9-1956

Effects of Early and Delayed Grazing on Orchardgrass--Alfalfa--Ladino Clover Pastures

University of Tennessee Agricultural Experiment Station

A. G. Van Horn

W. M. Whitaker

R. H. Lush

Bulletin No. 249 September, 1956

Effects of

EARLY AND DELAYED GRAZING

On Orchardgrass - Alfalfa - Ladino Clover

PASTURES

A. G. Van Horn, W. M. Whitaker
R. H. Lush

AGRICULTURAL EXPERIMENT STATION
THE UNIVERSITY OF TENNESSEE
KNOXVILLE

Effects of Early and Delayed Grazing on Orchardgrass-Alfalfa-Ladino Clover Pastures

A. G. Van Horn
Superintendent, Dairy Experiment Station, Lewisburg

W. M. Whitaker
Assistant Dairy Husbandman, Dairy Experiment Station, Lewisburg

R. H. Lush
Dairy Husbandman, University of Tennessee, Knoxville

Work at the Dairy Experiment Station, Lewisburg, is conducted jointly by the University of Tennessee Agricultural Experiment Station, and the Dairy Husbandry Research Branch, Agricultural Research Service, U. S. Department of Agriculture.

The authors of this bulletin hereby gratefully acknowledge the assistance of B. T. Throop, Technician, University of Tennessee Dairy Department, in making the chemical analyses of pasture vegetation.

THE UNIVERSITY OF TENNESSEE
AGRICULTURAL EXPERIMENT STATION
KNOXVILLE

TABLE OF CONTENTS

INTRODUCTION

Grazing and clipping practices are among the most important factors affecting productivity and maintenance of stand in grass-legume mixtures grown primarily for pasture. Many research workers have contributed to the available information on pasture management. Wolfe (1), working in Virginia, reported higher yields from orchardgrass under a hay system of cutting than under pasture conditions. Sprague and Garber (2) in Pennsylvania found that the time of removal and height of cutting of the first crop in the spring was an important factor in the persistence of ladino clover in orchardgrass-ladino clover and fescue-ladino clover mixtures. Wagner (3) reported yields of orchardgrass-alfalfa and brome grass-alfalfa mixtures comparable to the best yields of ladino clover mixtures by delaying the first cutting until June and letting the following growth reach a height of 12 inches. Van Horn and Dawson (4) found great differences in yields of pasture from different pasture mixtures (not including alfalfa) and from different treatments of the same mixture. Workers at the Middle Tennessee Experiment Station (5) at Columbia, Tennessee, obtained good yields from grazing (108 cow days) alfalfa by starting rotation grazing in August after two or more cuttings for hay had been removed.

Permanent pastures at the Dairy Experiment Station were supplemented for many years in late summer and fall periods by grazing alfalfa fields after two or three cuttings of hay had been removed. This practice caused no apparent injury to the stand. Enough cows were placed on a field to graze it in a comparatively short time. The cows were then moved to another field.

These observations, and results obtained by others, led to experiments reported in this bulletin. The tests compare all-season rotational grazing of an orchardgrass-alfalfa-ladino clover mixture with rotational grazing delayed until recovery of growth after one cutting was taken for hay or silage in May each year. The object was to determine relative effects of the two systems of management on the carrying capacity of the pasture and on the character of the herbage. Workers also anticipated that the experiment would provide information on the problem of providing all-season grazing through inclusion of the deep rooted legume, alfalfa, in the pasture mixture, and by extending the acreage grazed both during periods of drouth, and as the season advanced.

EXPERIMENTAL METHODS AND PROCEDURES

Pasture Layout and Management

A 20-acre field, excluding area for an access lane, was divided into four plots, each containing 4.76 acres. The division was made to equalize differences in soils as nearly as possible according to treatment to be given.

The soil in the field included Hermitage silt loam, in both undulating and rolling eroded phases; Talbott silty clay loam, severely eroded rolling phase; Emory silt loam; and a small area of Huntington silt loam. The Talbott, comprising about 20 per cent of the area in the field, is Class 4 land which usually is not recommended for use as crop land. The eroded rolling phase of Hermitage included about ten per cent of the field, is Class 2 land. The remainder of the field is Class 1 land. Soil tests indicated medium to very high available phosphate, high potash, and a pH varying from 5.3 to 6.5.

The plots laid out for the test were designated A, B, C, and D. Plots A and D were grazed all season. Plots B and C were grazed after recovery of growth following the removal of a cutting for hay or silage each year. It was apparent that because of the variability of the soil in the field the productivity of each of the plots would differ from the others. It was believed, however, that the productivity of plots A and D should approximate the productivity of B plus C. Each plot was divided into three areas of equal size for rotational grazing.

Two plots were rotationally grazed all season, starting in the spring when the herbage had reached a height of six to eight inches. The other two plots were not grazed until new growth had reached a height of six to eight inches following the removal of one cutting for hay or silage.

Each of the three grazing areas in each plot was grazed ten days, followed by 20 days for recovery with no grazing, except when grazing was started in the spring of each year. At that time the grazing periods were 7, 10, and 13 days for the three grazing areas, respectively. These differences in length of grazing periods were to provide time for grazing the different amounts of growth which resulted from differences in starting dates on the three different areas in each plot.

The different areas were grazed by varying numbers of producing Jersey cows, depending upon the amount of grazing available. Close grazing was avoided. Generally, the herbage was not

less than six inches in height. All cows were removed when the pasture stopped growing because of drouth.

The different pasture areas were clipped at a height of eight to ten inches immediately after the cows were removed to a new grazing area. This was done to remove stemmy growth of orchardgrass following either the first or second time the area was grazed. There were not many weeds, thus weed control was not a problem.

Establishment of Pasture and Additions to Fertility

The pasture area used in this experiment previously had been used as experimental grazing plots. In order to offset possible effects of previous use of the land, the new plots were laid out to run crosswise to the old plots.

The field was plowed and limed in the spring of 1949 and seeded to spring oats which were utilized for grazing and hay. Following removal of the oats, the field was prepared with a heavy disk harrow, and worked down to a firm seed bed. Then 480 pounds of 4-8-8 fertilizer and 20 pounds of borax per acre were applied. The field was seeded August 25 with a mixture of 8 pounds alfalfa, 2 pounds ladino clover, and 13 pounds orchardgrass per acre. An excellent stand was obtained. The cost of the seeding amounted to $34.69 per acre, distributed as follows: Seed, $12.66; lime and fertilizer, $8.44; labor and machinery, $13.59.

No additional fertilizer was applied during the experiment except 200 pounds of 60 per cent muriate of potash and about 20 pounds of borax in February of each year.

Measuring Pasture and Forage Yields

As indicated heretofore, cows were added to or removed from grazing areas according to the amount of grazing available. Records were kept of the amounts of milk and butterfat, produced, body weights of the cows, and the amounts of grain mixture and hay consumed as supplements to the pasture. From these records and from figures based on Morrison's* feeding standards showing the nutrients required for producing cows under usual conditions, the yields of total digestible nutrients supplied per acre of pasture were calculated in accordance with the method of Knott and associates (6). The yields of total digestible nutrients in hay or silage removed in an early cutting from plots B and C were calculated from actual weights of the forage, moisture determinations, and the use of figures shown for average analyses by Morrison.*

*Feeds and Feeding, 21st edition, by F. B. Morrison.

RESULTS

Yields of Total Digestible Nutrients

The total yields of calculated digestible nutrients per acre for the two methods of management averaged 1,971 pounds for the all season grazing, and 2,777 pounds for one cutting plus grazing (Table I). The differences in yields were progressively greater each year during the first four years. The differences in favor of cutting-plus-grazing were nine per cent in 1950, 24 per cent in 1951, 55 per cent in 1952, and 92 per cent in 1953. The difference in 1954 dropped to 61 per cent. The drop in 1954 is believed to be due to the loss of a high percentage of the orchardgrass in the one-cutting-plus-grazing pastures during the severe drouth of 1953. Severe drouth, which continued to July 15 following the cutting of a heavy growth of both orchardgrass and alfalfa May 11-13, 1953, appeared to produce conditions which the orchardgrass could not survive when in competition with alfalfa for moisture. The average for the five years was 41 per cent more total digestible nutrients from one-cutting-plus-grazing than from all season grazing. The yields of nutrients obtained on the land used in this experiment were very favorable when compared to yields which might have been obtained from corn if the yields of total digestible nutrients are converted to bushels of No. 2 corn. The comparison is shown in Table II. This comparison assumes that only the grain from the corn would be utilized. It indicates the yield of corn which would have to be obtained to equal yields of forage and pasture obtained from the experimental pastures. However, it is unlikely that actual corn yields would have produced more than 50 per cent as much TDN as was obtained from pasture and forage. Corn was practically a complete failure as a producer of grain in 1952 and 1954. The yields of forage from corn also were very low. The Dairy Experiment Station purchased approximately 100 acres of drouth-stricken corn for silage in each of these two years. This corn was grown on farms in the vicinity. The yields of silage per acre varied from two to five tons and averaged about three tons.

Effects of Rainfall Upon Yields

Total yields and the distribution of grazing were markedly affected by the amounts and distribution of rainfall. The rainfall record is shown in Table III.

The total rainfall, March through October, 1950, was near normal and the distribution was much better than usual. There

TABLE I *Calculated Yields of Total Digestible Nutrients Per Acre*

	Grazed all season, lbs.			Cutting + Grazing							Increase in yield with cutting + grazing	
				One cutting, lbs.			Grazing, lbs.					
Year	Plot A	Plot D	Av.	Plot B	Plot C	Av.	Plot B	Plot C	Av.	Total	Lbs.	Pct.
1950	2,682	4,310	3,496	1,403	1,480	1,441	2,161	2,556	2,358	3,799	303	9
1951	1,509	1,945	1,727	1,412	1,240	1,326	780	866	823	2,149	422	24
1952	1,438	1,880	1,659	1,481	1,287	1,384	1,151	1,223	1,187	2,571	912	55
1953	1,523	2,213	1,868	2,643	2,462	2,552	916	1,095	1,028	3,580	1,712	92
1954	901	1,317	1,109	1,078	1,254	1,166	648	594	621	1,787	678	61
Av. 5 yrs.	1,611	2,333	1,971	1,603	1,545	1,574	1,140	1,267	1,203	2,777	805	41

TABLE II *Bushels of Shelled Corn Required to Supply Digestible Nutrients Equivalent to the Amount Supplied Per Acre by Alfalfa-Orchardgrass*

Year	Grazed All Season TDN - Lbs.	Equivalent Bushels of Corn	Cutting + Grazing TDN - Lbs.	Equivalent Bushels of corn
1950	3,496	78	3,799	85
1951	1,727	38	2,149	48
1952	1,659	37	2,571	57
1953	1,868	42	3,580	80
1954	1,109	25	1,787	40
Av. 5 yrs.	1,971	44	2,777	62

TABLE III *Rainfall for Period Reported Herein at the Dairy Experiment Station, Lewisburg.*

	INCHES								Total
Year	March	April	May	June	July	Aug.	Sept.	Oct.	8 Mos.
1950	6.06	1.15	5.65	3.77	6.14	3.85	4.91	.47	32.00
1951	5.90	5.20	.78	5.19	1.25	1.74	4.04	1.81	25.91
1952	8.00	3.28	1.96	1.39	2.58	5.72	3.85	2.37	29.16
1953	5.97	7.64	3.39	2.81	6.81	.18	1.62	.32	28.74
1954	3.24	5.15	4.78	1.59	.84	2.38	3.48	2.32	23.78
50-year Av.	5.81	4.30	4.15	4.12	4.18	3.63	2.69	2.90	31.78

was no extended period when pastures suffered from lack of moisture. The next four summers were characterized by long periods of drouth.

There was insufficient rainfall in 1951 to produce recovery and growth of pastures from April 22 to June 8 and again from July 1 to September 22. There were several periods of effective rainfall in June, with a total of 5.19 inches for the month.

The amount of rainfall received in May, June, and July, 1952, was so small that none of the rains were effective in producing recovery and growth of pastures.

Again in 1953 rainfall was insufficient to produce recovery or growth from May 6 to July 15, and from August 1 through October 31, with the exception of one rain amounting to 1.03 inches on

TABLE IV *Length of Grazing Season and Total Number of Grazing Days*

Year		Grazing Season			No Grazing Due to Drouth			
		Started	Ended	Length Days, No.	Started	Ended	Total Days, No.	Total Days Grazed, No.
1950	all season grazing	April 10	Oct. 31	205	———	———	———	205
	cutting + grazing	June 10	Oct. 31	144	———	———	———	144
1951	all season grazing	April 1	Oct. 26	209	Aug. 10	Oct. 3	55	154
	cutting + grazing	June 15	Oct. 26	134	Aug. 10	Oct. 3	55	79
1952	all season grazing	April 14	Oct. 31	201	Aug. 1	Aug. 15	15	186
	cutting + grazing	June 6	Oct. 31	148	Aug. 1	Aug. 15	15	133
1953	all season grazing	April 1	Sept. 10	163	Sept. 11	Oct. 31*	51	163
	cutting + grazing	June 4	Sept. 10	99	Sept. 11	Oct. 31*	51	99
1954	all season grazing	April 6	July 27	113	July 28	Oct. 15*	80	113
	cutting + grazing	June 4	July 27	54	July 28	Oct. 15*	80	54
Av. 5 years:								
	all season grazing			178			40	164
	cutting + grazing			116			40	102

*Estimate of duration of period when grazing was stopped by drouth.

September 19. Good rains were received during the last half of July, which brought the July total to 6.81 inches.

The year 1954 contained a longer drouth than any of the preceding years, with no effective rainfall from June 4 until September 21 when there was .94 inch of rainfall. Effective drouth relief came with 2.22 inches of rainfall on September 30.

Moisture determinations made in pastures during the summers of 1953 and 1954, through use of plaster of paris electric resistance blocks attached to a moisture meter, showed that rainfall of .4 inch or less had little effect upon soil moisture at a depth of six inches during periods of drouth.

Distribution of Yields From Grazing

Previous records of grazing experiments (4) and observations covering a number of years indicated that grazing of orchardgrass-clover mixtures could be started about April 1 and be continued without interruption through October 31, although distribution of grazing would be markedly affected by distribution of rainfall. During the five-year period of tests reported herein (1950-54), however, it was possible to graze continuously only in 1950. The long drouths which occurred within the other four years prohibited continuous grazing.

During the first three years (1950-52) the average length of the grazing seasons was 205 days (Table IV) for the pastures grazed all season. The length of the grazing season was so severely cut by drouths that only 163 days of grazing was obtained during 1953 and 113 days during 1954. The pastures were plowed for reseeding in September, 1954. It is probable that an additional 10 to 15 days of grazing could have been obtained in late October, 1954, if the pastures had not been disturbed.

The estimates are 51 days of no grazing because of drouth in 1953, and 80 days in 1954. The average period of no grazing because of drouth was 40 days over the five-year period, and 50 days for the four years in which grazing was curtailed by drouth. The total days of grazing averaged 164 days for the pastures grazed all season, and 102 days for the pastures grazed after one cutting was removed. Grazing was delayed an average of 62 days by the removal of one cutting.

The distribution of yields from grazing is shown as calculated yields of total digestible nutrients per acre in Table V, and as standard cow days per acre in Table VI. The effect on grazing of the favorable amounts and favorable distribution of rainfall

TABLE V *Calculated Monthly Yields of Total Digestible Nutrients Per Acre*

Month	1950		1951		1952		1953		1954		Av. 5 yrs.	
	Grazed All Season	One Cutting + Grazing	Grazed All Season	One Cutting + Grazing	Grazed All Season	One Cutting + Grazing	Grazed All Season	One Cutting + Grazing	Grazed All Season	One Cutting + Grazing	Grazed All Season	One Cutting + Grazing
April	340		392		269		590		348		377	
May	586	1,441[1]	606	1,326[2]	446	1,384[3]	387	2,553[4]	429	1,166[5]	491	1,574
June	628	485	167	134	186	294	346	351	226	417	311	336
July	415	484	405	493	138	234	213	232	107	204	256	329
Aug.	554	510	35	56	33	87	316	337	—	—	188	198
Sept.	472	447	—	—	228	296	15	107	—	—	143	170
Oct.	501	434	122	139	360	275	—	—	—	—	197	170
Totals from grazing	3,496	2,360	1,727	822	1,660	1,186	1,867	1,027	1,110	621	1,963	1,203
Totals 1 cutting + grazing		3,801		2,148		2,570		3,580		1,787		2,777

[1] Cut for hay May 23, 1950; 2,883 lbs. hay, air dry basis.
[2] Cut for hay May 16, 1951; 2,652 lbs. hay, air dry basis.
[3] Cut for silage May 13-15, 1952; 6,921 lbs. wilted silage.
[4] Cut for silage May 11-13, 1953; 12,763 lbs. wilted silage.
[5] Cut for silage May 6-7, 1954; 5,832 lbs. wilted silage.

TABLE VI *Standard Cow Days of Grazing Per Acre*[1]

Month	1950		1951		1952		1953		1954		Av. 5 yrs.	
	Grazed All Season	One Cutting + Grazing	Grazed All Season	One Cutting + Grazing	Grazed All Season	One Cutting + Grazing	Grazed All Season	One Cutting + Grazing	Grazed All Season	One Cutting + Grazing	Grazed All Season	One Cutting + Grazing
April	21		24		17		37		22		24	
May	37		38		28		24		27		31	
June	39	30[2]	10	8[3]	12	18[4]	22	22[5]	14	26[6]	19	21
July	26	30	25	31	9	15	13	14	7	13	16	21
Aug.	35	32	2	3	2	5	20	21	—	—	12	12
Sept.	30	28	—	—	14	18	1	7	—	—	9	11
Oct.	31	27	8	9	22	17	—	—	—	—	12	11
Total	219	147	107	51	104	73	117	64	70	39	123	76

[1] One standard cow day is equivalent to 16 lbs. calculated total digestible nutrients, an amount sufficient to supply all nutrient requirements of cow weighing 1,000 lbs. and producing about 22 lbs. of 5% milk per day.
[2] Cut for hay May 23, grazing started June 10.
[3] Cut for hay May 16, grazing started June 15.
[4] Cut for silage May 13-15, grazing started June 6.
[5] Cut for silage May 11-13, grazing started June 4.
[6] Cut for silage May 6-7, grazing started June 4.

in 1950, as compared to the smaller amounts and less favorable distribution in 1951, is shown in Figure 1. As this figure indicates, favorable amounts of rainfall within any month usually are not reflected in the amounts of grazing obtained until the following month. When effective rains came following a period of drouth, it required about two weeks for the pastures to recover sufficiently for more cows to be added. Conversely, it required about two weeks for the pastures to be noticeably affected after favorable rainfall stopped.

Yields, and Value of Milk Above Feed Costs

Cows used for the grazing tests were fed a grain mixture in proportion to milk production. The amount of grain mixture fed varied with individual cows in proportion to their milk production. Cows producing at high levels received grain at higher rates than cows producing at lower levels. The average rate of grain feeding was approximately one pound of grain for each four pounds of milk produced. Hay, fed when the cows were brought to the barn to be milked, was added only when cows showed symptoms of bloat. Cows which grazed on the all-season pastures obtained an average of 63 per cent of their calculated total requirements from the pasture, and those which grazed the one-cutting-plus-grazing pastures obtained 61 per cent.

The yields, and value of milk per acre above the value of grain and hay which supplemented the pastures, are shown in Table VII. The plots grazed all season produced a five-year average of 4,763 pounds milk (testing 4.8 per cent butterfat) per acre with a value of $174 over feed costs. The pastures grazed after one cutting was removed produced 3,148 pounds of milk (testing 4.8 per cent butterfat) with an average value of $121. If the hay is valued at $30 per ton and the silage at $10 per ton, there was an additional value amounting to $42 per acre obtained from the pastures which were grazed after the removal of one cutting. The total value of the milk produced, plus forage harvested in one cutting, amounted to $163. While it is apparent that under the conditions of this experiment there was little difference between the monetary values obtained from the two systems of pasture management, these values should not be considered as an exact comparison for all conditions. For example, if the hay and silage harvested from the cutting-plus-grazing-pastures had been fed to producing cows, and values measured in dollars received from the sale of milk, it is probable that

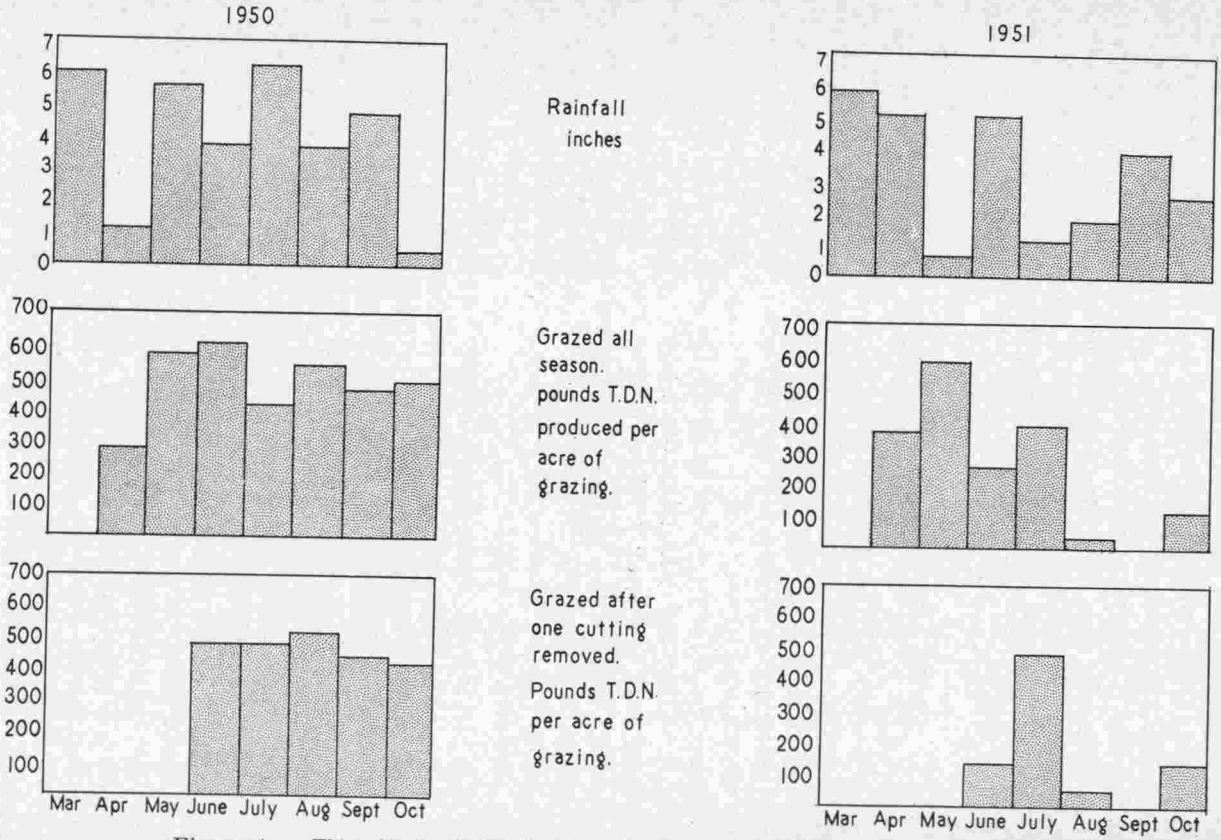

Figure 1. — The effect of distribution of rainfall on distribution of grazing.

TABLE VII *Yields, and Value of Milk and Forage Per Acre Above Cost of Supplemental Feeds*

Year	Grazed All Season		Cutting & Grazing		
	Milk Lbs.	Value Above Cost of Supplemental Feed	Milk Lbs.	Value Above Cost of Supplemental Feed	Value of Forage Harvested[2]
1950	7,947	$281	5,619	$215	$43
1951	4,072	159	2,347	104	40
1952	3,972	185	3,148	146	35
1953	5,058	152	3,093	88	64
1954	2,768	92	1,535	51	29
Av. 5 yrs.	4,763[1]	174	3,148[1]	121	42

[1] Average butterfat test of milk was 4.8%.
[2] The forage was valued at $30 per ton when cut for hay in 1950 and 1951, and $10 per ton when cut for silage in 1952, 1953, and 1954.

the one-cutting-plus-grazing pastures would have shown a higher return than the pastures which were grazed all season.

Effects of the Two Management Systems on Pasture Flora

Observation indicated that during the favorable moisture conditions of 1950 there was no thinning of stands of any of the three plants which were seeded in the pasture mixture. The orchardgrass did not stool as much and the ladino clover did not spread as much in the pastures which were cut for hay as in those on which grazing was started in April. The alfalfa also was more aggressive and made more growth in plots where it was cut for hay.

During 1951, the alfalfa held the original stand well in the pastures which were cut for hay, but loss of some of the alfalfa in pastures grazed all season was apparent. Due to the severe drouth of 1951, practically all of the ladino clover disappeared from all of the pastures. There also was some loss of orchardgrass in all pastures but loss was greatest in the pastures which were cut for hay.

During 1952 and 1953, the picture in regard to the alfalfa became somewhat clouded because of differences in soils. The stand held better on Hermitage and Talbott soils than on Emory and Huntington; however, it continued to be distinctly thicker and better where one cutting had been removed before grazing was started. After removal of heavy yields of forage from plots B and C in 1953, a high percentage of the orchard grass in these

pastures died during the summer drouth. There was no comparable loss of orchardgrass in the pastures grazed all season. The loss of orchardgrass in the cut pastures probably accounted for lower comparative yields for forage in 1954, which was mentioned previously. During 1954 it was estimated that herbage in the pastures rotationally grazed all season was 75 per cent orchardgrass and 25 per cent alfalfa, and that in the pastures from which one cutting had been removed each year herbage was 80 per cent alfalfa and 20 per cent orchardgrass. On portions of the Talbott soil where rocks were not near the surface, and on Hermitage, the alfalfa maintained practically the original stand where it had been cut before the grazing was started.

Occurrence of and Treatment for Bloat

The weather was unseasonably cool during the first part of April, 1950. Grazing was started on April 10. Temperatures were 25 degrees F. on the night of April 13, 24 degrees on the night of April 14, and 26 degrees on the night of April 15. These low temperatures caused wilting of the top portions of the pasture herbage, and severe trouble from bloat followed. One cow died from bloat. It was found advisable to turn the cows on the pastures in the daytime only, and to feed them hay at the barn at night. After several days, cows were placed on the pastures day and night, but hay feeding at the barn when the cows were brought in to be milked was continued for several weeks until symptoms of bloat subsided. Later, in the summer of 1950, there was some severe bloating of cows on the pastures from which a cutting of hay had been removed. The cows had been moved to a new grazing area where there was a tender and lush growth of alfalfa. Good rains had fallen about two weeks earlier and the alfalfa was taller than the orchard-grass. Hay feeding when the cows were at the barn was resumed and the trouble with bloat subsided.

During the following years (1951-1954) there was no severe bloating at any time. During the first week or two after grazing was started each spring, hay was fed as a precautionary measure while the cows were at the barn. Feeding hay appeared to provide considerable protection against bloat.

Chemical Composition of Pasture Herbage

Samples of the pasture herbage obtained during June and October indicated high nutritive value (Table VIII). There was little difference between June and October samples and between

TABLE VIII *Average Chemical Composition of Alfalfa-Orchardgrass Vegetation for 1951-54, on Dry Matter Basis*

Date	Cut	Ash %	Crude Protein %	Lignin %
6-19-51	grazed all season	9.43	23.31	9.87
6-19-51	grazd after 1 cutting	10.08	25.57	8.81
10-15-51	grazed all season	10.52	26.90	7.95
10-15-51	grazed after 1 cutting	9.98	26.16	8.00
6-14-52	grazed all season	9.55	23.90	7.76
6-14-52	grazed after 1 cutting	9.29	25.25	7.43
10-11-52	grazed all season	10.40	23.74	9.34
10-11-52	grazed after 1 cutting	9.91	24.70	10.03
6- 8-53	grazed all season	9.60	24.47	8.49
6- 8-53	grazed after 1 cutting	9.06	30.90	6.03
10-23-53	(dry, no samples)			
6- 9-54	grazed all season	10.39	27.46	7.07
6- 9-54	grazed after 1 cutting	10.57	28.83	5.87
10-15-54	(dry, no samples)			
Average grazed all season, spring		9.74	24.79	8.30
Average grazed after 1 cutting, spring		9.75	27.64	7.04
Average grazed all season, fall		10.46	25.32	8.65
Average grazed after 1 cutting, fall		9.95	25.43	9.02
Average all spring		9.75	26.21	7.67
Average all fall		10.20	25.38	8.83
Average all samples, 4 years		9.90	25.93	8.05

samples obtained from the different pastures. The average analysis of all samples showed 9.9 per cent ash, 25.93 per cent protein, and 8.05 per cent lignin.

SUMMARY AND CONCLUSIONS

Data reported herein are from a five-year study, 1950 through 1954, with a forage mixture of orchardgrass, alfalfa, and ladino clover under two systems of management: (1) rotation grazing all season, and (2) rotation grazing after the removal of one cutting for hay or silage.

The results were:

(1) Rotation grazing started after the removal of one cutting produced an average of 41 per cent more calculated digestible

nutrients, including both grazing and harvested forage, than rotational grazing all season. Total yields from both systems are considered favorable.

(2) Although there was a significant difference between yields of nutrients under the two systems of management the difference in monetary value as measured in this experiment was small.

Pastures which were rotationally grazed all season were consumed by cows which produced milk with a value averaging $174 per acre per year above the cost of supplemental feed.

Cows on the pastures which were grazed after recovery of growth following the removal of a crop of hay or silage produced milk with a value averaging $121 per acre per year above the cost of supplemental feed. The value of the hay or silage harvested before the grazing was started averaged $42 per acre per year. The total value, therefore, was $163.

(3) The distribution of grazing obtained under both systems of management was very irregular and was dependent upon the amounts and distribution of rainfall. During four years of the five, there were periods averaging 50 days in length when no grazing was available due to drouths.

(4) Ladino clover did well in the mixture during 1950, a year when there were favorable amounts of rainfall fairly well distributed, but it died in 1951, the first year of drouth. Orchardgrass became dominant in the pastures rotationally grazed all season, and alfalfa became dominant in the pastures grazed following the removal of one cutting. During the fifth summer it was estimated that 75 per cent of the herbage in the pastures grazed all season was orchardgrass, and that in the pastures grazed after the removal of one cutting herbage was 80 per cent alfalfa. However, the percentages in different areas under both systems of management varied considerably with soil types.

(5) There was serious trouble with bloat early in the season of 1950 when temperatures dropped low enough to produce wilting of the pasture herbage. There was some bloat later, after a period of favorable rainfall, when the alfalfa grew taller than orchardgrass. Bloat was lessened considerably by allowing the cows access to hay twice per day.

(6) The pasture herbage was of high quality and chemical analysis showed little difference between samples obtained from the different pastures, and between samples obtained during June and October.

References

(1) Wolfe, T. K., "The Yield of Various Pasture Plants at Different Periods When Harvested as Pastureage and as Hay." Journal of the American Society of Agronomy, Vol. 18, pp. 381-384, 1926.

(2) Sprague, V. G., and Garber, R. J., "Effect of Time and Height of Cutting and Nitrogen Fertilization on the Persistence of the Legume and Production of Orchardgrass-Ladino and Bromegrass-Ladino Associations." Agron. Journal, Vol. 42, pp. 586-593, 1950.

(3) Wagner, R. E., "Yields and Botanical Composition of Four Grass-Legume Mixtures Under Differential Cutting." U.S.D.A. Technical Bulletin No. 1063, 1952.

(4) Van Horn, A. G., and Dawson, J. R., "Improvement of Pastures for Dairy Cattle in Middle Tennessee." U.S.D.A. Circular No. 786, 1948.

(5) Tennessee Agricultural Experiment Station, Sixty-Second Annual Report, p. 74, 1949, (and other recent reports).

(6) Knott, J. C., Hodgson, R. E., and Ellington, E. V., "Methods of Measuring Pasture Yields with Dairy Cattle." Washington Agricultural Experiment Station Bulletin No. 295, 1934.