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BEEF CATTLE RESEARCH at the University of California

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THE OLDEST PROFESSION? Ask a cattleman and he'll probably tell you that it's raising livestock. And he won't be too far wrong, at least in California. The first Spanish longhorn cattle were in the state as early as 1540, many years before the establishment of Jamestown along the Atlantic coast by the first British colonists.

By 1786 mission herds were expanding, and there were 70,000 head of cattle in California. Today there are approximately 5 million head.

Despite more than 400 years of history, most of the industry's major changes have been within the last century, with organized research accelerating that change within the last 50 years. During this era, the cattle industry in California shifted from mainly hide and tallow production to meat production—focal point of the industry today. Invention of barbed wire and the windmill made it possible to segregate herds for beef improvement and utilize range areas that were previously short of water. Completion of the transcontinental railroad aided livestock movement. The British breeds—Shorthorn, Hereford and Angus—were gradually used to upgrade the Spanish longhorn. Following the turn of the century the Texas fever tick was under control and vaccines were being developed for other diseases such as anthrax and blackleg. Cattle are still the best "machines" for converting range forage into usable protein in many areas of the state, but range finishing of beef has, until recently, been overshadowed by feedlot finishing with grain to put on a lot of pounds in a short time.

The goal of today's beef industry is to produce the most meat in the most efficient way possible. For many years research and extension personnel in the Department of Animal Science at the University of California, Davis, and at the University's field stations have been working closely with the industry to achieve this goal for the benefit of producer and consumer alike.

During the 1920's and 1930's, researchers at U.C. Davis sought to increase the efficiency of rangelands by studying the nutritive value of range grasses. They found that vitamin A, protein and phosphorus were greatly reduced when range grasses dried and withered. Although short-term body storage of vitamin A is sufficient to prevent a deficiency, the lack of protein and phosphorus were reducing animal performance. This led to supplementing range feed with cottonseed cake to provide the necessary protein and phosphorus. The return: about $2 for every $1 spent for the cottonseed cakes.

Cattle grading

Also in the early 1930's U.C. animal scientists developed the procedure for grading and selecting cattle on conformation and weight-per-day-of-age that is now used extensively by cattle producers throughout the United States.

Systematic crossbreeding of beef cattle began in the early 1940's. Research at U.C. and elsewhere showed that crossbred cattle reach sexual maturity earlier, have a higher conception rate and produce more and heavier calves than straightbred cows. These studies also documented that the crossbred cow lives longer, gives more milk and has an overall production record that is 15 to 20% higher than that of the straightbred cow.

The practice of breeding yearling heifers to get one more calf from a cow during her lifetime, followed by some 70% of today's cattlemen, is based on recommendations made by U.C.'s Cooperative Extension Service as early as 1942. The recommendations followed six years of field tests on breeding yearling heifers.

Bloat prevention

Between 1938 and 1955 intensive studies were conducted by U.C. animal scientists on the cause and prevention of bloat in cattle. Contrary to the commonly accepted view, the researchers found that bloat was caused by a breakdown in the mechanism of expelling gas rather than excessive gas formation. Gas was being trapped by foaming of the rumen ingesta. Presumably, lack of sufficient scabrous (scratchy) material in the diet was reducing the flow of saliva, a foaming depressant.

It was found that bloat could be prevented by feeding Sudan or oat hay before pasturing or by sprinkling vegetable or animal oils on alfalfa. A more recent bloat preventive procedure is the use of poloxalene, an antifoaming agent that can be used as a drench, mixed with concentrates or added to drinking water.

The use of diethylstilbestrol (DES) to increase the average daily gain of beef cattle under full feeding was thoroughly tested by U.C. and other researchers. Cattle implanted with 30 mg of DES gained 10 to 15% faster and about 10% more economically than those not implanted.

Studies on the influence of certain

trace minerals in the diet of livestock have helped cattlemen in various areas of the state. In some areas, excess molybdenum in the soil and forage can decrease livestock performance, but U.C. scientists have discovered that the effects of excess molybdenum can be overcome by giving animals intramuscular injections of copper glycinate.

In parts of Northern California, lack of selenium also decreases animal performance, causing a nutritional disease called white muscle disease. Researchers found that the problem could be corrected by treating animals with selenium and vitamin E.

Performance testing

Another major step in the progress of California's cattle industry was the advent of performance testing and the subsequent development of the California Beef Cattle Improvement Association (CBCIA). The U.C. Cooperative Extension Service helped establish the CBCIA in 1959 and has been an integral part of the organization since.

During the 1950's and early 1960's the widespread use of cattle performance testing helped the beef industry recover from selection trends that were resulting in development of small, compact animals that were plagued with serious incidences of dwarfism and were often inefficient feed converters at conventional slaughter weights. Within the last 10 to 15 years, selection for growth rate—variously labeled or measured as weaning weight, yearling weight, feedlot gain, WDA or gain-ability—has received major emphasis in CBCIA breeding programs. The result has been more efficient animals.

Probably the most serious problem that has always faced the cattle industry is fertility, but researchers are making progress in this area also. Larger calf crops are the result of numerous studies and field tests on semen quality of bulls and the practice of pregnancy testing cows. Ova transfer, estrus synchronization and increased twinning are other exciting areas U.C. animal scientists are investigating as potential solutions to the fertility problem.

Improved feeding efficiency—getting the maximum return for the investment in feed—has long been of concern to U.C. researchers. Fiber analysis of roughage has led to a more accurate evaluation of various roughages as feed. Researchers also found that finishing cattle on grass with only limited concentrate supplementation is feasible and economical. A new system for the evaluation of feedstuffs was developed in the 1960's. This system is useful for predicting animal response to a particular feeding regime or for determining balanced least-cost diets for beef production. Research on development of low quality roughages such as rice straw and other waste materials is showing that some of these materials, when used with proper treatment and supplementation, can be incorporated into the diet of cattle to help offset the surge in cattle feed prices.

Researchers also are working on ways to make feed more efficient once it is inside the cow by trying to inhibit the release of wasted energy in the form of methane gas inside the rumen and by protecting proteins from rumen microorganisms so they can reach the small intestine where they are absorbed to increase growth and productivity.

Several experiments—early castration, bulls vs. steers, Russian castration and short scrotum animals—have concentrated on harnessing the male hormone testosterone for more efficient beef production. Some of these practices have proved feasible, some have not. To date, none has received widespread acceptance because of marketing or other problems, but, as has been the case with other work, the research could be the framework for future beef management practices.

Carcass quality studies in relationship to rate of gain and federal grading standards are another integral part of U.C. animal science research. The work established that high-gaining cattle produce carcasses that cut out just as high or higher than carcasses of slower-gaining animals. Recent carcass evaluation research indicates that there is no correlation between actual age and bone maturity of young beef animals. Since federal beef grading standards are based on an assumed age-bone maturity relationship, the finding has helped promote proposed changes in these standards.

No one really knows for sure what the future holds for California's beef industry. But, if past performance is any indication, University of California animal scientists will continue to have an active role in shaping that future for the benefit of both the cattleman and the consumer of his products.

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Control of LEMON TRUNK

MECHANICAL PRUNING of lemon trees leaves stubs around which buds sprout, producing vegetative growth which is usually unwanted. Hand pruning, which selectively removes unwanted limbs, does not cause as many buds to sprout, since pruning cuts are usually made at laterals. However, pruning of any kind causes a vegetative growth flush, and an immediate reduction in yield. On mature trees it would be of economic benefit on some occasions to stop, or at least reduce, this growth flush. Removal of trunk sprouts is important especially during the formative years, or if high scaffold limbs are desired.

Trunk sprouts of nine species of trees and shrubs have been controlled with several growth regulators including naphthaleneacetic acid (NAA). Sprouts from cut stumps of citrus have been prevented from growing for periods of up to one year using ethyl hydrogen 1-propylphosphonate and 1-propylphosphonic acid. The former was also applied in a formulation containing the ethyl ester of naphthaleneacetic acid (NAAEE). Ethyl hydrogen 1-propylphosphonate plus NAAEE and several other formulations of NAA have successfully retarded sprouting of shoots from the base of fig trees.

In 1970, tests with ethyl hydrogen 1-propylphosphonate on lemon trees which had been mechanically topped resulted in significant reduction in shoot regrowth. The application was made to young shoots when they were between 6 and 12 inches long.

In trials with a grape harvester modified to harvest hedge-row lemon trees, it was necessary to prune the skirts of the