Technology in Beef Production Systems

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Artificial intelligence has increasingly been in the spotlight. At the American Society for Animal Science meetings this summer there was a notable increase in technology related presentations. So, what does this mean for the beef industry? This article will highlight some of the potential tools available now and give insight into others that may come.

Information that can be used for precision livestock management includes animal identification, body weight, temperature, location, behavior, behavior associated with health changes and time of calving. The basis for many monitoring systems is a radio frequency identification (RFID) tag or collar that may have additional capabilities such as an accelerometer or thermometer. Global positioning (GPS) is another technology that can be very useful in tracking animal location. Cameras, infrared sensors, and 3D imaging are other technologies being developed for use in livestock systems.

Compared to intensive or confined production systems, pasture-based production systems present more challenges with issues such as transmission range, service coverage, storage capacity, and battery lifespan. The dairy industry has long used various tools for estrus detection including pedometers, and now accelerometers with integrated monitoring systems. If a female needs to be inseminated or treated based on data collected from the monitoring system, the tag or collar that identifies her triggers a sorting gate to open on her way to the milk parlor. This type of system reduces labor costs and is very low stress for the animal.

A number of producers use cameras to monitor calving, but someone still needs to check the camera feed, nevertheless this can be a big help and very appealing in cold weather. Work is being done on a combination of video monitoring and accelerometers or with a 3D camera with image processing to predict calving.

Also available to help with calving are different sensors. One type attaches to the tail and senses spinal contractions and tail movement. Another type involves a vaginal insert that monitors the temperature until calving dislodges it. In the case of the last two examples, text messages alert the owner of changes. Other wearable sensors to detect calving include accelerometers, microphones detecting rumination activity and electromyography tags. Monitors can be costly to have for each animal and some may cause discomfort to the animal.

Building from the camera technology are efforts to use cameras to estimate body weight and body condition. The ability to routinely track body condition with an automated system could improve the timeliness of management decisions and reduce costs. Unmanned aerial devices or strategically placed cameras may be able to estimate the weight of pasture cattle and help make marketing or pasture management decisions. A fixed camera that cattle pass under at a uniform distance is where most research efforts are being spent, however a drone application would be

valuable in more extensive conditions. In a feedlot setting, images of the bunk condition (full to slicked clean) help

make the next day's feed calls. Knowing if the bunk was slick at 10 pm verses 3 am can be helpful in working cattle up on feed.

Drone services are available to count cattle in feedlots, a step up from flying over feedlots in a plane, taking pictures to monitor collateral, a job my cousin had in the 1980s. Cameras with satellite communication capabilities can monitor water levels in remote water tanks or rainfall.

Technologies that can help researchers understand foraging behavior include inertial measurement unit (IMU) sensors that combine accelerometers, gyroscopes, and magnetometers. Similar technology is part of many smart phones. Work is being done to measure jaw movements (biting, chewing, or ruminating) to help estimate feed intake in grazing animals.

Other efforts include trying to match mothers to offspring by proximity to each other when passing by an RFID reader while entering a pen or by Bluetooth connections. In one study it took 21 days of RFID readings to achieve 80-85% accuracy in correctly identifying dams and offspring.

Virtual fencing is a system to replace traditional physical boundaries with a sound stimulus or an electric shock. Many systems are available for dogs. Training the animals is a necessary part of using the system. This tool creates a variety of pasture management options from excluding grazing in sensitive riparian or burn areas or implementing some type of rotational or strip grazing.

With advances in technology, current challenges of transmission range, battery lifespan and affordability will likely diminish. Thank you to Sandy Johnson, Extension Beef Specialist, for the information in this article. If you have any additional questions, feel free to contact Hunter Nickell, Livestock Production Agent, at any of the Southwind Extension District offices, or by e-mail at nickell99@ksu.edu.