Grazier

► by **Sue Gordon**

Smart fences

Summer signals the start of the grazing season and, for many, the fencing season as well. Whether you have plans to build new fences, to cross-fence existing pastures, or to have your hopes pinned on virtual fences in the future, here's a fencing update.

Fencing guidelines

When designing a rotational grazing system, consideration should be given to the placement of fences. The University of Missouri's Jim Gerrish, who has focused much of his research on grazing management, shares some guidelines:

1. Keep paddocks as nearly square as possible. In a square pasture, livestock will utilize the forage more uniformly, and it takes less fence to enclose a square, Gerrish says.

He says cattle are also closer to water in a square paddock than in different-shaped pastures of the same area. He especially advises avoiding long, narrow pastures, as cattle have to travel farther from water to graze than in a more nearly square pasture. Long, narrow pastures and pie-shaped paddocks are typically overgrazed near water and undergrazed at the opposite end of the pasture, he adds.

Another consideration when planning the size of paddocks for a management-intensive grazing (MIG) system is to try to keep cattle within 800 feet (ft.) of water, if possible, Gerrish says.

2. Make paddocks of similar grazing capacity, not similar size in acreage, Gerrish says. Depending on the variation of forage productivity throughout the area being fenced, paddocks will likely vary in size. Those areas with less available forage and lower-quality forage will tend to require more acreage.

3. For uniform grazing distribution, aim to fence paddocks into homogeneous areas. For example, rather than having one paddock include both a level grazing area and some rolling hills, follow the contour of the land for paddock boundaries, Gerrish advises. Hence the level area would be one paddock, and the rolling hills would be a separate paddock.

4. If necessary, plan an alley for livestock movement from one paddock to the next. But if an alley is part of your rotational system, use it for livestock movement only and not daily access to water, Gerrish says.

For more on what to consider when planning a fence, visit *www.bae.uky.edu/~lturner/fence.htm.* The site includes software for calculating fencing costs.

Wireless grazing in the future

If building fence isn't your favorite pastime, there is good news on the horizon. Researchers are working on developing virtual fences where livestock movement is controlled by signals given to the animal through radio frequencies.

Oregon researcher Tom Quigley was among the first to start testing this technology on cattle nearly a decade ago. (Invisible fencing systems have been available to contain pets since the late 1970s.) Quigley's intent was to utilize the virtual fence as a means to keep livestock out of riparian areas on grazing allotments. Here's how it worked:

Cattle were fitted with collars containing radio transmitters and electrical stimulators with contacts touching the animals. A portable, battery-operated transmitter was installed in the middle of the area where grazing wasn't wanted. If an animal entered the exclusion area, the collar picked up a signal from the transmitter and gave an audio warning. If the animal didn't retreat from the exclusion area, it received an electrical shock. The shocks continued at regular intervals until the animal left the restricted area.

From his research, Quigley says they were able to control about 95% of the animals from grazing in the exclusion area, with most of the animals being trained within two days.

Today, research continues on improving virtual fence technology with the objective of making it a cost-effective alternative to traditional fences, says Bob Marsh. Marsh works with the Kansas-based company AgriTech Electronics, which is working to commercialize this technology for the livestock industry.

AgriTech Electronics currently has two products in development: one that is based on Quigley's research and uses ground-based transmitters to define an area an animal shouldn't enter. The company's second product will use global positioning system (GPS) satellites to determine the animal's location and then transmit radio frequency signals to the animal if it gets too near the established boundary.

Marsh reports that the product with the ground-based transmitters could be on the market within the next 12 months. The GPS units could be available in the next two years, he says. "One of the biggest challenges in bringing this technology to the market is the development of a lightweight battery that will last as long as a grazing season," Marsh says.

Due to cost, he says initial applications for these units will likely be for research applications and special grazing areas where fencing isn't an option and some extra cost is justified. Long term, Marsh says his company hopes to offer the product as a radio frequency ear tag for about $25 per tag.

Dean Anderson, a research animal scientist with the U.S. Department of Agriculture's (USDA's) Agricultural Research Service (ARS), has also been studying virtual fencing technology at the Jornada

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Electric fences & wildlife

Another consideration when planning fence placement is the effect the fence may have on wildlife movement. According to recent research by the University of Wyoming, it appears electric fences cause the least harm to wildlife.

The study, which was designed to determine if electric fences influence the movements of big game animals, was conducted by scientists with the Cooperative Fish and Wildlife Research Unit at the University of Wyoming. Infrared activated video cameras were used to record animals' natural movements without human interference.

The Wyoming researchers found that because electric fences require fewer fence posts and are more flexible than rigid conventional fences, electric fences are easier for wildlife to cross. As a result, animals are less likely to get tangled in the wires and would incur less stress.

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Experiment Station near Las Cruces, N.M. Anderson is working with a solar-powered collar that receives radio frequency signals from GPS satellites. He, too, hopes that eventually an ear tag in the "double-digit" price range will be available instead of a collar.

Anderson's research is focusing on technology that would give a variety of audio and physical cues to the animal in a bilateral (right or left side) fashion, rather than just one sound or one shock. Animals tend to move away from novel cues, so those administered on the animal's right side normally produce movement to the left and vice versa, Anderson explains. Cues go from whisper soft to very loud and, if necessary, from a light shock to a severe jolt.

"We know every animal is a unique individual, and so the cues are ramped. This lets each animal choose the appropriate level of cueing it needs to change its location," Anderson says. For example, initially animals may need a jolting shock when they approach a virtual boundary, but as they learn and change their behavior, an audio whisper may be all that is needed. The location and width of the virtual boundary, as well as the cues, are programmable. These features make the system easily adaptable to each user's specific needs, Anderson says.

"The real value of virtual fencing will be in managing stocking density and animal distribution in real time," he says. He foresees the virtual fence concept as a prescription grazing tool that can be used to move animals to graze in specific areas based on low-stress animal management principles.

Eventually, information about the pasture's quantity and quality of vegetation, rainfall, soils, topography and other features can be entered into the virtual fence using the system's geographic information system (GIS) capabilities, Anderson says. This feature will assist managers in deciding where to establish virtual boundaries and for how long, in order to optimize utilization of the forage resource, he adds.

Anderson says he likes the GPS capability that today's technology offers because it eliminates the need for ground-based transmitters, except those worn by the animals. Because the animals are focusing on the cues given — and not an environmental cue it associates with location — Anderson says he hopes this technology will eventually aid in rounding up or rotating animals over the landscape.

By combining the technology with electronic animal identification (ID), there are also opportunities for individual animal management, possibly even sire management, he says. "If you turn out three bulls in a pasture, you could program boundaries around certain cows so that potentially only a specific bull could approach and breed certain cows," Anderson says. However, he cautions, this is currently only theory and must be thoroughly investigated before it is known if it will work.

While such applications may sound far-fetched, both Marsh and Anderson are convinced that virtual fences will be a useful part of livestock grazing in the future.

"We're not going to put conventional fences out of business. The exterior boundary of an area will still need to be fenced to keep livestock off of roads and railroads," Anderson says. "This technology is not 100% perfect at containing animals, because we are dealing with animal behavior, which is not 100% predictable."

Still, the applications look promising. And, with fewer actual fences, virtual fences should help eliminate arguments over who has to open and close the gate.