AgriLife Research adds new instrumentation to measure greenhouse gases

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Steve Plowman, a representative of the MIDAC Corp., left, and Dr. Ken Casey, Texas AgriLife Research air quality engineer, check the installation of the infra-red light source. Credit: Texas AgriLife Research photo by Al Caramanica

As greenhouse gases become more of a concern, determining the actual rates of emissions through scientific data is a growing necessity, according to a Texas AgriLife Research scientist in Amarillo.

Dr. Ken Casey, AgriLife Research air quality engineer, has commissioned through his program an open-path Fourier transform infra-red spectrometer for use in monitoring greenhouse gases.

This is in collaboration with Dr. Brock Faulkner in the Texas A&M University biological and agricultural engineering department, who set up an identical open-path spectrometer at the same feedyard 18 months

ago for long-term emissions monitoring.

Each instrument cost $125,000, Casey said. The instrumentation and project are being funded by the U.S. Department of Agriculture-National Institute of Food and Agriculture air quality project and a state-appropriated air quality project.

Both researchers are using the instruments to measure emissions of methane and nitrous oxide, which are greenhouse gases with global warming potentials of 21 and 310 times higher, respectively, than that of carbon dioxide, Casey said.

To date, greenhouse gas inventory methodology comes from the Intergovernmental Panel on Climate Change, and that methodology for intensive livestock facilities is based on a very limited data set which was not collected from the type of animal feeding systems in this region, Casey said.

"We are concerned the inventories don't accurately reflect actual emissions from feedyard operations because they are based on limited research on some production systems that may not be typical of what happens on a High Plains feedyard. Hence, the resulting inventory has a significant degree of uncertainty," he said.

"Because the concentration of nitrous oxide in normal air is not zero and the increase in contribution from a large feedyard operation is relatively small, complex and very expensive instrumentation must be used to accurately measure the increase in concentration," Casey said.

The open path configuration of these instruments allows more sensitive measurements to be made by integrating the concentration in the air over a path length of 300-450 meters between an infra-red light source and the spectrometer, Casey said.

Working together, the two open path spectrometers can measure the concentration of nitrous oxide downwind and upwind of the feedyard regardless of which direction the wind is coming from, he said.

"Other agricultural operations such as field cultivation and fertilizer application can contribute to a varying background which must be accurately accounted for in calculating the emissions," Casey said. "If you can't account for the background, then you can't measure the emissions from the feedyard alone."

The scientists will be continuously monitoring the emissions of nitrous oxide particularly, because they are episodic, influenced by season and by rainfall, he said. "If you are not there when it happens, you miss it."

Their goal is to get a good measurement of the annual emissions and then "we can use this data for improving the emissions workbooks of federal and other regulating agencies," Casey said.

"Also, by gaining a better understanding of what controls these emissions and when they occur, we can guide feedyard management in implementing practices that can minimize the emissions," he said.

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