

after irrigation—an increase over the initial sampling of 5.0 me/l in salt concentration in the shoulder of the open bed. In contrast, the salt concentration in the soil beneath the edge of the plastic canopy steadily decreased. There was a sharp decrease in salt concentration between the initial and second soil sampling eight days after the irrigation, followed by a slight but steady decrease in soluble salt concentration from 22.0 to 11.5 me/l—a decrease of 10.5 me/l below that found in the initial soil sample. As indicated in this experiment (and also reported previously), salts can be redistributed readily in soil under unsaturated conditions.

Some troublesome elements (sodium, chloride, and boron) associated with irrigation water, and the soil in this area, were also investigated. In the shoulder of

the open beds the sodium content increased from 16.2 to 20.7 me/l, chloride increased from 3.0 to 4.2 me/l, and boron showed an apparent decrease from 3.3 to 2.3 ppm. Under the edge of the plastic canopy the sodium content decreased from 16.2 to 9.2 me/l, chloride decreased from 3.0 me/l to a trace, while the boron content decreased from 3.3 to 1.8 ppm. Decreases in these troublesome elements in the soil through use of plastic canopies could be beneficial in seed germination and early plant growth in some areas.

The plant population on the open beds was considerably greater than found 5 cm outside the plastic canopies. This reduction in plant population alongside the plastic canopies, unlike that shown in the sketch (in which the seed was planted through the soil covered plastic), was

attributed to the effect of the recycling water leaching the soluble salts outside, and the evaporative action concentrating the salts in the center of the beds where the radishes were planted. The differences in plant population also may have accounted for some of the increases in water losses from the open beds (through greater transpiration). However, previous work indicated that the increasing of plant populations causes only a small increase in total water use, but will result in a marked reduction of the amount of water used per plant. Chemical treatment of the soil for weed control was necessary prior to installation of the plastic.

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## CROSSBRED BEEF CATTLE

*are more profitable*

S. W. THURBER • REUBEN ALBAUGH

Crossbred Angus-by-Hereford calves (seen in photo above, and cover, at the Albaugh Ranch, Shasta County) yielded a significantly higher return per head at weaning and at yearling age than straight Hereford calves out of Hereford dams of the same age, under the same environmental conditions. At weaning age, crossbred calves weighed 62 lbs more than the straightbred, and (at \$27 per 100 lbs) were worth \$16.74 more than the straightbreds. Yearling crossbred steers brought an income of \$28 more than straight Hereford steers, and crossbred heifers brought \$16 more than Hereford heifers.

**C**CROSSBREEDING of beef animals has been practiced in many parts of the world over a long period of time. The hybrid vigor resulting from the crossing of two breeds of beef cattle is well known. The profitability of crossbreeding has varied with price levels and with degree of benefit derived. In most instances the highest level of advantage from cross-

breeding has resulted from the use of crossbred dams. In the past, little information has been available from tests involving straightbred dams, all of the same age.

In a trial conducted at Albaugh ranch in McArthur, Shasta County in 1966, 52 2-year-old Hereford heifers were selected at random. One-half of them were bred to

an Angus bull and the other half to a Hereford. They were grazed together on the same range, under the same environmental conditions except during the breeding season when they were separated but still kept under comparable conditions. Eleven steers and fifteen heifer calves were born to each group.

### Weaning results

At weaning time the calves were individually identified by tattoo and individually weighed. The crossbred calves outweighed the Hereford calves by an average of 62 lbs. With \$27 per cwt used as an average price at weaning the crossbreds had an advantage of \$16.74 per head. Table 1 gives a statistical comparison between groups.

### Postweaning results

The cattle on trial were wintered together in a large lot on the Albaugh ranch and fed long grass and alfalfa hay of good quality. Heavy snows during the winter of 1967-68 were a factor preventing normal gains during the postweaning period. In the spring of 1968 the animals were again individually weighed. Postweaning gains are shown in table 2.

### Final yearling weight

Although the crossbred cattle did not gain as rapidly during the postweaning period as they did during preweaning, the final weight is economically significant (see table 3). The final weight of the crossbred yearling steers was 567 lbs, and they should bring \$28 per cwt at this weight. The Herefords weighed 449 lbs and would bring \$29 per cwt at this lighter weight. A calculation of returns at these prices indicates that the crossbred steers would bring a profit of \$28.55 per head more than the Herefords.

In a comparison of the final weights, the crossbred yearling heifers at 502 lbs would bring \$120.48 per head based on \$24 per cwt for that weight. Hereford heifers weighing 418 lbs would bring \$104.50 at \$25 per cwt. About \$16 per head more income would come from the crossbred heifers.

It is well known that heavier animals bring less per pound at market time. However, the heavier crossbred animals, of the same age raised in the same environment, return a substantial increase in total income per head over the straightbred.

The difference between the weaning weights of the crossbred steers and those of the crossbred heifers was highly significant. At yearling time, the difference was still highly significant. There was no

TABLE 1. SUMMARY OF WEANING WEIGHTS ANGUS X HEREFORD VS STRAIGHT HEREFORD CALVES

Groups	Ave. final weight	Ave. weight difference
(1) Hereford steers	343	78*
Crossbred steers	421	
(2) Hereford heifers	330	49*
Crossbred heifers	379	
(3) Hereford steers	343	36**
Crossbred heifers	379	
(4) Hereford heifers	330	91*
Crossbred steers	421	
(5) Hereford steers	343	13†
Hereford heifers	330	
(6) Crossbred steers	421	42*
Crossbred heifers	379	

\* Significant at the 1% level.

\*\* Significant at the 5% level.

† Not significant.

TABLE 2. POSTWEANING GAINS ANGUS X HEREFORD VS STRAIGHT HEREFORD CALVES

Groups	Ave. gain	Ave. difference
(1) Hereford steers	117.50	26.59†
Crossbred steers	144.09	
(2) Hereford heifers	88.00	34.80**
Crossbred heifers	122.80	
(3) Hereford steers	117.50	5.30†
Crossbred heifers	122.80	
(4) Hereford heifers	88.00	56.09*
Crossbred steers	144.09	
(5) Hereford steers	117.50	29.50†
Hereford heifers	88.00	
(6) Crossbred steers	144.09	21.29†
Crossbred heifers	122.80	

\* Significant at the 1% level.

\*\* Significant at the 5% level.

† Not significant.

TABLE 3. FINAL YEARLING WEIGHT COMPARISON ANGUS X HEREFORD VS STRAIGHT HEREFORD CATTLE

Groups	Ave. final weight	Ave. weight difference
(1) Hereford steers	449.37	117.44*
Crossbred steers	566.81	
(2) Hereford heifers	418.00	84.13*
Crossbred heifers	502.13	
(3) Hereford steers	449.37	52.76**
Crossbred heifers	502.13	
(4) Hereford heifers	418.00	148.81*
Crossbred steers	566.81	
(5) Hereford steers	449.37	31.37†
Hereford heifers	418.00	
(6) Crossbred steers	566.81	64.68*
Crossbred heifers	502.13	

\* Significant at the 1% level.

\*\* Significant at the 5% level.

† Not significant.

significant difference between the performance of Hereford steers and heifers for the same periods. Considering the crossbred sex difference as a percentage of the steer weights at each period, the percentage difference is very close (10 per cent and 11 per cent for the weaning and final weights, respectively). In general, most of the advantages of crossbreeding came from preweaning gains and these were still apparent at yearling age.

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## A progress report..

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THE ONCE-OVER MACHINE HARVEST of California's cucumber crop requires a heavy concentration of fruit set to produce a profitable yield of usable fruit. The pollination of female cucumber flowers is one of the important factors limiting a concentrated fruit set; nearly all of the usable fruit obtained in a single harvest develop from flowers that are pollinated over the span of a few days.

The importance of the honey bee in the pollination of the cucumber crop has previously been recognized in scientific literature, but honey bees have seldom been deliberately introduced by growers into cucumber fields. High, multiple hand-harvest yields averaging 10 to 12 tons per acre per season have probably led growers to believe that local wild bee populations were adequate, or that perhaps other insects and wind pollination played an important role in the pollination of this crop.

### Field tests

To field test the importance of bees to once-over harvesting of cucumbers, exploratory trials were conducted in 1967 in the Gilroy area of Santa Clara County.

Two replicated, duplicate plots (A and B) were established at opposite ends of an 800-foot long, 40-acre cucumber field. The only introduced difference between the plots was a two-story colony of bees near plot B.

The pollinating activity of bees at both plots was controlled by covering the plant rows with aluminum screens. Exposure of the plants to bee activity was limited to hourly intervals at specific times dur-