C. F. Kelly, T. E. Bond and W. N. Garrett

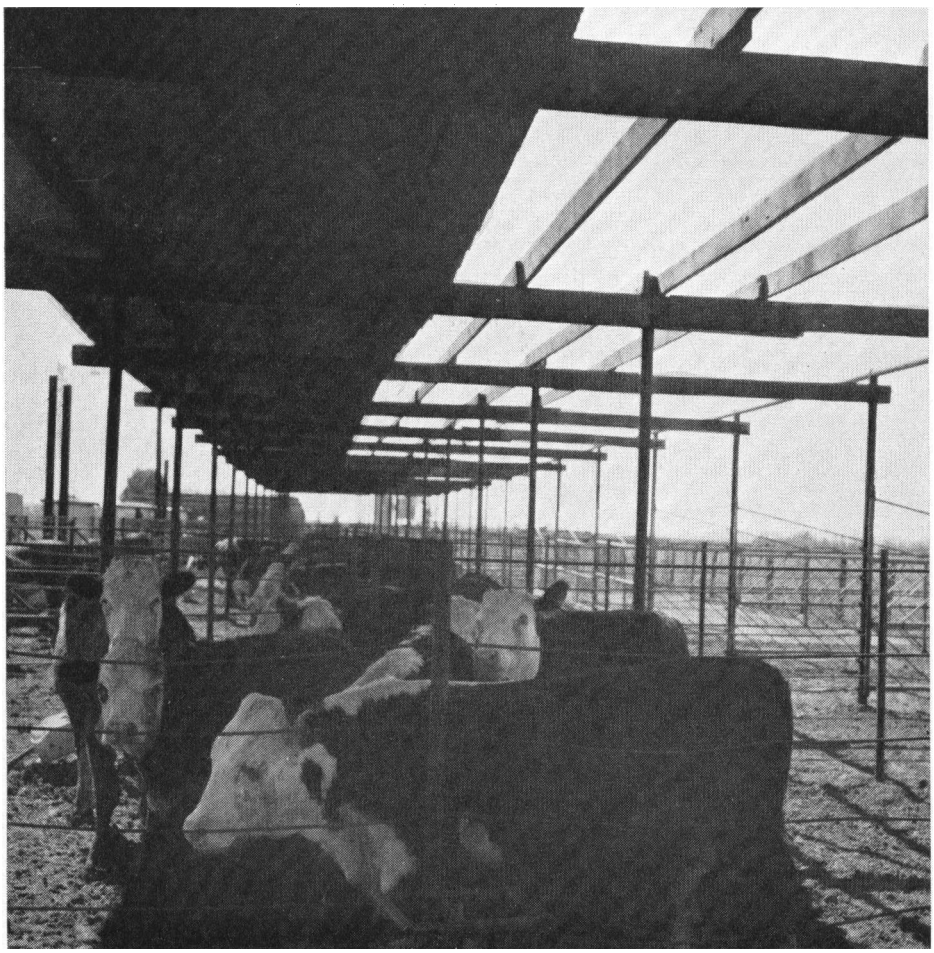
Shade area requirements for Beef Feed Lots in the Imperial Valley

One-fourth of all of California's feedlot cattle are in the Imperial Valley—a seemingly unfavorable environment for livestock production in the summer months. From June through September, daily temperatures average about 90° F., and frequently do not go below 80° F. Air temperatures above the animal's body temperatures may prevail for as long as eight or nine hours every day; and, because of the southern latitude and almost cloudless skies, the solar radiation is intense. But by good management practices involving corrals open to breezes, drinking water as cool as possible, proper rations, and well-designed shades, the Valley feeder has been able to obtain efficient gains.

Shades are used throughout the Valley. Experiments at the Imperial Valley Field Station, near El Centro, have shown that shades reduce the spherical radiant heat load upon the cattle by as much as 50%. However, shades do not appreciably lower air temperature. Commercial feedlot operators in the Imperial Valley allow between 16 and 25 square feet of shade per animal, although the general opinion is that the animals would be more comfortable if 60 square feet could be provided.

An experiment involving two areas of shade per animal—27 and 48 square feet—and two feed rations—high- and low-energy—was conducted for 84 days, from June 25 to September 16, 1959. A series of pens was used for the trial. These were covered by a shade 16′ wide and 10′ high extending over them in an east-west direction. The shade material was galvanized steel, painted white on top. One row of steel sheets was removed from a 90′ length of the shade to reduce its width from 16′ to 9′. Thus a 90′ length of shade 16′ wide provided shade for 30 animals at the rate of 48 square feet per animal, and a similar length, 9′ wide, shaded another 30 animals at 27 square feet per animal.

Cattle in test pens after some of the shade sheets were removed.



The 60 experimental animals were grade Hereford yearling steers. The high and low energy rations are given as a footnote to the table on the next page. Response to the treatments was based on average daily gain and daily feed intake. A micro-weather station with the sensing elements at animal height recorded air-dry bulb and black-globe temperatures, and air velocity, in an empty pen under the 16′ wide shade. These factors and air relative humidity were also recorded for outside conditions in the Field Station's weather station near the corral area.

Results of the 84-day trial indicated that steers having access to a shaded area supplying 48 square feet per individual gained at a significantly faster rate—2.25 pounds per day—than did steers having 27 square feet of shade available—gain, 2.06 pounds per day. The steers receiving the high-energy ration gained very significantly faster than the animals receiving the low-energy ration. The latter was expected—the same thing would normally occur in an optimum environment. A more important observation is that gains on both types of rations were reduced under the conditions of limited shade and that the reduction in gain due to the reduced shade area was more pronounced with the low-energy ration. This fits the theory that, under conditions of high thermal stress, as compared with normal conditions, high roughage rations can be relatively less valuable than high concentrate rations.

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Pelleted hay mixture enables

Dairy Cattle

to give more milk with less butterfat

Dairy cows receiving an all-pellet ration produced slightly more milk but with significantly lower butterfat than did cows eating similar amounts of long hay and concentrates. Butterfat tests were reduced by 0.1% to 0.3%.

Two groups of 15 first-calf heifers were used to study the effects of a pelleted hay concentrate ration in Riverside County. All cows received both a long hay concentrate and a pelleted mixture of ground hay and concentrate, alternately, for four-week periods during the course of a 12-week, double-reversal trial.

The pellets used contained approximately 25% concentrate and 75% ground hay. Hay, ground to ¼″ length for the first two periods, and to a 5/16″ grind in the latter period, was blended with concentrate and compressed into a ⅝″ pellet. The control ration was baled alfalfa hay fed free choice, with the concentrate level adjusted each period to maintain approximately a 1:3 grain:hay ratio.

The animals were paired according to size, stage of lactation, and production level before the trial was started. All cows had reached their peak of production before the start of the trial. They had been in milk an average of 112 days at the beginning of the trial and were producing a daily average of 45.4 pounds of 3.7% milk. Average body weight of the 30 cows was 1,170 pounds. Daily milk weights for each cow were recorded, and a portion of the milk was saved for a butterfat determination. The butterfat tests were determined from weekly composite samples of the milk from each cow. Body weights were obtained by weighing each cow once monthly, immediately after milking. Amount of feed used was estimated for each group of cows by weighing all feed offered during the four-week period, and obtaining daily weighbacks of feed refused. Milk and butterfat production and feed used were calculated on a per-cow per-day basis. Body weight changes were analyzed on a per-cow per-four-week period basis.

The data were analyzed statistically to remove the effects of changing environment, between-cow variation in production level, and between-cow variation in the slope of the lactation curve. After these effects were removed, it was found that pellet-fed cows produced 1.69 pounds more milk daily and that daily butterfat production was decreased 0.04 pound. Since milk increased significantly while total butterfat production decreased significantly, the depression of butterfat test must be significant. It was

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Analysis of the feed consumption data after correction for changes in animal size showed a significant shade-by-ration interaction. This indicates that there was some difference in the acceptability of the rations under the two conditions of shade. However, no difference in total dry matter consumption due to the different shade areas was detected.

The results of the trial indicate a definite advantage of increased average daily gain when yearling steers are provided 48 square feet of shade per head, as compared with 27 square feet per head. This result was true whether a ration relatively low in total digestible nutrients—58%—or high in TDN—67%—was fed.

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Effect of Shade Area and Ration on Gains and Feed Consumption of Hereford Steers

	48 sq. ft. of shade/steer			27 sq. ft. of shade/steer		
	High-energy ration*	Low-energy ration†	Mean	High-energy ration*	Low-energy ration†	Mean
No. of animals	15	15	30	15	15	30
Av. initial weight, lbs.	627	625	626	627	623	625
Av. final weight, lbs.	823	808	815	814	782	798
Total average gain, lbs.	196	183	189	187	159	173
Av. daily gain, lbs.	2.33	2.18	2.25	2.23	1.89	2.06
Av. daily feed consumption, lbs.	17.8	18.3	18.0	18.2	17.9	18.0
Feed/100 lbs. gain, lbs.	763	841	802	814	946	880

* High-energy ration: Alfalfa hay 25%; oat hay 10%; barley 48%; molasses beet pulp 15%; and molasses 2%. Estimated total digestible nutrients—TDN—67%.

† Low-energy ration: Alfalfa hay 46%; oat hay 19%; barley 25%; molasses beet pulp 8%; and molasses 2%. Estimated TDN 58%.

A cross section of the shade before removal of the sheets.