

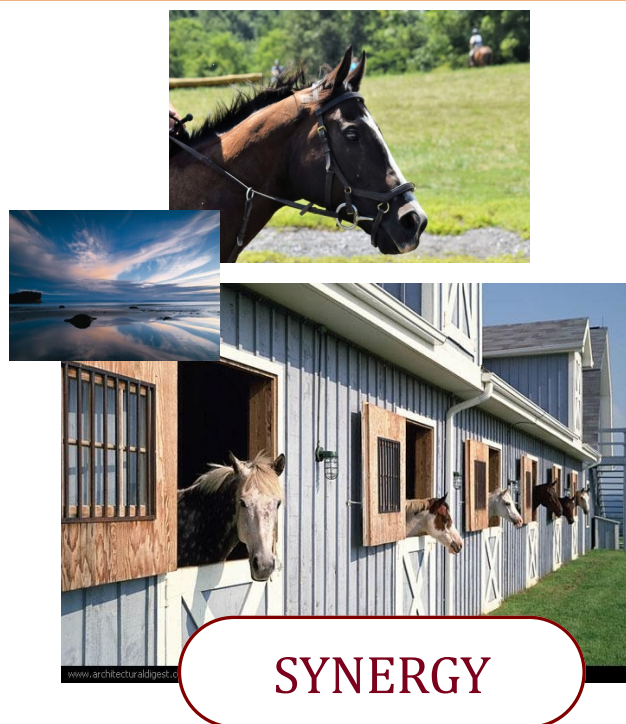
Sensor Technologies at Middleburg AREC

Why Sensor Technologies?

There is a growing interest in the agricultural community to leverage advances in technologies like Artificial Intelligence, Internet of Things, Machine Learning, and Remote Sensing to make more informed and more profitable management decisions. Sensor technologies have been tested in a variety of agricultural settings and have shown promise as a cost-effective strategy to monitor a variety of complex phenomena. Despite this advantage, there are limitations in the application of most current sensor networks for agricultural systems—most crucially, sensors are often treated as stand-alone systems and minimal effort is made to integrate among sensors to make more holistic and systems-based decisions.

What Work is Ongoing at the Middleburg Agricultural Research and Extension Center?

One challenge identified in the equestrian community in Virginia is the need to understand and better manage manure runoff into waterways. Many recommendations oversimplify the management of N runoff by failing to consider that runoff is impacted by horse behavior, owner decision making, weather, pasture quality, and soil characteristics. At the Middleburg Agricultural Research and Extension center, we are testing an integrated network of sensors to monitor weather patterns, horse location and grazing behavior, soil characteristics, and water quality. The data from these sensors will be analyzed using state-of-the-art techniques to get a better understanding of where horses are spending their day, how much they are eating, where they are defecating, and how that manure is transported into local waterways during various weather patterns. In the long-term, these data can help inform more user-friendly pasture management strategies and improved policies for maintaining water quality.



The sensor research being conducted at MAREC focuses on using an integrated network of sensors to evaluate synergies among the horse, the owner, and the environment.

Learn More About Precision Agriculture
Research at the Middleburg AREC!



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Applications of Sensor Technologies

Feeding

Multi-factor sensors that contain an accelerometer, magnetometer, gyroscope, and weather station can be used to understand how a horse's head/jaw are moving in relation to grazing, chewing, and resting activities. Researchers hope to use these values to monitor horse feed intake.

Health

When horses are ill, they have observable behavioral and physiological responses. Depending on the animal, sometimes it can be difficult to detect these responses with the naked eye. Sensor technologies that focus on pattern recognition have shown promise in many species as a way to improve upon human diagnostics to inform when animals are behaving out of sorts. Behavioral and body temperature information can help detect sick animals earlier.

The network of sensors at the Middleburg AREC will provide integrated information about how a horse's behavior, health, and feeding influence the soil and water in its surrounding environment. This network of sensors can be used to inform upon better pasture management strategies, to design more effective buffers and waterway management approaches, and to reduce the environmental burden of horses in sensitive watersheds.

Interactions

Global Positioning System data can be used to understand the spatial distribution of how a horse spends its time throughout the day. These data can be used by researchers to predict the pattern of manure emission in a pasture or paddock as well as the evenness of grazing throughout an area.

Behavior

