Electronics

(Continued from Page E2)

time they come for water.

When a thirsty cow enters a small enclosure containing a water basin at the opposite end, she breaks a light beam. Much like the door operation in some grocery stores, the beam controls a gate that shuts automatically behind her. Once she is locked in the stall leisurely drinking water, the electronics go to work.

Each cow has a donut-shaped ear tag about the size and thickness of three stacked quarters. As she lowers her head to drink, the ear tag comes close to a box that emits low-level microwaves. This energy bombards the ear tag, bringing to life a miniature radio transmitter inside that broadcasts her identification number. After this ID is verified by a microcomputer, the time and date are recorded and measuring begins.

The bottom of the stall is a scale. The cow's weight is read electronically 30,000 times a second. An average of these weights, computed each second, eliminates variations caused by the cow jostling around—something similar to weight differences people can get by shifting their bodies on bathroom scales.

Other devices measure volume and weight of water each cow drinks. When the cow has finished, she starts to back out of the stall, breaking another light beam that triggers the release mechanism on the privacy gate. She returns to her pasture, and the microcomputer calibrates the scale, setting it to read zero just before the next cow enters. This eliminates errors that might occur if cows track in mud or defecate. The scale also has heating coils to keep snow or ice from accumulating in cold weather.

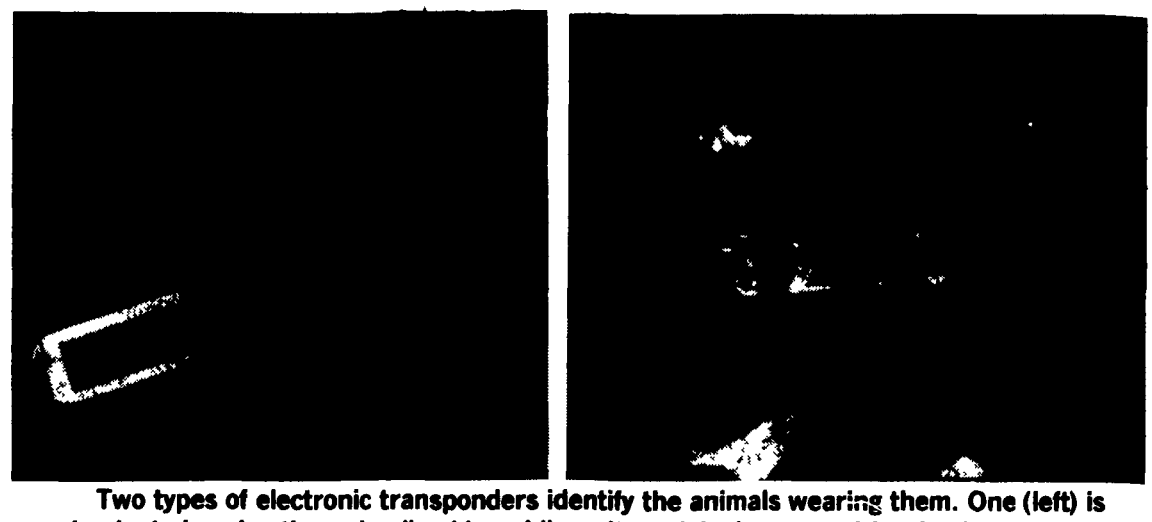
Researchers, 5 miles away in an office at the Fort Keogh Livestock and Range Research Station, receive the data via radio. A computer stores this data for analysis and gives information on how individual animals are faring on the range as well as overall herd performance.

Bradford W. Knapp, a statistician at the research station says, "We use repeaters that pick up the electronic signals from our seven scales, amplify their intensity, and boost them over hills that make line-of-sight transmission impossible. With more repeaters, we could collect information from the very edges of our 55,000-acre experimental ranch—some 8 miles distant."

"Our system is 'water driven,' meaning the cow's reward for entering the stall is a drink. It can be modified so the treat is a feed supplement when the research requires it," says Don C. Adams, a range nutrition scientist.

Adams and another range scientist, Pat O. Currie, are using the new equipment to monitor cattle gains on eight summer pastures that have received various treatments to improve grass growth. Currie developed the pastures with a machine that, in a single pass, can till, build water-retaining furrows with small dams, and apply fertilizer and seed. (See Agricultural Research, October 1983, pp. 8-9).

The pastures obviously look better, Currie says, but the true value of rangeland improvement is how much faster cattle gain weight. In a study just begun, all pasture treatments are helping the cattle gain weight faster compared with regular pastures. Further studies will show which boosts weights the most. Then the scientists will be able to tell ranchers how they can improve their own cattle operations.



Two types of electronic transponders identify the animals wearing them. One (left) is implanted under the animal's skin, while unit at right is encased in plastic and worn around the animal's neck. Each contains a miniature radio transmitter that broadcasts an identification number to a computer.

The weighing system at Fort Keogh is portable, and scientists intend to move it to winter pastures to check performance of cattle receiving supplemental feed. At the same time, Adams and Currie will study how harsh winter weather affects cattle. A weather station hooked to the remote weighing system automatically measures such things as temperature, barometric pressure, windspeed, and humidity.

In Nex Mexico, near Las Cruces, at the 193,000-acre ARS Jornada Experimental Range, another system is helping scientists monitor beef cattle growth on desertlike rangeland.

The Las Cruces scientists want to learn how much supplemental feed should be given livestock and when it is most helpful. This information will be useful to ranchers with similar rangeland in western Texas, southern New Mexico, and southeastern Arizona.

Cattle have a tough time getting enough to eat on arid rangeland. Each cow often has to graze 2 to 3 acres every day in the winter. And when there isn't enough rain in the fall and spring, there may be little or no green forage for them.

The scientists are using the equipment to electronically identify and sort about 100 head of cattle into 3 groups every time they come in for water. Two of the three groups receive cottonseed meal to supplement their range diet.

"By having the three groups graze the same range, we eliminate the effect different pastures might have on our results. Thanks to the electronic equipment, we can quickly and cheaply separate the groups at feeding time," says range scientist Dean M. Anderson.

USDA's Animal and Plant Health Inspection Service, in cooperation with the Los Alamos National Laboratory, Los Alamos, NM, developed the electronic identification system, and ARS scientists integrated it with an electronic weighing system.

Weights are not the only bovine secrets being exposed by ARS electronic surveillance—implanted electronic sensors have proven

(Turn to Page E7)