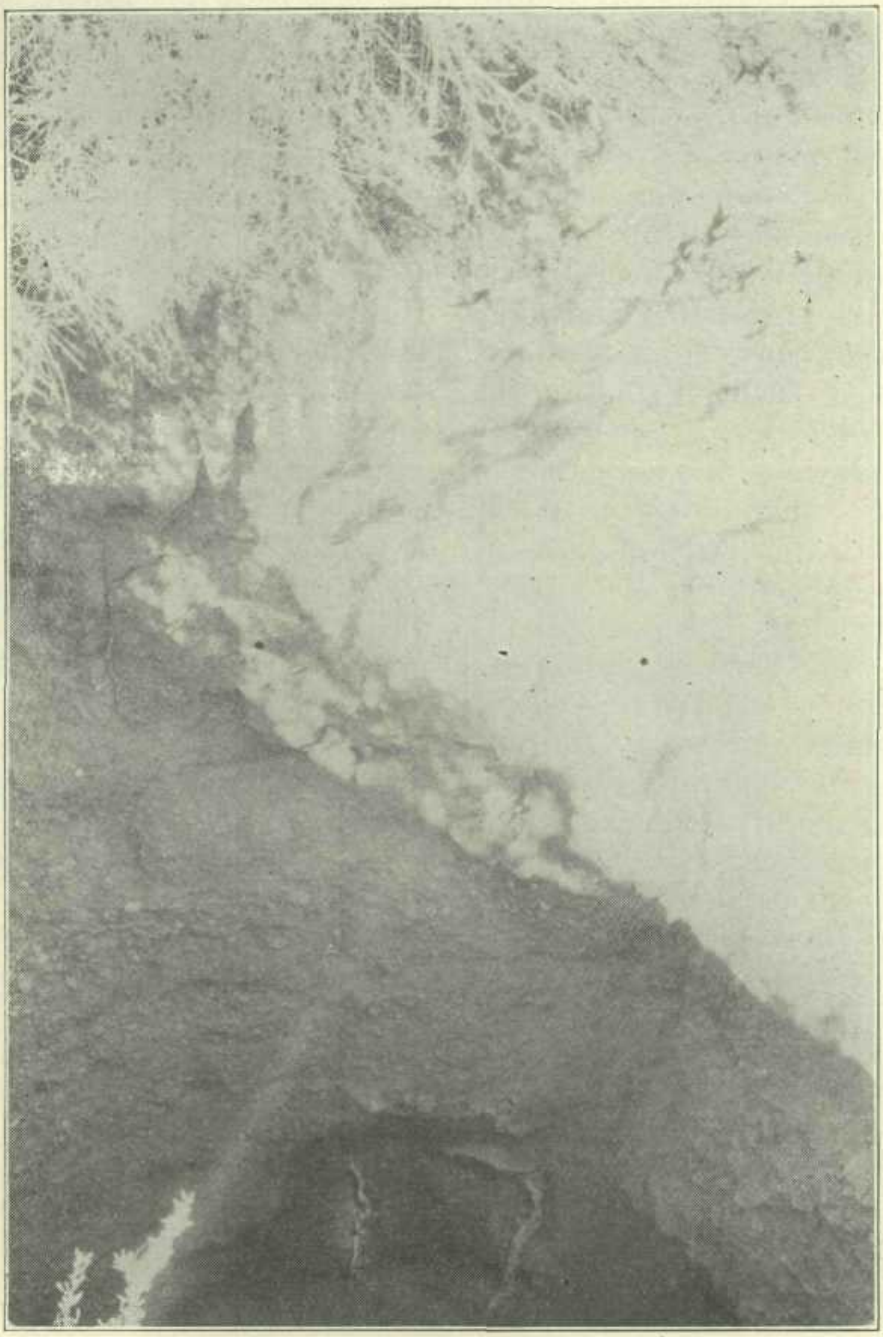


Fig. 1.—The two chamiza roots shown at the center of the lower part of the illustration are 19 ½ feet from the surface.

more of it is thus saved until there is greater need of it; and the more succulent plants are consumed before they dry up and blow away.

A number of attempts have been made to find some practicable method of securing a stand of various species of *Atriplex,* under range conditions, but the results, so far, have not been successful. As to the desirability of extending the range or improving the stand of this genus, there can be no question. Further work along this line is being done at the present time at this Station. The problem is evidently much more difficult of solution than casual observation might lead one to believe. Seed is produced in profusion, and after a few days of rainy weather often thousands of small seedings may be found growing around the older bushes on the mesas. A large majority of these are destroyed by rabbits or other animals, however, or die from drouth. While the seed, when planted, sometimes fails to germinate readily, even if the soil is kept moist by irrigation, when planted shallow and irrigated, good stands have been secured, both in Arizona* and at this Station. It has been found at the New Mexico Experiment Station that when the chamiza is removed from mesa land, the land irrigated, plowed, and cultivated for one or more years, and then no further attempt made to irrigate or cultivate it, usually within a year or two there is a fairly good stand of the chamiza again; provided there is seed that can readily blow on to the ground. In one instance a strip of mesa land, containing less than a quarter of an acre, that had been in alfalfa several years was plowed and planted to sugar beets, then to cotton, the following year. After this crop was removed, no further cultivation or irrigation was given. At the end of two years there were hundreds of chamiza bushes on the plot, some of them four feet tall and with trunks nearly an inch in diameter. (See fig. 2.) Seed

*Bulletin 65, Arizona Agricultural Experiment Station.

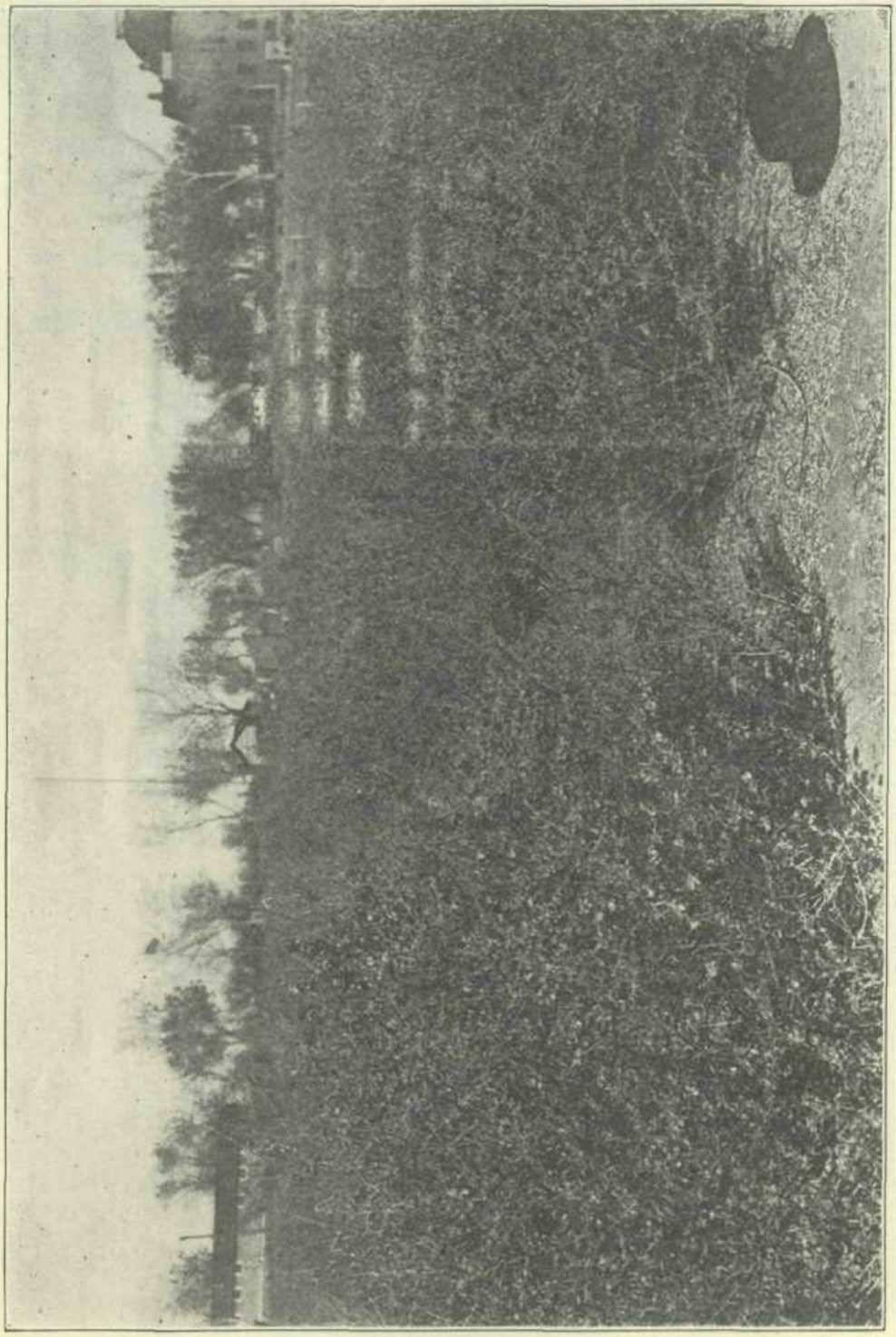


Fig. 2.—The foreground shows growth made in two years' time by chamiza. The land was not irrigated after the plants came up. Distance to water table, about 55 feet; average annual precipitation for the two years, 8.11 inches.

and a small amount of sand had blown on to the plot, where germination readily took place. The young plants made rapid growth, without other moisture than such as was already in the soil and that derived from an average annual precipitation of 8.11 inches. The fact that there was an abundance of alfalfa only a few feet away no doubt prevented the destruction of many of the small seedlings by rabbits.

Further reference to the experimental work that has been done with chamiza at this Station will be found in the following pages, as well as copies of letters regarding the poisoning of sheep from the eating of this bush. Below is an extract from "Flora of New Mexico," by Wooton and Standley, giving description and range of this shrub:—

"**Atriplex canescens** (Pursh) Nutt. . . . . .

TYPE LOCALITY: 'In the plains of the Missouri, near the Big-bend.'

RANGE: North Dakota to Arizona and northern Mexico.

NEW MEXICO: Common nearly throughout the State. Dry plains, in the Lower and Upper Sonoran zones.

This is one of the commonest shrubs over the plains, in arroyos, and in the lower valleys of the Sonoran zones throughout the State. It is variously called "chamiza,' 'chamis,' and 'sagebrush,' the last name being used mostly by newcomers who think that name applies to any grayish shrub. There are two forms common in the southern part of the State. One of them is a plant about 100 to 150 cm. high with short obovate or elliptic leaves, flowering generally in June and fruiting in late August and September. The other is a taller plant, frequently 2 meters high or more, with narrowly oblong-oblanceolate leaves, flowering and fruiting a month to 6 weeks earlier..."

EXPERIMENTAL DATA

Chemical analyses (see Table III) having shown that the chamiza leaves, twigs, and seeds are comparatively high in nutrients, it was decided to fence a tract of unirrigated mesa land at State College, N. M., and secure data as to what use can be made, in emergencies, of range on which this shrub is the dominant vegetation; ascertaining, in a general way, the carrying capacity. The pasture contained thirty-eight acres. About three acres had little except creosote bushes (*Covillea glutinosa*) on it, but there was a fair stand of chamiza on the remainder. In no part of the pasture was the latter very thick on the ground; the tops of the chamiza bushes covering probably not more than eight or ten per cent of the surface, on the average. (See fig. 3.) Aside from a few mesquite bushes (*Prosopis glandulosa*) scattered throughout the inclosure, there was little other vegetation until after the beginning of the rainy season. Commencing about August 7 and continuing for a few weeks, there was a good deal of purslane over the greater part of the pasture; also a much smaller growth of other annual weeds. Cattle had browsed the chamiza, off and on, for many years, and there was only a moderate amount of young growth. The tract was forty or fifty feet above the valley, and the water table was approximately fifty-five to sixty-five feet below the surface.

In April, 1919, ten range cows that had been shipped in from Otero County, New Mexico, were bought for use in a nutrition experiment. While in this experiment they were fed cut Yucca and about a pound of cottonseed meal each per day. This investigation closed the fore part of September, 1919; after which, until January 30, 1920, when the cows and four calves were placed in the chamiza pasture, the cows were fed corn stover and about a pound of cottonseed meal each per day. Ever since they were bought, they had been in rather thin flesh.

As shown by figures 3 to 10, inclusive, the cows were probably not as well bred as the average to be found at present on the ranges of New Mexico. Four or five of them carried

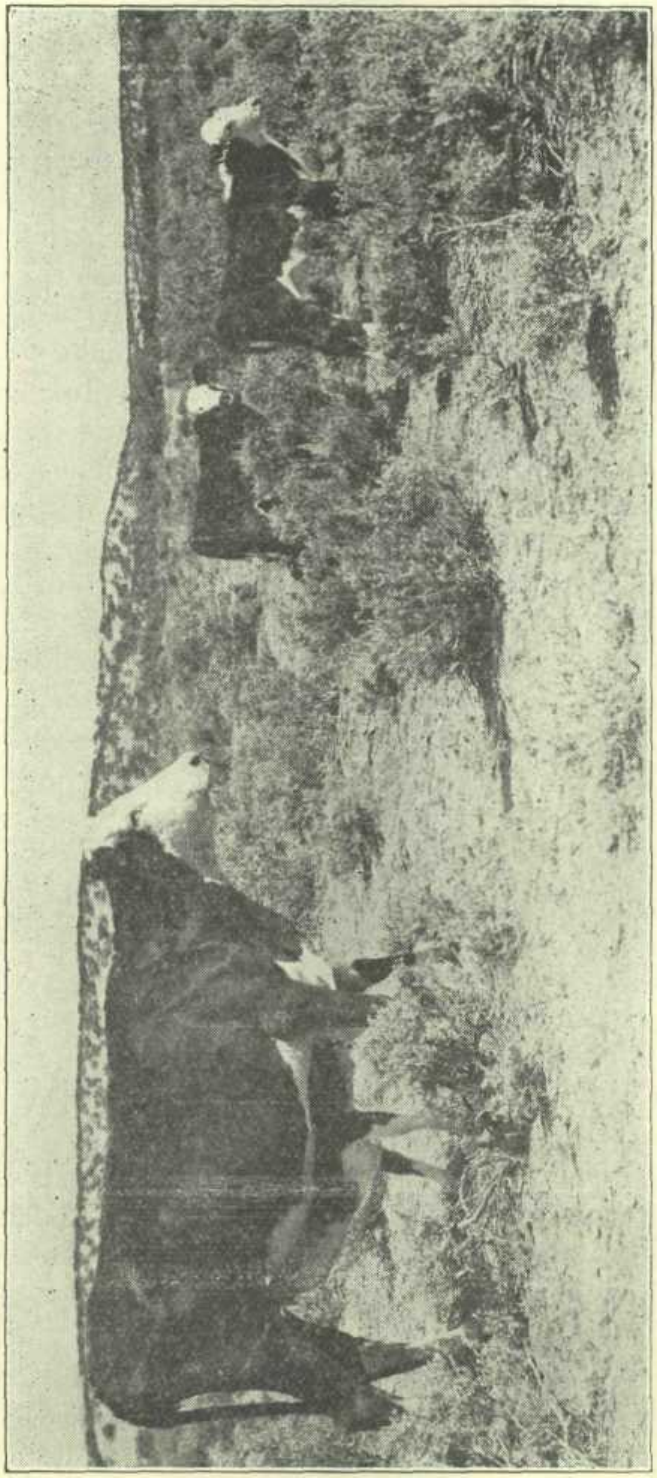


Fig. 3.—The foreground shows chamiza in a part of the pasture used for this experiment. The hills in the background were not included in the pasture. The vegetation on the hills is mostly creosote bushes. The cow is referred to in Table 1 as No. 2, Lot 1.

a good deal of Hereford blood; the others were crosses between beef and dairy breeds. They were old, and several of them had bad teeth.

At the beginning of the experiment, four of the cows had calves, ranging in weight, February 1, 1920, two days after the experiment began, from 90 pounds to 300 pounds each. The others, with the exceptions of Nos. 3 and 5 of Lot 1, dropped calves during the period covered by the investigation.

After being divided into two lots, as nearly equal as possible, each containing five cows and two calves, the cows were weighed on three consecutive days, January 30, January 31, and February 1, 1920. The calves, also, were weighed February 1. Weighings were continued every week or two until November 8, 1920; again being made on consecutive days November 8th, 9th, and 10th. The averages of the three weights were taken as the beginning and closing weights, respectively. The experiment closed November 10, 1920, having covered a period of 285 days.

In addition to pasture, the cows of Lot 1 received a pound of cottonseed meal each per day, until September 18; after which neither lot received supplementary feed of any kind, the cows being obliged to depend entirely on the pasture.

By May 22, a little less than four months after the beginning of the experiment, cow 1 of Lot 1 had lost 127 pounds in weight, and from that time until September 18 she was fed 10 pounds of choice alfalfa hay per day. At the end of the experiment she weighed slightly more than at the time she began receiving the hay. It will be noted from the table below that she and cow 2, Lot 2, were suckling small calves at the beginning of the experiment.

Throughout the experiment, with the exception of the two weeks from September 18 to October 2—when no supplementary feed was given them—all the calves were fed as much choice alfalfa hay as they would eat in half an hour, daily. The calves also received daily, except during these two weeks, a pound of cottonseed meal; that is, a pound for the entire number of calves. Thus at the beginning of the experiment,

each of the four calves received an average of ¼ pound per head daily, but with the birth of each additional calf the average amount of cottonseed meal per head per day was reduced. From July 22—when the eighth calf was born—until November 10 the amount fed per day averaged only ⅛ pound per head.

Cow 4, Lot 1, weighed 71 pounds more April 24 than when the experiment began, but she got out of the pasture a few days thereafter, ate alfalfa that was growing near by, bloated, and died.

On April 10 a purebred Hereford cow—referred to in Table I as Cow No. 11—was also placed in the pasture. She was small, but in high condition, and weighed, at that time, 1243 pounds. She had never been accustomed to browsing. No supplementary feed was given her, she being obliged to depend practically entirely on the feed she obtained in browsing the chamiza. By July 24, when she was removed from the experiment—108 days after being placed in the pasture—she had lost 105 pounds in weight.

None of the cows in Lot 2 received feed of any sort to supplement the pasture. The only shade available to any of the cows was such as was made by the mesquite bushes; which, in no instance, was very dense. Water and salt were constantly available to them.

TABLE I.—WEIGHTS, IN POUNDS, OF THE COWS AND CALVES AT DIFFERENT TIMES DUPING THE EXPERIMENT.

LOT 1.			LOT 2.		
Cow No.	Weight of cow.	Weight of calf.	Cow No.	Weight of cow.	Weight of calf.
		January 30, 1920.			
1	795		1	755	
2	940		2	735	
3	848		3	761	
4	725		4	820	
5	810		5	905	
Total	4118			3976	

Table I (continued)

	LOT 1.			LOT 2.	
Cow No.	Weight of cow.	Weight of calf.	Cow No.	Weight of cow.	Weight of calf.
		January 31, 1920.			
1	819		1	775	
2	960		2	730	
3	859		3	775	
4	735		4	835	
5	815		5	920	
Total	4188			4035	
		February 1, 1920.			
1	807	91	1	787	
2	932		2	730	90
3	845		3	782	152
4	742	300	4	841	
5	840		5	931	
Total	4166	391		4071	242
		February 14, 1920.			
1	800	91	1	790	
2	934		2	779	74
3	812		3	761	130
4	794	279	4	881	
5	850		5	942	
Total	4190	370		4153	204
		February 28, 1920.			
1	803	137	1	842	
2	899		2	751	116
3	846		3	781	166
4	837	321	4	900	
5	880		5	929	
Total	4265	458		4203	282
		March 13, 1920.			
1	808	156	1	840	
2	930		2	770	130
3	850		3	791	198
4	841	363	4	908	
5	925		5	946	
Total	4354	519		4255	328
		March 27, 1920.			
1	740	182	1	851	
2	916		2	771	154
3	864		3	762	217
4	834	391	4	940	
5	960		5	964	
Total	4314	573		4288	371

Table I (continued)

	LOT 1.			LOT 2.		
Cow No.	Weight of cow.	Weight of calf.	Cow No.	Weight of cow.	Weight of calf.	Weight of cow No. 11.
			April 10, 1920			
1	773	200	1	813		1243
2	950		2	806	175	
3	835		3	793	241	
4	805	426	4	966		
5	950		5	942		
Total	4313	626		4320	416	
			April 24, 1920.			
1	769	206	1	850		1226
2	901		2	769	190	
3	816		3	777	258	
4	805	444	4	968		
5	975		5	958		
Total	4266	650		4322	448	
			May 8, 1920.			
1	695	212	1	803		1205
2	880		2	685	195	
3	790		3	725	250	
4		417	4	895		
5	890		5	875		
Total	3255	629		3983	445	
			May 22, 1920.			
1	680	225	1	855		1188
2	945		2	710	225	
3	770		3	770	290	
4		480	4	935		
5	890		5	910		
Total	3285	705		4180	515	
			June 5, 1920.			
1	617	248	1	811		Not weighed.
2	917		2	730	230	
3	771		3	714	290	
2		470	4	935		
5	870		5	899		
Total	3175	718		4089	520	
			June 12, 1920.			
1	625	264	1	835		Not weighed.
2	920		2	734	249	
3	760		3	782	312	
4		425	4	910		
5	906		5	895		
Total	3211	689		4156	561	

Table I (continued)

	LOT 1.			LOT 2.		
Cow No.	Weight of cow.	Weight of calf.	Cow No.	Weight of cow.	Weight of calf.	Weight of cow No. 11.
			June 26, 1920.			
1	710	275	1	827		Not weighed.
2	947		2	665	265	
3	779		3	721	326	
4		513	4	878		
5	837		5	901		
Total	3273	788		3992	591	
			July 10, 1920.			
1	700	270	1	775	67	Not weighed.
2	865		2	700	260	
3	805		3	773	330	
4		480	4	830	67	
5	892		5	862		
Total	3262	750		3940	724	
			July 24, 1920.			
1	686	287	1	740	72	1135
2	832	67	2	690	280	
3	769		3	740	327	
4		493	4	831	79	
5	900		5	740	60	
Total	3187	847		3741	818	
			August 7, 1920.			
1	745	255	1	745	85	No longer in
2	790	80	2	700	245	experiment.
3	760		3	735	270	
4		500	4	830	90	
5	855		5	775	75	
Total	3150	835		3785	765	
			August 21, 1920.			
1	715	295	1	715	100	
2	805	95	2	700	290	
3	750		3	750	340	
4		545	4	750	100	
5	890		5	770	85	
Total	3160	935		3685	915	
			September 5, 1920.			
1	725	345	1	780	130	
2	835	120	2	755	335	
3	845		3	785	395	
4		580	4	825	130	
5	930		5	870	100	
Total	3335	1045		4015	1090	

Table I (continued)

	LOT 1.			LOT 2.	
Cow No.	Weight of cow.	Weight of calf.	Cow No.	Weight of cow.	Weight of calf.
		September 18, 1920.			
1	788	397	1	830	149
2	915	145	1	707	367
3	880		3	807	445
4		610	4	870	157
5	945		5	845	118
Total	3528	1152		4059	1236
		October 2, 1920.			
1	740	385	1	720	155
2	845	160	2	694	365
3	815		3	730	410
4		650	4	725	165
5	930		5	805	128
Total	3330	1195		3674	1223
		October 16, 1920.			
1	735	411	1	715	168
2	820	170	2	646	355
3	790		3	773	331
4		640	4	708	180
5	934		5	805	135
Total	3279	1221		3647	1169
		October 30, 1920.			
1	727	401	1	700	162
2	843	172	2	681	374
3	784		3	819	430
4		617	4	774	132
5	927		5	741	177
Total	3281	1190		3715	1275
		November 8, 1920.			
1	742	412	1	727	175
2	820	178	2	682	378
3	805		3	837	463
4		643	4	795	200
5	950		5	745	142
Total	3317	1233		3786	1358
		November 9, 1920.			
1	681	400	1	678	175
2	820	181	2	635	375
3	805		3	837	462
4		637	4	747	194
5	910		5	755	142
Total	3216	1218		3652	1348

Table I (continued)

	LOT 1.			LOT 2.	
Cow No.	Weight of cow.	Weight of calf.	Cow No.	Weight of cow.	Weight of calf.
			November 10, 1920.		
1	693	391	1	675	170
2	830	170	2	662	380
3	770		3	830	455
4		630	4	741	182
5	915		5	747	130
Total	3208	1191		3655	1317

TABLE II.—SHOWING GAINS OR LOSSES IN WEIGHTS OF COWS AND GAINS MADE BY THE CALVES.

(Gains of cows are indicated by +; losses by—.)

	LOT 1.						LOT 2.					
	Initial weight of cow.	Final weight of cow.	Gain or loss.	Initial weight of calf.*	Final weight of calf.	Gain.	Initial weight of cow.	Final weight of cow.	Gain or loss.	Initial weight of calf.	Final weight of calf.	Gain.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Cow 1	807	705	—102	91	401	310	772	693	— 79		170	
Cow 2	944	823	—121		176		732	660	— 72	90	378	288
Cow 3	851	793	— 58				773	835	+ 62	152	460	308
Cow 4	734	(Died before close of experiment)		300	637	337	832	761	— 71		182	
Cow 5	822	925	+103				919	749	—170		130	
Total	3424†	3246	—180	391	1214	647	4028	3698	—330	242	1320	596
Average†	856	811	— 45	195	404	323	805	740	— 66	121	264	298

*The calves of cow 1, Lot 1, and cow 2, Lot 2, were born a few weeks, and that of cow 3, Lot 2, several months, before the experiment began. The calf of cow 4, Lot 1, was born May 16, 1919, being about eight and a half months old when the experiment started, January 30, 1920. The calf of cow 4, Lot 2, was born June 28, 1920; that of cow 1, Lot 2, June 29, 1920; that of cow 2, Lot 1, July 12, 1920; and that of cow 5, Lot 2, July 22, 1920. Cows 3 and 5 of Lot 1 did not have calves until after the close of the experiment.

†Omitting cow 4, Lot 1.

Averaging the first three weighings, as shown in Table I, gives the initial weights as follows: Lot 1, 4158 pounds; Lot 2, 4028 pounds. By omitting cow 4, Lot 1, the initial weight of this lot is reduced to 3423 pounds. By March 13, 43 days after the beginning of the experiment, the cows of Lot 1, which had received a pound of cottonseed meal per head daily, had gained a total of 196 pounds; and those of Lot 2, receiving no supplementary feed, had gained 227 pounds. The cows of the latter lot continued to gain until about the end of April, the weighing of April 24 indicating a total gain of 294 pounds,

or an average of 55 pounds per cow. The weights of the cows of Lot 1 show losses, as a rule, from March 13 to August 21; they weighing on the latter date 201 pounds less than at the beginning of the experiment. However, it should be borne in mind that by July 24 four additional calves had been dropped; one in Lot 1 and three in Lot 2. This accounts for a small amount of the loss sustained by the cows of Lot 1 and a considerable percentage of that of Lot 2. By the latter part of August there was a good deal of purslane in the pasture. The cows ate this eagerly, and both lots showed substantial gains in weights September 5 and September 18; these gains being attributable almost entirely to the larger amounts of feed in the alimentary tracts. Reference to Table I will show that the gains were soon lost, as the purslane was practically all gone by the first of October.

It will also be noted from this table that the calves of Lot 1 gained 143 pounds between September 18 and October 2, while those of Lot 2 lost 13 pounds. No alfalfa hay was fed the calves during this time, but the period was too short for the gain or loss to be of any particular significance.

Some difficulty was experienced in keeping cow 5, Lot 2, in the pasture, and it became necessary to put a rather heavy yoke on her several months before the close of the experiment. This probably accounted for a considerable part of the rather large loss that she sustained. Of the two cows that had no calves at the close of the experiment—Nos. 3 and 5 of Lot 1—cow 3 lost 58 pounds and cow 5 gained 103 pounds during the experiment. The only other cow that made a gain for the entire period was No. 3, Lot 2. Her calf was several months old at the beginning of the experiment, as previously stated.

Though cow 1, Lot 1, apparently had fairly good teeth, and received a pound of cottonseed meal a day, in addition to chamiza pasture, the same as the other cows in this lot, by May 22 she had lost 127 pounds in weight, and it was deemed advisable to feed her 10 pounds of choice alfalfa hay daily, for a few months. September 18 she weighed 108 pounds more than when she first began receiving the hay, but by the close of the

experiment she had lost all except 25 pounds of this gain.

The two calves of Lot 1 that were in the experiment during the entire period gained 647 pounds, while the two calves of Lot 2 that were born before the experiment began gained 596 pounds. The former probably ate somewhat more alfalfa than the latter, and this may account for most, if not all, of the difference in gains.

The four calves born during the period covered by the test were normal in every way, and the cows had no difficulty at time of calving.

The pasture was evidently considerably overstocked, the new growth of the chamiza bushes was browsed back quite closely, and a few of the bushes were more or less broken from trampling. It will be several months before they are in as good condition as when the experiment began.

The precipitation, in inches, by months, from January 1, 1920, to November 1, 1920, at the pasture, was as follows: January, .72; February, .43; March, .07; April, 0; May, .58; June, 1.20; July, 1.05; August, 2.74; September, .08; October, 1.30.

A study of the results obtained fails to reveal any appreciable advantage in feeding a small amount of cottonseed meal to cows on chamiza pasture. The four range cows that were in Lot 1, receiving a pound of cottonseed meal per head daily, in addition to pasture, during the first 232 days of the 285 days covered by the experiment, lost an average of 45 pounds per head, in weight. It is reasonable to presume that the loss would have been considerably greater if one of these cows had not received, in addition, alfalfa hay amounting to a total of 1190 pounds, during the period. The five cows in Lot 2, which received no supplementary feed of any kind, lost an average of 65 pounds per head. However, all of these cows except one were suckling small calves during several months of the experiment; while only two of the cows of Lot 1 were suckling calves at any time between the beginning and close of the test. Cows 3 and 5 of Lot 1 did not give birth to their

calves until a few weeks after the final weights had been recorded.

As shown by Table III, the chamiza itself is quite high in protein, and if a small amount of carbonaceous grain, such as corn, kafir, or milo, or straw or stover, were used as a supplement, it might give better results than the cottonseed meal. If the chamiza pasture is in fairly good condition, however, it will carry a comparatively large number of cattle eight or ten months, if necessary, without supplementary feed of any kind; though cows with small calves on such pasture may lose considerably in weight.

The following is taken from the annual report of this Station for the fiscal year that ended June 30, 1919:—

TABLE III.—ANALYSIS OF CHAMIZA.

	Moisture.	Ash.	Crude protein.	Ether extract.	Crude fibre.	Nitrogen-free extract.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Chamiza leaves	67.74	6.14	5.86	.85	4.31	13.78
Chamiza old leaves & stems*	54.94	5.20	4.75	.98	14.56	19.57
Chamiza new leaves & stems*	59.47	5.29	4.32	.78	14.01	16.13
Chamiza seed pods	67.31	5.63	3.28	.61	9.39	13.78
Fresh green alfalfa	74.7	2.4	4.5	1.	7.	10.4
Fresh corn fodder, ripe	65.2	1.4	2.7	1.	7.4	22.3
ANALYSIS ON MOISTRUE-FREE BASIS.						
Chamiza leaves		19.83	18.94	2.76	13.93	44.53
Chamiza old leaves & stems*		11.53	10.55	2.17	32.32	43.42
Chamiza new leaves & stems*		13.04	10.66	1.92	34.56	39.82
Chamiza seed pods		17.22	10.03	1.86	28.73	42.16
Alfalfa hay		9.41	16.30	2.51	30.96	40.82

*Whole plant.

The composition of the edible portion of this plant shows very favorably for it in comparison with many of the ordinary forage crops. In crude protein it is very much higher than such carbohydrate roughages as oat straw, green corn fodder, and kafir, milo and cane fodder. It stands high in protein, even in comparison with the fresh cut legume hays. It also stands well in nitrogen-free extract and fat; and it shows but little more crude fiber than alfalfa hay.

The following is an extract from a recent letter from Professor C. E. Fleming, of the Department of Range Management of the Nevada Experiment Station:—

"In 1918 our attention was first called to **Atriplex canescens** as a possible source of livestock losses when several sheep were killed in the vicinity of Fallon when they were grazing on a range supporting almost entirely greasewood (**Sarcobatus**) and saltbrush (**Atriplex**). Feedings were immediately commenced and the saltbrush proved to be toxic to sheep. All the feedings of the greasewood were negative. Many feedings since that time with sheep have been made with positive results, indicating quite clearly the poisonous nature of this plant. Further, we have three large recorded losses on the range which have been attributed to the saltbrush. We have made many feedings of this plant to cattle but have not, however, found it poisonous to this class of live stock.

Our chemical investigations of this plant show that it contains a principle highly toxic to smaller animals.

Our feedings, of course, are far from complete, but we hope to have something fairly definite in the near future."

Under date of December 7, 1920, Professor E. O. Wooton of the Office of Farm Management, United States Department of Agriculture, wrote as follows:—

"I cannot understand the results obtained by the Nevada Station. Possibly there is a soil condition involved.

The plant is a very important winter feed in certain parts of Arizona, and New Mexico ranges would benefit greatly if it could be induced to grow on them. Freezing does not seem to affect it very much, which is in its favor. It is a first-class thing to have on ranges where snow covers the smaller plants. Cattle can live on the native species of **Atriplex** for some time under such circumstances."

SUMMARY AND CONCLUSIONS

1. Range cows, most of them with suckling calves during a considerable part or all of the nine and a half months covered by the experiment, were run on unirrigated chamiza (*Atriplex canescens*) pasture at the New Mexico Agricultural Experiment Station, at the rate of one cow to about four and a fourth acres of pasture. During the first three months there was one additional range cow in the thirty-eight-acre pasture. For 108 days of the fore part of the test, a purebred Hereford cow was also included in the experiment. At the close of the experiment, the oldest four calves ranged in age from about eleven to eighteen months; and their average weight was 469 pounds. The other four calves were smaller, and much younger. Taking all stock into consideration, the pasture was browsed at the rate of about three and a half acres per cow. It was overstocked considerably, but the results indicate that browsing at the rate of one cow to six or seven acres of chamiza pusture, with little or no supplementary feed, would cause little, if any, deterioration; even though continued over quite a long period of time.

2. All of the cows that suckled young calves during any considerable portion of the experiment lost weight; also one of the two cows that did not give birth to their calves until shortly after the final weights were recorded; the losses ranging from 58 to 170 pounds per head. One of the five cows of Lot 1—which Lot received no supplementary feed, in addition to the pasture—gained 62 pounds during the experiment. Her

calf was several months old when the cows were first placed in the pasture. The only other cow that was in the pasture the entire time and that gained in weight was in Lot 2, which received a pound of cottonseed meal per head daily, in addition to the pasture.

3. The tender growth of chamiza is high in protein, and no appreciable advantage was noted from feeding a pound of cottonseed meal per head daily to the cows of Lot 1. It is believed that a small amount of carbonaceous supplement, such as corn, milo, kafir, or a larger quantity of straw or stover, might have given better results.

4. While the chamiza had a laxative effect, no apparent injury to any of the cows or calves resulted from browsing this bush. It is evidently more or less poisonous to sheep, however.

5. The four cows that dropped calves during the experiment calved normally and without difficulty; also the two cows that gave birth to their calves shortly after the close of the experiment.

6. Chamiza is comparatively high in nutrients, and the results secured in this experiment indicate that its value as an emergency pasture plant is not fully appreciated. It would be greatly to the interest of the cattle industry of the Southwest if the stand of this shrub could be economically improved, or its range extended. Further experiments along this line are now under way at this Station. Its deep rooting habit indicates that it may be able to utilize moisture from the underflow, in many situations in the Southwest.

ILLUSTRATIONS.

The photographs from which the following illustrations and figure 3 were made were taken at the close of the experiment. The two range cows not shown were of practically the same grade as those illustrated.

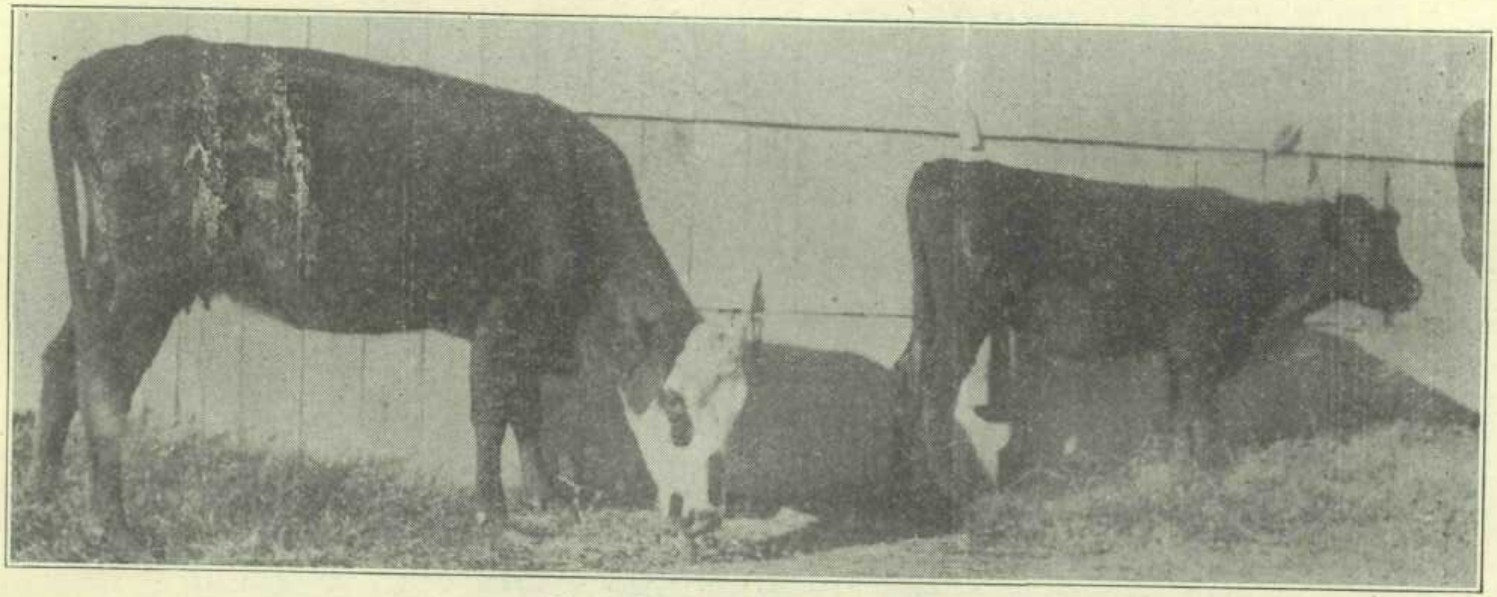


Fig. 4.—Cow 1, Lot 1, and her calf.

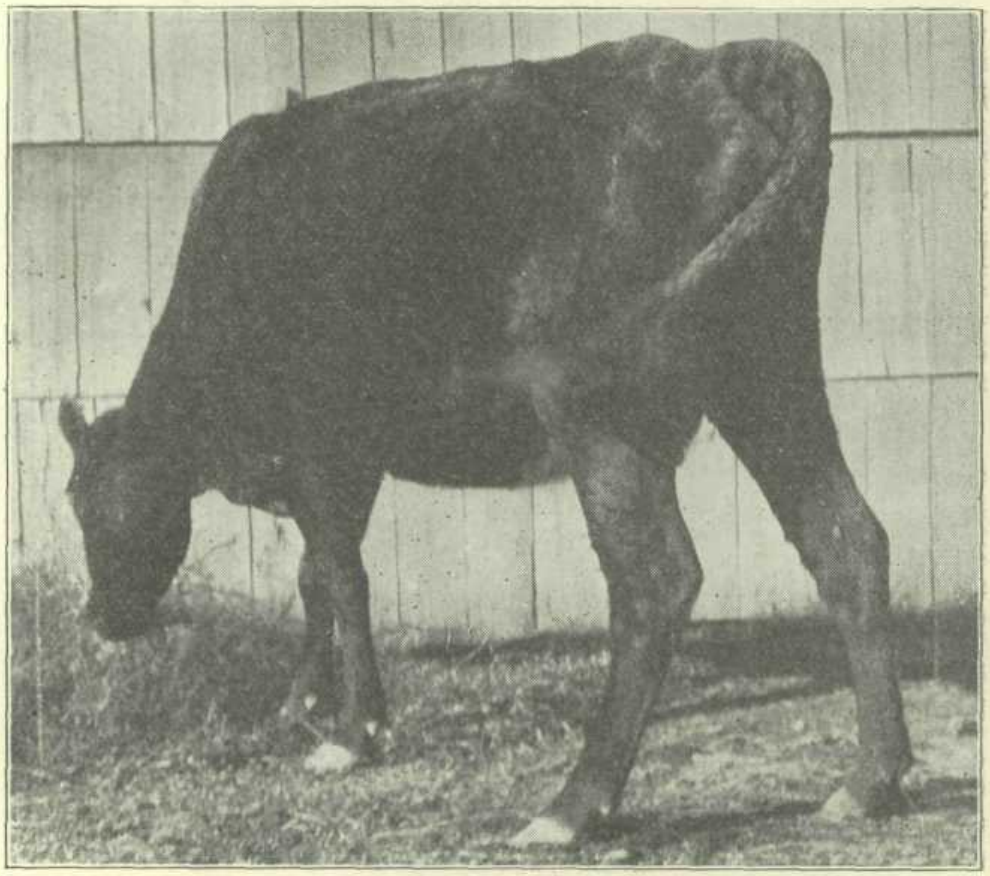


Fig. 5.—Cow 3, Lot 1.

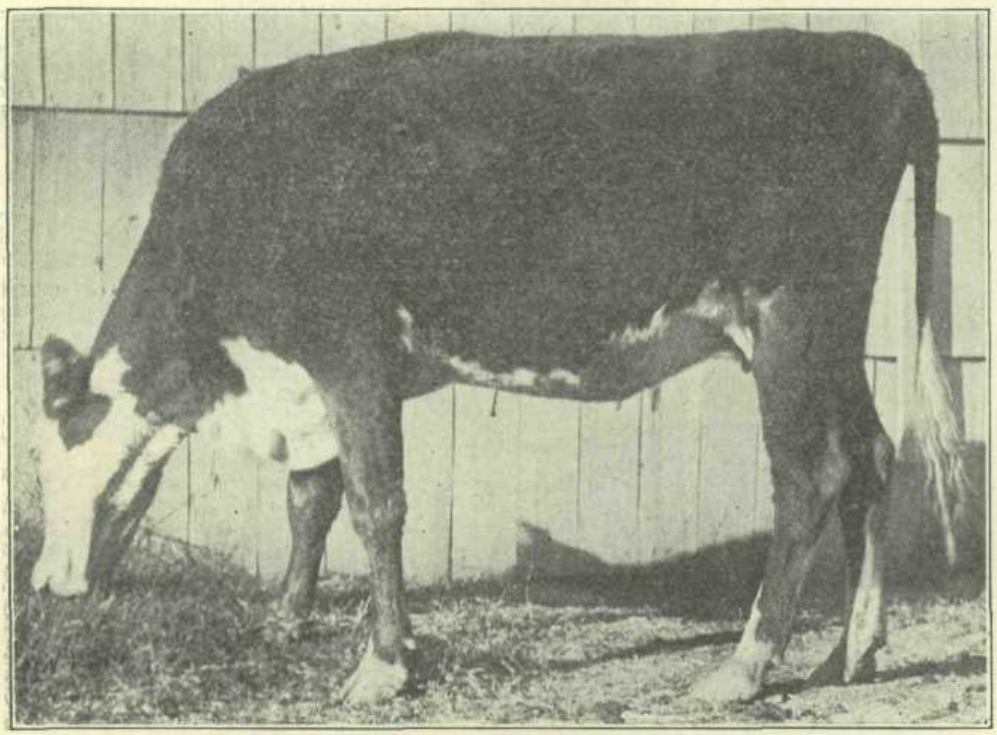


Fig. 6.—Cow 5, Lot 1.

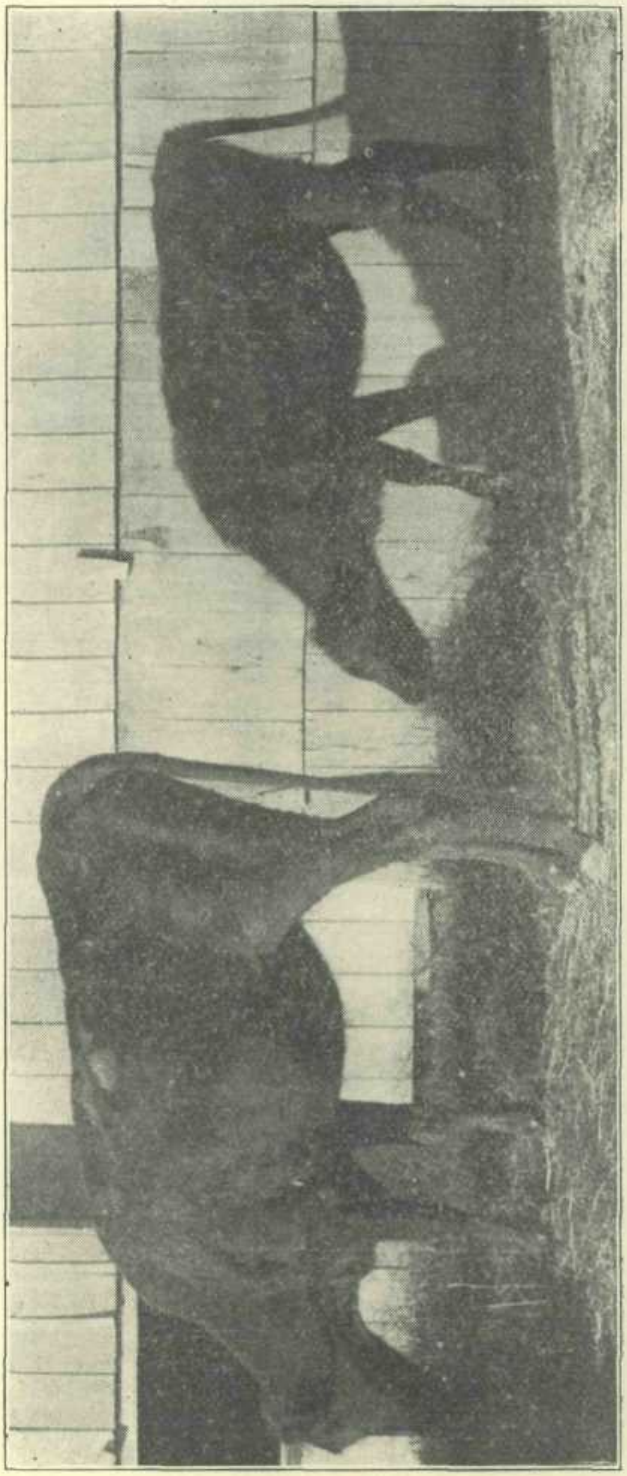


Fig. 7.—Cow 2, Lot 2, and her calf.

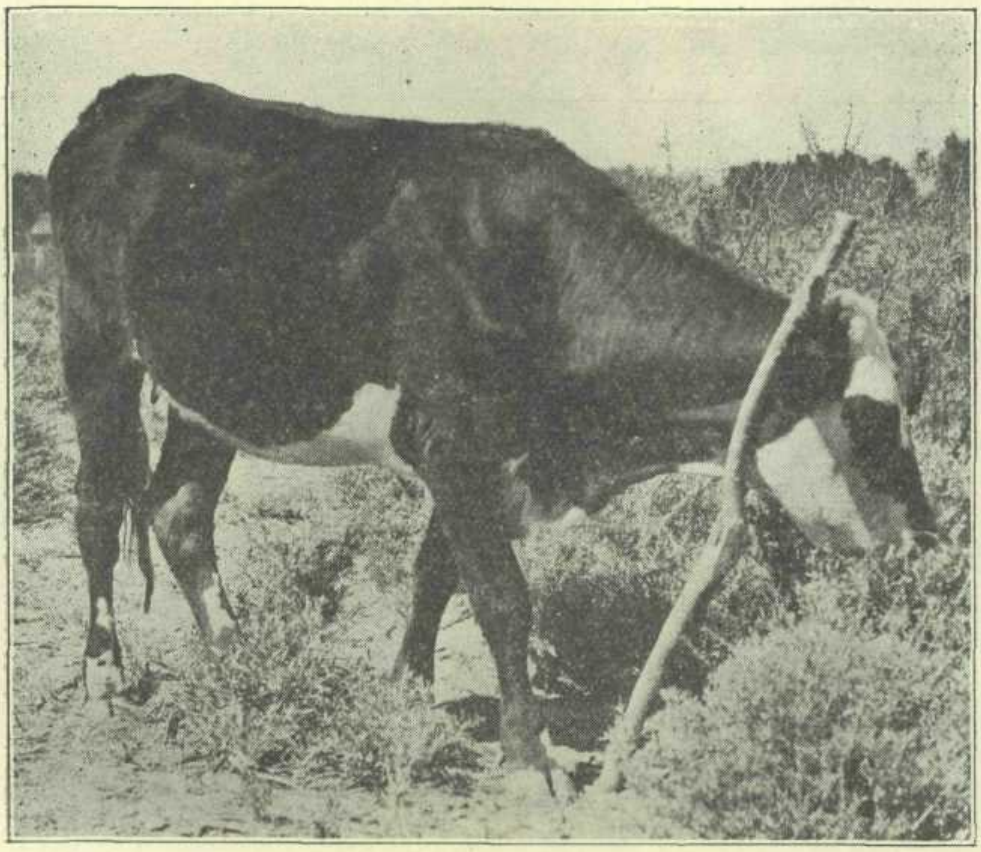
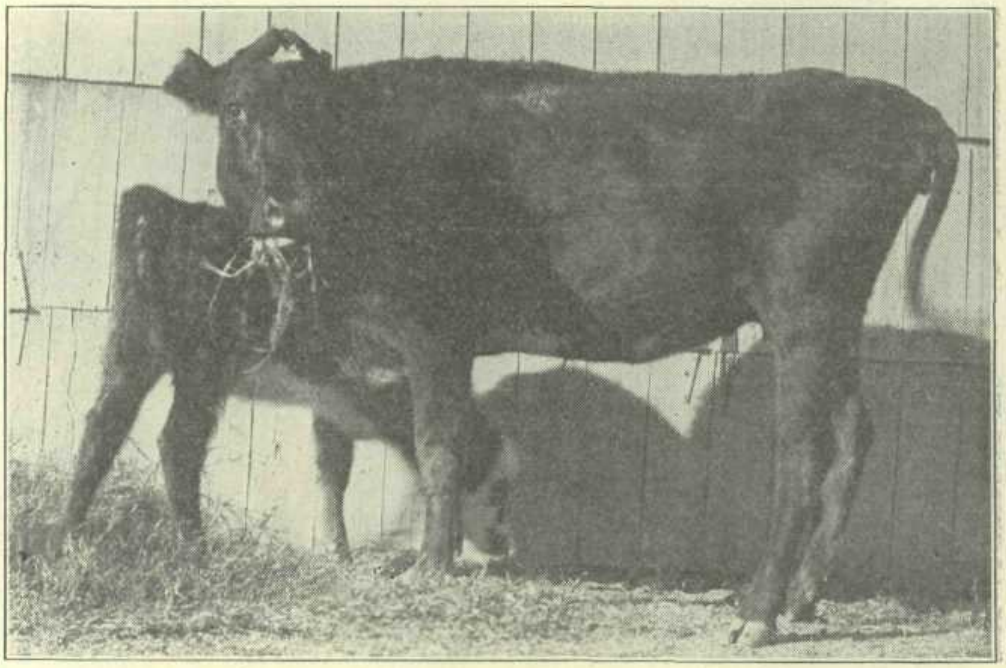


Fig. 8.—Cow 3, Lot 2.



Fg. 9.—Cow 4, Lot 2, and her calf.

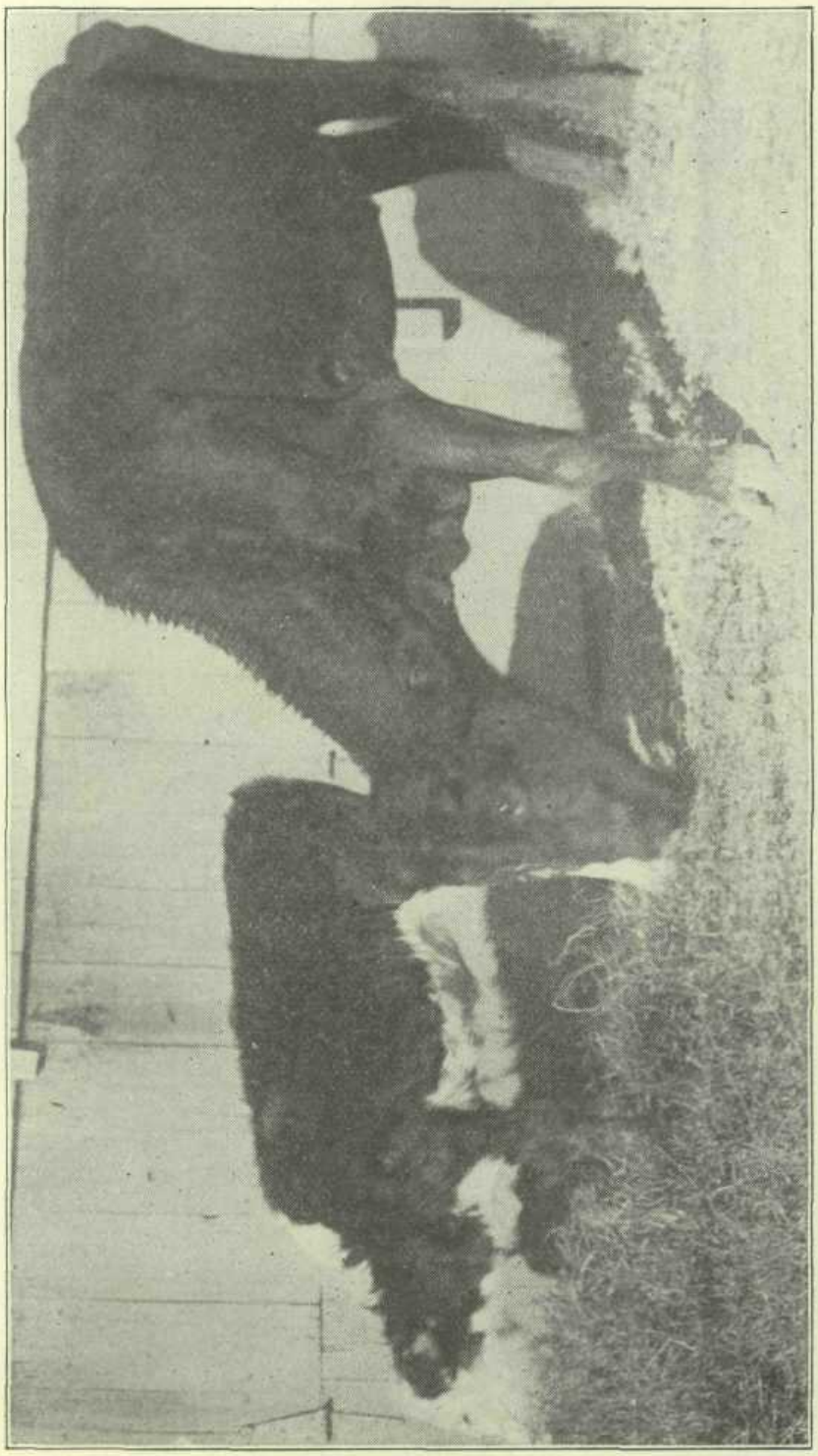


Fig. 10.—Cow 5, Lot 2, and her calf.