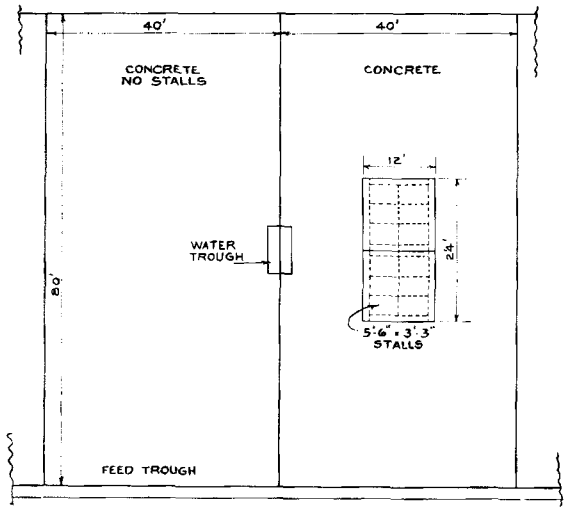
Influence of Feedlot Pen Design and Winter Shelter On Beef Cattle Performance

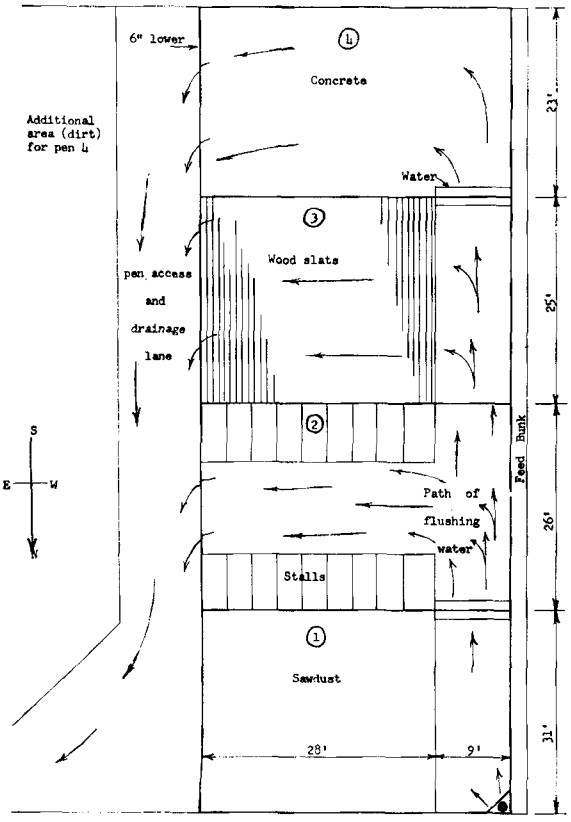
R. L. GIVENS • S. R. MORRISON
W. N. GARRETT • W. B. HIGHT

Satisfactory winter gains were obtained with beef cattle in either concrete or dirt corrals when allowed 312 to 355 sq ft of space per animal, according to these tests. Animals given shelters and slatted floors gained as well in only 58 sq ft of space per animal, as did unsheltered animals in a dirt corral with 355 sq ft per animal. Stalls were of no benefit to beef cattle, as used in these tests, and in some cases actually reduced animal weight gains.



Corrals used at Davis, winter 1965–66.

Pens (1 to 4) used in San Joaquin Valley, winter 1966–67.



MAXIMUM ANIMAL GROWTH at lowest cost is the goal of all feedlot owners, and many studies have been devoted to improving the environment for beef cattle during the summer. However, little information has been available on problems during winter months, even though many Sacramento and San Joaquin Valley feeders have observed declining animal gains and increased costs during this period. The problems have usually been attributed to increased maintenance needs during the colder months, and to mud and/or manure conditions in the feedlot.

The studies reported here are of methods of modifying beef cattle pens for improved production efficiency during winter months. The tests were conducted at the University of California, Davis, feedlot during the winter of 1965–66, and in a San Joaquin Valley feedlot during the winter of 1966–67.

Experiment No. 1

Concrete corrals used for experiment 1 at Davis measured 40 × 80 ft and were enclosed with cable fences as shown in the sketch. Three corrals had a movable shade 12 × 24 × 8 ft high, centrally located. Each shade was built with 12 stalls, each 5 ft 6 inches × 3 ft 3 inches wide. The other three corrals had no shelter during the test period. The stalls were bedded with rice hulls, replaced every 14 days. Nine animals were kept in each of the six corrals during the test period from November 2, 1965 to March 22, 1966. The ration fed is listed in table 1.

Experiment No. 2

Experiment 2, conducted in the San Joaquin Valley during the winter of 1966–67 used five pens, four of which are shown in the sketch. The four pens included a 9-ft-wide manure washway which ran the length of the feed bunk and was flushed daily. These pens were completely covered with a galvanized corrugated roof mounted an average of 11 ft above the floor. Pen 5 (check, not shown) was 100 ft square, had a 20 ft concrete apron in front of the feed bunk, and was not washed. This pen had a 10-ft shade over the feed bunk only. There were 16 animals in each of pens 1 to 4, and 32 in pen 5 during the test period from December 3, 1966 to February 1, 1967. The ration fed is listed in table 2.

The five pens were arranged as follows:

Pen 1. Sawdust and straw bedding covered 28 × 31 ft, plus a 9- × 31-ft washway. Feed bunk space was 31 ft long. Sixteen animals had 72 sq ft of pen space per animal.

Pen 2. Straw bedding in 18 free stalls measured 3 × 7 ft each. There was a 12- × 28-ft central washway between stalls and a 9- × 26-ft washway in front of the feed bunk. Sixteen animals had 60 sq ft of pen space per animal.

Pen 3. Slatted wood flooring covered 28 × 25 ft with 1-inch spaces between wooden 3 × 4's. There was a 9- × 25-ft washway in front of the feed bunk. Flushing water also cleaned under the slatted

floor. Sixteen animals had 58 sq ft of pen space per animal.

Pen 4. Concrete flooring covered 37 × 23 ft, including a washway in front of the feed bunk. A dirt lot (uncovered) of 40 × 40 ft square provided additional space. The sixteen animals had 53 sq ft of covered concrete space per animal and 100 sq ft of uncovered dirt space per animal.

Pen 5. The check, was a standard uncovered dirt pen, of 100 sq ft with a 20 ft concrete apron in front of the feed bunk. Thirty-two animals had 312 sq ft of pen space per animal.

Production data

The experiment at Davis showed no significant difference in average daily gain (ADG) between the no-shelter animals (2.994 lbs/day) and the sheltered animals (2.986 lbs/day). There was an increase in pounds of feed per pound of gain (significant, $P<0.05$) for the no-shelter animals (6.34 *versus* 6.16).

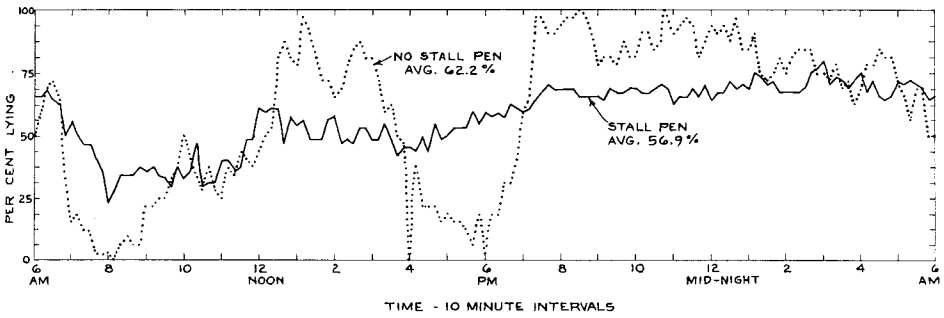
In experiment 2, there was no significant difference in ADG between pens 1, 3, 4, or 5. However, in pen 2 (with stalls) the ADG was significantly lower ($P< 0.01$) than for all other pens. Also, the feed/lb-gain was higher for this treatment. This reduced performance in pen 2 may have been due either to space limitations or stall design. The steers in this treatment had space only for standing in the washways, whereas the steers in all the other pens had additional standing or lying space. The stall design was such that the 6-inch concrete curb prevented drainage of urine, storm water, or overflow flushing water.

Activity

The activity of the animals using the stalls in the Davis experiment, and pens 1 and 2 of the San Joaquin Valley experiment, was observed on selected days by time-lapse photography (a single frame every 10 minutes). No difference was shown in the relative use of stalls between January and March. At Davis the stalls were used 41.7% of the time during January when the average temperature was 45.3°F, and 41.5% of the time in March when the average temperature was 53.4°F.

Stalls

There was a difference in stall use from day (6 a.m. to 6 p.m.) to night (6 p.m. to 6 a.m.), as expected. Where additional lying space was available at Davis, the stalls were used an average of 32.6% of the time during the day and 49.3% during the night. Where no additional lying space was available (San Joaquin Valley pen 2) the stalls were used an average of 46.5% of the time during the day and 67.3% of the time during the night.



Comparison of time spent lying by cattle with and without stalls, San Joaquin Valley, winter 1966–67.

In experiment 2 the no-stall cattle (pen 1) lay down during the daytime about as much as did the stall cattle of pen 2. However, during the night the no-stall cattle lay down a greater percentage of the time than the stall cattle. As shown in the graph, the stall cattle were lying down from 25% to 75% of the time during the 24-hour period. This is in contrast to the cattle without stalls, which lay down from none to 100% of the time, with the greatest amount of movement following feeding.

When stalls were provided in addition to other lying space, a stall was not needed for each animal. In 1440 observations at 10-minute intervals at Davis (lying space in addition to stall space), the stalls were being used 100% only once, 89% only 21 times, 78% only 48 times, and 67% only 129 times. In 576 observations (10-minute intervals) in the second experiment (no additional lying space), the stalls were used 87% only 10 times, 81% only 21 times, 75% only 67 times, and 69% only 121 times. These figures indicate that it would be necessary to provide stalls for only about 75% use at any one time.

Management

As the space allowed per animal decreases, the condition of the feedlot becomes more of a problem during winter. If paved lots are not cleaned frequently there is a build-up of manure slop, and an even deeper mire of mud and manure will exist in unpaved lots. A large percentage of the manure is usually deposited at or near the feed bunk. The flushing of this area with water as done in experiment 2 removed the deposit but the disposal of this fluid material, after it leaves the corral, remains a problem in the winter.

R. L. Givens is Agricultural Engineer, AERD, ARS, United States Department of Agriculture. S. R. Morrison is Assistant Professor, Department of Agricultural Engineering; and W. N. Garrett is Associate Professor of Animal Husbandry, University of California, Davis. W. B. Hight is Farm Advisor, Madera.

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TABLE 1. SUMMARY OF WINTER SHELTER TRIAL, BEEF PRODUCTION, DAVIS, 1965–66

Treatment	No shelter	Shelter
Number of days	154	154
Number of animals	27	27
Average initial weight, lbs	473	479
Average final weight, lbs	933	939
Average daily gain, lbs*	2.99	2.99
Lbs feed/lb gain**	6.34[c]	6.16[d]

* Ration: Alfalfa hay, 13%; Oat hay, 5%; Beet pulp, 9%; Milo, 30%; Barley, 30%; Cottonseed meal, 3%; Molasses, 8%; fat, 2%. To each 100 kg of the above mixture, 0.5 kg of urea, 0.5 kg of trace mineral salt and 60,000 IU of vitamin A were added. Fed free choice.

** Differences significant ($P < 0.05$) if comparable means do not have a common superscript.

TABLE 2. SUMMARY OF PEN DESIGN TRIAL, BEEF PRODUCTION, SAN JOAQUIN VALLEY, 1966–67

Treatment	Sheltered Pens				No shelter
	Bedded	Stalls	Slats	Concrete & dirt	Check (dirt)
Pen No.	1	2	3	4	5
No. of days	60	60	60	60	60
No. of animals	16	16	16	16	32
Average initial wt, lbs	787	782	788	818	782
Average final wt, lbs*	937	894	943	987	933
Average daily gain, lbs**	2.50[a]	1.87[b]	2.58[a]	2.82[a]	2.52[a]
Feed/lb gain, lbs	8.47	11.10	8.63	8.24	8.51

* Balanced ration consisting of two-thirds high-quality corn silage, and one-third barley (rolled), molasses, ground alfalfa, expeller cottonseed meal. Added calcium, phosphorus, aureomycin (70 mg), stilbestrol (10 mg), vitamin A (30,000 units). Fed twice daily.

** Differences significant ($P < 0.01$) if comparable means do not have a common superscript.