Fall grazing by sheep on alfalfa

Despite the devastated appearance of the heavily grazed plot in the background, it recovered fully within a few weeks after sheep were removed and later could be distinguished from the moderately grazed alfalfa in the foreground only with the help of a plot map.

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Grazing sheep on alfalfa in the fall is widely accepted in the southern half of California, but is viewed with skepticism for a number of reasons in the northern part of the state. The greatest concern expressed by northern California growers is the possibility of increased soil compaction and subsequent reduction of water infiltration and yield. The potential for entry of pathogens into injured alfalfa crowns is also of concern. A lesser but still important concern is the possible introduction of weed seeds contained in fecal droppings or caught in the wool. We therefore began a three-year research program in the fall of 1984 at the University of California, Davis, to study the effects of fall-grazing sheep on alfalfa.

Background

Management techniques for both alfalfa and sheep production are well documented, but information on the interaction between them is limited. With the exception of the northern intermountain areas, the bulk of California's lamb crop is born in the fall and early winter. Grazing on alfalfa at this time is primarily to accommodate the lambing operation. Sheep producers commonly establish enclosed paddocks by erecting temporary fences for the drop band (ewes about to lamb), and separate paddocks for ewes that have already lambed. Ewes with newborn lambs are first placed in small fenced-in areas to enhance the mothering instinct. As the mother-lamb bond grows stronger, the smaller groups are combined into progressively larger groups that eventually may reach 600 or more pairs. The sheep producer fences new areas each day, and a checkerboard pattern emerges as fences go up and come down across the field.

It is the rotation of animals through this process that results in total defoliation of the alfalfa. Nothing remains but pruned crowns and bare soil with a great deal of tracking and manure pelleting. After lambing, much larger areas are fenced, including entire fields. Where free-choice feed is abundant, the sheep tend to strip only the leaves from the stems. If the producer removes the sheep at this stage, the alfalfa field will be left with standing defoliated stems. This second condition can be found in fall-grazed alfalfa fields when the sheep have departed earlier than normal.

Experimental procedure

The objective of this experiment was to recreate the conditions just described, and evaluate the effect of grazing on alfalfa production of subsequent years. Using a randomized complete block design with three replicates, we constructed temporary pens, each fall, measuring 32 by 64 feet. A one-year-old field (Yolo loam), was planted in October 1983 to Southern Special alfalfa, an intermediate dormancy variety. The field was flood-irrigated and maintained by the Animal Science Department at UC Davis.

The four treatments consisted of an ungrazed control, severe grazing (340 head per acre, or 16 per pen), partial grazing (170 head per acre, or 8 per pen), and machine-harvesting. An average animal weight of approximately 120 pounds per head was maintained for each group of sheep used. There was no set time limit for removal of the sheep, since this was determined by observation. The sheep were removed from the severely grazed treatment only when there was nothing consumable left in the treatment area.

The average confinement time in the pens was 3 days on the severe grazing treatment and 2.5 days on the partially grazed treatment. The sheep were purposely left in the severe grazing treatments longer to stress and trample the alfalfa as much as possible. In the partially grazed treatment, the sheep were removed when approximately 70 to 80 percent of the leaves had been stripped from the still-standing stems.

All yield samples were harvested with a Carter flail forage plot harvester, weighed fresh, and analyzed for moisture content.

TABLE 1. Effect of severe and partial fall grazing on yield of dry matter over three years (1985-87)

Treatment	Yield*							
	4/4/85	5/16/85	4/17/86	6/30/86	10/15/86	4/16/87	7/24/87	10/9/87
	tons dry matter/acre							
Control	1.37	1.51	0.96	1.42	0.67	1.45	1.62	1.03
Machine harvest	1.39	1.38	0.96	1.52	0.70	1.65	1.56	0.98
Severe graze (340 head/acre)	1.39	1.48	0.97	1.63	0.68	1.33	1.64	1.01
Partial graze (170 head/acre)	1.44	1.60	1.03	1.40	0.71	1.36	1.51	1.02

NOTE: The last harvest of 1985 was unobtainable due to a late irrigation and early rains.
* Differences among treatments were not significant (LSD .05).

Soil density measurements by technicians Nancy Goodell and Joe Nunez before and after sheep grazing showed no significant difference, even on heavily grazed plots.

The soil bulk density was measured with a Troxler Double-Density Probe at depths of 0 to 2, 2 to 4, 4 to 6, and 6 to 8 inches. These measurements were first made in all plots before the first grazing in 1984. All subsequent measurements were made after fall grazing, in the spring just before the first cutting.

The moisture content just before the sheep entered the treatment area for grazing each year ranged from 20 to 22 percent. Because of a late irrigation in the fall of 1984, the moisture content was 22 percent. Deep tracking was evident as the sheep entered the plots. Midway through this grazing period, 0.58 inch of rain fell, saturating the soil to the point of ponding. In the first year, we attempted the double ring method of measuring water infiltration but obtained highly variable data. The main problem seemed to be that, when we pounded the rings into the soil, alfalfa root crowns were cut open and water could easily drain off along the larger roots and resulting channels.

Results

Yields were at levels expected for this soil and were not affected by the grazing treatments (table 1). There was no obvious effect from grazing or harvesting on the weed population, plant density, insect infestation, or disease, although we did not make measurements. Despite their devastated appearance, the plots subjected to either grazing treatment were fully recovered within a few weeks after each grazing period, and could only be located with the aid of a plot map and measuring tape. The bulk density measurements indicated no significant difference among treatments or between treatments and the initial readings made just before the first fall grazing in 1984 (table 2).

Conclusions

These results suggest that northern California alfalfa producers in the southern Sacramento and northern San Joaquin valleys could graze fields in the fall with no loss of production. Soils with a larger clay content than the Yolo loam used in this experiment could possibly produce different results. Ponding would occur much more rapidly in the event of rain.

We believe that ponding on any field, regardless of texture, should be avoided, even though in our wettest year (1985) there was no effect on bulk density or yield. Persistent ponding or very muddy conditions could result in the loss of forage for the sheep (stems trampled into the mud) and possible contamination of the first spring cutting of alfalfa. To avoid this possibility, an adjacent area available nearby would be ideal, so that the sheep could be moved off for a short period while the surface dried.

Even though the partial grazing treatment had no apparent effect on yield, the presence of standing stems could have a small detrimental effect on the quality and appearance of first-cutting hay.

Southern California growers accustomed to renting to sheep producers often run over the field with a rotary mower after the sheep depart. The reduction of as much plant material as possible for overwintering not only produces cleaner hay for the spring but may reduce costs of spraying overwintering insects. An easier plan would be for the alfalfa grower to arrange with the sheep producer at the onset for grazing down to the crowns by using fences.

This and other details (such as alternate arrangements in the case of heavy rains) should be worked out in advance. Methods of payment vary, but the most common are on a per-head-per-day basis or by a direct rental per acre. It is understood that, when the existing stand has been grazed, the agreement terminates. The stocking rate apparently has no influence other than to affect how rapidly a given area is grazed and totally cleaned off. We believe that many Central Valley alfalfa growers are missing an economic opportunity by not considering early fall grazing of alfalfa fields by sheep.

TABLE 2. Effect of grazing sheep on soil bulk density

Treatment and depth	Soil bulk density			
	Pre-graze Fall 1984	Fall 1985*	Spring 1986*	Spring 1987*
inches	*g/cc*			
Control				
0-2	1.5	1.4	1.4	1.5
2-4	1.6	1.5	1.5	1.5
4-6	1.6	1.5	1.5	1.5
6-8	1.6	1.5	1.5	1.6
Machine harvest				
0-2	1.4	1.4	1.4	1.5
2-4	1.5	1.5	1.5	1.5
4-6	1.5	1.5	1.5	1.5
6-8	1.5	1.5	1.5	1.5
Severe graze				
0-2	1.4	1.4	1.5	1.5
2-4	1.5	1.5	1.6	1.5
4-6	1.6	1.6	1.5	1.5
6-8	1.5	1.6	1.5	1.6
Partial graze				
0-2	1.5	1.4	1.5	1.5
2-4	1.5	1.5	1.5	1.5
4-6	1.5	1.5	1.5	1.5
6-8	1.5	1.5	1.5	1.5

NOTE: Data not reported for spring of 1985 due to malfunction of density probe. The measurements were repeated again that year just before the fall grazing.
* Overall treatment for 1985, '86 and '87. Within each year, no statistically significant treatment effects were observed. (F = 1.01 N.S.) Coefficient of variation on overall data: 5.52%.

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