Pollen was collected in front entrance traps after all cracks in the hive body were sealed shut with masking tape, allowing entrance only through the pollen trap.

purposes. Group 2 collected about one-half the weight of pollen collected by group 3 during 1969 and 1970. Group 4 collected more than one and one-half times the pollen collected by group 3; and group 5 collected almost three times the weight of pollen collected by group 3. Table 3 lists the comparative relationships of pollen collection results for these five colony strength groups during 1969 and 1970. Results are expressed as a percentage of the pollen collected by colonies in strength group 3.

Colony strength survey

To accompany the "pollen collection, versus colony strength" study, a survey was conducted in Fresno County during both 1969 and 1970 to determine the strengths of bee colonies used to pollinate the county's almond crop. Written permission was obtained from beekeepers for the purpose of inspecting their colonies at random for strength. It was agreed that specific results would be reported to the beekeeper only, and that only a summary of the county survey results would be made public.

Up to 36 colonies were inspected at random in each of 28 orchards in 1969, and in 22 orchards in 1970. This represented bee colonies from 37 beekeepers. Beekeepers were not notified which orchards would be included in the survey. Results of the two surveys are summarized in table 4.

TABLE 4
PER CENT OF SURVEYED COLONIES IN EACH STRENGTH GROUP IN FRESNO COUNTY FOR 1969 AND 1970 ALMOND POLLINATION

Strength Group	1969	1970
	%	%
1 (0–2 frames)*	21.6	1.4
2 (3 frames)	14.9	1.6
3 (4–5 frames)	24.6	6.8
4 (6–7 frames)	15.1	11.3
5 (8 or more frames)	23.8	78.9

* The equivalent number or frames covered on both sides with bees.

Colonies were much stronger for almond pollination during 1970 than in 1969. A combination of three factors can be credited for this difference. Many beekeepers fed their colonies during the fall and late winter of 1969 to build colony populations for almond pollination. The late spring rains of 1969 in Fresno County provided more than the normal weed and range plant pollen and nectar sources. This allowed beekeepers to enter the 1969 winter with much stronger colonies than in the previous year. An awareness of the minimum colony strength standards adopted in 1968 in California may have encouraged the combining or culling of some colonies prior to the 1970 almond bloom period.

The 1970 survey strength average of 11.2 frames of bees per colony during almond bloom is far greater than that which can be expected following an average or below average rainfall year. The 1969 survey strength average of 5.3 frames of bees per colony is less than should be expected following an average rainfall year.

If beekeepers are to provide strong colonies for almond pollination in California, both feeding and grading of colonies are tools that may be used to advantage. Both of these procedures can help almond growers improve their crop pollination and increase subsequent yields. Beekeepers who provide strong pollinating colonies need to be paid for the additional management expenses involved. Almond growers and beekeepers both can profit by adopting a multiple rental price structure for almond pollination based upon colony strength. It seems logical that written almond pollination agreements in the future should financially encourage the use of strong honeybee colonies.

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Effects

performance

Under mild winter conditions in California's Central Valley (mean temperature about 50°F) moderate amounts of artificial wind had no effect on beef cattle performance. Artificial rainfall reduced performance somewhat, depending on the amount of "rain." Muddy pens seriously affected production, reducing the rate of gain by about 35 per cent and increasing the amount of feed required per lb of gain by about 25 per cent.

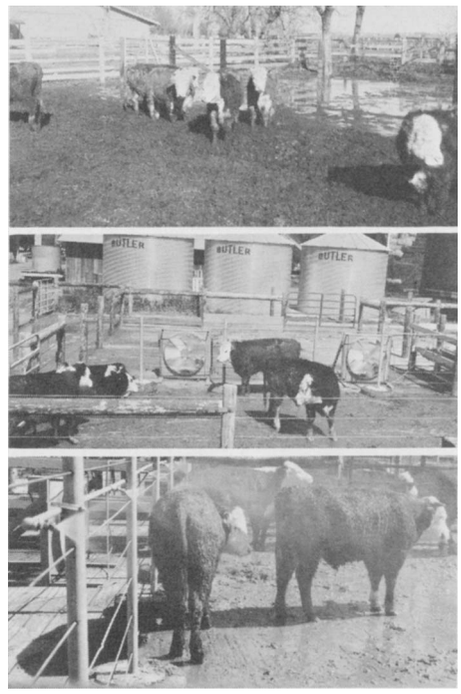
CATTLE FEEDERS in the Central Valley of California have reported higher production costs in winter compared with other times of the year—costs which presumably are due to slower rates of gain and poorer feed conversion. Winter temperatures in the Valley are well above those usually considered detrimental to beef cattle. However, other factors associated with winter such as wind, rain and mud were considered as possible causes of reduced performance. These factors were studied in controlled experiments for three years at Davis. Tests were conducted from January 17 to June 5, 1967 (139 days); from February 18 to April 15, 1969 (84 days); and from December 2, 1969 to March 27, 1970 (112 days). Eight animals initially weighing 500 to 600 lbs were used in each treatment, and were fed a high-energy feedlot ration.

of

MUD—WIND—RAIN

on beef cattle in feed lot

S. R. MORRISON • R. L. GIVENS • W. N. GARRETT • T. E. BOND



Mud

Performance in a muddy pen was compared with performance in a concrete-floored pen—allowing 400 sq ft of space per animal in each pen. The floor of the concrete pen was cleaned once a week, and the dirt pen was kept in an artificially muddy condition with periodic sprinkling (see photo). There was no shelter in either pen. Mud seriously reduced animal performance during a period of winter and spring weather (see table).

Muddy pens were part of an experiment in 1969 and 1970 which also included shelters, and the use of artificial wind and rain. Concrete pens provided 75 sq ft and dirt pens 150 sq ft of space per animal. The results for 1969 are averages for pens with shelter and wind. In 1970 the shelter in the mud pen had a wood floor and the results for this treatment are given separately. Activity studies carried out between 7 a.m. and 7 p.m. showed the shelter with mud floor was used less than 3 per cent of the time, while the one with the wood floor was used 73 per cent of the time. Analysis of all the data indicated the effect of floor rather than protection from wind was most likely responsible for the better results in this pen.

It can be concluded from these tests that the costs of solid or slatted floors which might be required for alleviation of manure and dust problems can be partially recovered in improved winter performance.

Wind

Cattle were exposed to an artificial wind produced by fans (center photo) in pens on both concrete and mud in 1969 and 1970. These fans were operated continuously and provided a mean air velocity of 3.4 m.p.h. in the concrete pens and 2.6 m.p.h. in the mud pen. A mean air velocity of 1.3 m.p.h. was measured in a pen without fans, but the control pens had 12- by 24-ft shelters open only on the south side, thus giving cattle in these pens nearly full protection from the wind. The results are averages for concrete and mud pens in 1969 and concrete pens only in 1970. Evidently wind had no adverse effect on performance.

Rain

Fine spray from nozzles directed on a concrete pen (with fans) provided an artificial rain. The nozzles were operated 10 minutes each hour in 1969 and 2.25 minutes per hour in 1970 throughout the test periods. The results from these treatments are compared with concrete pens with fans only.

None of the differences were significant, but the 1969 rate of gain showed near significance at the 5 per cent level. Since there was four times as much water applied in that year, as compared with 1970, it seems probable that prolonged rainy periods might reduce performance somewhat independent of the mud effect.

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TABLE 1. RATE OF GAIN AND FEED CONVERSION FOR BEEF ANIMALS IN TESTING WITH CONCRETE, MUD AND WOOD FLOORS

		Concrete	Mud	Mud, shelter with wood floor
1967	Gain, lb/day	2.85	2.17	
	Lb feed/lb gain	6.50	7.83	
1969	Gain	3.15	2.17	
	Feed/gain	7.05	8.93	
1970	Gain	2.93	1.89	2.58
	Feed/gain	6.41	8.34	6.87

TABLE 2. RATE OF GAIN AND FEED CONVERSION FOR BEEF ANIMALS IN TESTS WITH ARTIFICIAL RAINFALL

		No rain	Rain
1969	Gain, lb/day	3.13	2.67
	Lb feed/lb gain	7.00	8.44
1970	Gain	3.02	2.85
	Feed/gain	6.27	6.61

TABLE 3. RATE OF GAIN AND FEED CONVERSION FOR BEEF ANIMALS IN TESTS WITH ARTIFICIAL WIND, SHELTERED AND EXPOSED

		Shelter	Wind
1969	Gain, lb/day	2.62	2.70
	Lb feed/lb gain	8.12	7.86
1970	Gain	2.85	3.02
	Feed/gain	6.56	6.27