Cowboys Use High Tech To Round 'em Up

When Jack Cooper grew up on his family's Montana ranch in the early 1900s, cowboys on horseback managed the cattle herds. In today's not-so-wild West, pickup trucks round up the animals.

"Some of our men don't even know how to ride," says Cooper.

And now ranchers like Cooper, who produce breeding animals for other beef producers rather than beef for the table, use technology to round up not just cattle, but their genes.

Artificial insemination and embryo transfer allow Cooper to produce the most offspring from his best cattle. But the most important advancement, he says, has been performance testing.

In the past, cattle were judged visually. Then in the 1930s, U.S. Department of Agriculture and Montana State University scientists in Miles City, Montana, discovered that important but subtle characteristics like growth rate were heritable. Producers could improve their stock more by keeping precise records and breeding animals with desirable traits than they could if they judged animals by appearance.

To facilitate these genetic studies, the scientists developed several inbred lines of Hereford cattle, including Line 1. The researchers continue this genetic improvement. Line 1 remains a closed herd, and more than half of all purebred Hereford calves produced in the United States—including Cooper's—have Line 1 breeding in their pedigrees (see "Beefing Up Herefords With Line 1," *Agricultural Research*, August 1996, p. 18).

Because Cooper raises registered cattle, say ARS researchers, computers may play a larger role in his family's future. Most breed associations provide predictions of the genetic merit of individual animals, called Expected Progeny Difference, or EPD.

"An EPD tells the breeder whether animal A or animal B will be the most likely to produce the best young, in terms of a particular desired trait," says ARS geneticist Michael D. MacNeil. "A computer program uses performance testing information and solves about 7 million simultaneous equations to arrive at the EPD for Hereford breeders."

Producers use EPDs to decide whether to buy or breed specific animals. A bull that provides consistently desirable EPDs may have a selling price of $20,000 or more.

MACNEIL (K8690-1)

An exemplary Line 1 Hereford bull. Soon, scientists will supplement established methods of predicting an animal's genetic merit—that is, its own performance and that of its offspring—with DNA and profitability information.

MacNeil is helping the American Hereford Association incorporate a new measure into the program: profit.

"We're developing a systematic method for producers to balance traits important to consumers, like leanness, and traits necessary for breeders, like fertility," says MacNeil.

As genetic mapping allows them to add more precise information about the genes responsible for those traits, they'll be able to refine EPDs even more.—By **Kathryn Barry Stelljes,** ARS.

This project is part of Animal Genomes, Germplasm, Reproduction, and Development, an ARS National Program (#101) described on the World Wide Web at http://www.nps.ars.usda.gov/programs/appvs.htm.

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1990s

Technique developed to grow taxol-producing cells in tissue culture.

Rapid test developed to identify antibiotic-resistant strain of *Salmonella;* reduced test time from 6 weeks to 2 hours.

Method developed to recycle chromium-containing solid waste from leather production.

First clone of a plant-derived gene for resistance to a plant virus; *N* gene.

Biodegradable plastics developed with cornstarch.

Fat replacer "Oatrim" for food developed from carbohydrate fiber and natural enzymes.

Gel formulation of formic acid developed to control parasitic bee mites.