California Agricultural Experiment Station
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ANNUAL PROGRESS REPORT OF THE CALIFORNIA CONTRIBUTING PROJECT TO W-94 FOR 1970-71

DATE: July 22, 1971

PROJECT TITLE: The Nutritional Value of Range Forage and the Nutrient Requirements Range Livestock (California Project No. 1670)

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PRINCIPAL ACCOMPLISHMENTS FOR THE YEAR:

Cattle

Use of intensely managed irrigated pastures alone or as a supplement to dry range

Beef production from irrigated pastures alone

Trial 1. In studies at Davis with irrigated pastures (orchardgrass, perennial ryegrass, ladino clover and strawberry clover) comparisons were made between continuous grazing and a five-field rotational grazing over a four-year period, and to a two-field rotation for two years. Beef steers were used for three years and beef heifers for one year. Stocking rates were approximately equal within years for each grazing treatment and were such that forage availability would allow maximal individual animal performance.

TABLE 1. Continuous vs. rotational grazing (two years)

	Continuous	2-field rotation	5-field rotation
Animal days/acre	1501	1550	1501
Ave. daily gain, lb.	1.52	1.48	1.39
Live wt. gain/acre, lb.	961 (1028)*	937 (1034)*	862 (960)*

*Figures in parentheses show an estimate of additional gain per acre made by cattle utilizing pre-trial excess forage.

Yearling beef steers (good to choice grades) were allotted at random to the grazing treatments after number branding and treatment for worms. During the course of the trials the steers were weighed every 28 days after an overnight shrink without feed or water. Where the animals were carried for the entire grazing season (Table 1), it was possible to obtain very good production of beef/acre (approximately 1000 lb.) although the animals were of inadequate finish for slaughter. Continuously grazing consistently resulted in 3-8% higher average daily gains and more beef/acre than rotational grazing.

Changes in botanical composition differed among the grazing management systems. A higher percentage of legumes persisted in the sward under continuous grazing,

but regardless of the grazing system, there was a trend toward higher percentages of grass over time.

Rates of water infiltration increased progressively during the four years of the experiment in both the continuous and rotationally grazed pastures. However, these experiments were conducted on Yolo clay loam, a soil of generally desirable, physical characteristics, and results may not be the same on poorer soils. It was concluded that the type of grazing management system used should not be determined by the method or timing of irrigation application, but by other criteria such as soil type, temperature and plant growth.

Trial 2. Irrigated pasture composed of cool season forage species (orchardgrass, ryegrass, ladino and strawberry clover) were compared to one consisting of primarily warm season species (Dallis grass and Bermuda grass). This trial was conducted at the Sierra Foothill Range Field Station and was for one growing season. The steers were continuously grazed, allotted, treated and weighed as in trial 1. The trial was started as soon in the spring as forage growth permitted. Here again stocking rates were such as to allow maximal individual animal performance and increased or decreased as forage availability dictated. The cool season pasture was sprinkler irrigated and the other flood irrigated at approximately nine and 14 day intervals, respectively.

The pasture planted to the cool season species out-performed the other in beef produced by almost 20% (Table 2). This is a reflection of more animal days per acre and a higher average daily gain. Even though the forage production of warm season grasses was high during the hot summer months, the apparent lack of growth early in the season and the rapid decline in forage production in the fall resulted in lower total beef/acre.

TABLE 2. Comparison of type of irrigated pasture (191 days)

	Cool season plants	Warm season plants
Animal days/acre	1826	1590
Initial wt., lb.	413	426
Ave. daily gain, lb.	1.64	1.39
Gain/acre, lb.	705	575

Unless the livestock operator is able to adjust his stocking rate to efficiently utilize the short mid-summer flush of growth shown by the warm-season grasses, an accumulation of stemmy, unpalatable dry matter can accumulate, lowering both the quality and productivity of the pasture.

Range supplementation

Irrigated pasture has a potential as a protein supplement for dry range. Supplements of cottonseed meal and other protein sources given to beef cattle grazing dry annual range will increase beef production per acre, percentage calf crop, weaning weight of calves and general thriftiness of the cattle. Comparative

average costs for CSM and for irrigated pasture protein indicate that a unit of protein from CSM could cost as much as three-equivalent units from intensively-managed irrigated pasture.

Trial 3. Studies conducted at the Sierra Foothill Range Field Station using the cool season pasture described in trial 2 and an adjacent dry range were conducted over two different summer dry forage seasons. The cattle were weighed and handled as previously described.

TABLE 3. Dry range supplementation
(Ave. 2 years' data, 107 days, 8 head/treatment)

	Dry range			
	Alone	+ 1.5 lb. CSM	+ 3 times per week irrigated pasture	Irrigated pasture
Acres used	30.5	26.0	18.8+1.8	4.2
Animals/acre	0.28	0.28	0.42-8.0	1.9
Initial wt., lb.	655	642	655	613
Final wt., lb.	678	732	770	765
Ave. daily gain, lb.	0.22	0.83	1.07	1.39
Ave. daily gain/acre	0.07	0.25	0.43	2.5

The response to the addition of protein to the dry range diet either as CSM or irrigated pasture was apparent both years. The most striking differences between treatments was in ADG/acre. A small area of irrigated pasture gave a 30% increase in production above that of the CSM supplemented dry range. Even though the cattle had "access" to the irrigated pasture on three days/week they actively grazed the dry range forage on the other days.

From the data obtained in this trial and preliminary trials at Davis it was concluded that irrigated pasture could be used advantageously to increase the amount, or to improve the quality of beef production from cattle grazing dry annual-range forage. It can also be concluded that irrigated pasture could compete favorably with CSM as a supplemental protein source for dry annual range forage.

Stocking rate of foothill range

A stocking rate trial was conducted on the Sierra Foothill Range Field Station with Hereford weaners between March 3 and June 22, 1970. The four stocking used and gains per animal and per acre are shown in Table 4.

Gain/animal remained constant as stocking rate increased to 4.4 ac/animal, but gains/ac. increased as stocking rate increased.

Table 4. Stocking rate as it affected gains per animal and gains per acre

No. of head/treatment	Stocking rate (ac/animal)	Gain/animal (lb.)	Gain/ac. (lb.)
18	7.6	206	27.0
23	6.0	202	33.7
31	4.4	201	45.2
45	3.1	186	60.7

From June 29 to August 17 the body weights of 20 steers which remained in the trial were almost constant.

It was intended that this trial would be repeated in 1971, but a very low rainfall in the growing season resulted in inadequate herbage.

Sodium requirements of range cattle

Forty-two Hereford breeding cows grazing range at the Sierra Station were divided into two groups each of 21 cows. One group was given salt ad libitum while the other received no supplemental sodium. The parotid saliva and plasma were analyzed for Na and K. Results indicate that breeding cows at the Sierra Station do not require supplemental salt during pregnancy but may require it during lactation. The study is continuing.

Sheep

The effect of biuret as a supplementation of range ewes and the drylotting on lambing performance

The effect of biuret supplementation and drylotting on the lambing performance of ewes was measured in a trial at the Hopland Field Station.

One hundred and twenty Corriedale ewes were randomly divided into two groups (each of 60 ewes) and were given from 7-1-70 either salt or a salt-biuret (50:50) mixture. Fifty-six days later (9-1-70) half of each group was brought into a drylot and given 4 lb. of alfalfa hay/head/day. Rams were joined with all ewes 10 days later (9-11-70) and were withdrawn on 9-30-70 when the ewes from the drylot were returned to the range and biuret feeding was discontinued.

Blood urea nitrogen levels (BUN) were measured on the ewes on the range at the beginning of the experiment (7-7-70), after 23 days of biuret supplementation, again after 10 days and the end of the period in the drylot, and after 15 days on the range without supplementation.

Results

Biuret supplementation prior to and during breeding had no significant effect on the number of any ewes or the incidence of multiple births (Table 5). Drylot feeding significantly increased the number of ewes lambing and multiple births, but the response was not affected by previous supplementation with biuret.

BUN values were higher in the sheep on range supplemented with biuret than those given salt only (Table 6). The very high values recorded on 9-11-70 in the biuret group on range may have been caused by sheep having access to biuret right up to the time of sampling whereas samples collected on 7-30-70 and 9-1-30 were after 48 hours without biuret. However, sheep on range not supplemented with biuret on this occasion also had higher BUN values than on previous or subsequent sampling dates.

The results are in agreement with previous experiments conducted at Hopland which indicate that a short period (about 30 days) of drylot feeding can significantly increase the number of wet ewes and multiple births.

TABLE 5. The effect of biuret and drylot feeding on alfalfa on lambing performance (%)

	Range		Drylot	
	Salt + biuret	Salt	Salt + biuret*	Salt
Dry	31	23	10	12
Singles	69	65	47	48
Multiples	0	12	43	40

*Biuret available from 7-7-70 to 9/1/70 on range before feedlotting.

TABLE 6. Blood urea nitrogen levels (mg/100 ml) in ewes given biuret and alfalfa

	Range		Drylot	
7-30-70 (start)	12.8			
	+ Biuret	No Biuret		
7-30-70	15.0	9.6		
9-1-70 (half to feedlot)	14.2	9.6	+ Biuret	No Biuret
9-11-70 (joining)	25.2	18.0	27.4	27.2
9-30-70 (end of feedlotting and biuret)	9.8	9.6	27.1	26.3
10-15-70 (no supplement)	10.6	8.6		

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