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### **Research to Mitigate Green House Gas Emissions**

LANSING, MICH. – Corn growers and livestock producers have had a mutually beneficial relationship since the very beginning of animal agriculture. With the growing demand for corn for ethanol, some livestock producers are concerned that this long established corn supply may soon run out. However, today's ethanol process allows corn farmers to produce feed and fuel from the same bushel, thus satisfying both markets simultaneously.

Distiller's grain with soluble (DGS) are a co-product of the ethanol production process which contain the highly nutritious parts of the corn kernel. During the dry milling process, the primary way in which ethanol is processed in the U.S., starch is removed from the corn kernel leaving oil, crude protein, fiber and other minerals such as sulfur and phosphorus. These nutrients are nearly three times more concentrated within DGS as compared to corn, making it a valuable and nutritious feedstuff for cattle, poultry and other livestock. The availability and use of DGS in cattle diets has enhanced the ability of the industry to remain competitive with elevated corn prices. Use of 40 percent DGS in the ration lowers the ration cost by 15 to 20 percent. Additionally, the manure from cattle fed DGS is fortified with higher nutrient levels than manure from cattle fed traditional diets, consequently giving the manure more value when used as a fertilizer.

With the growing availability and reasonable price of DGS, the livestock industry has increased the amount of DGS in cattle diets. While this substitution has its benefits, feeding high levels of DGS to livestock may increase nitrogenous gases and sulfur concentrations that theoretically could increase greenhouse gas emissions. In order to help Michigan's farmers understand the potential impact of feeding DGS on the environment, the Corn Marketing Program of Michigan (CMPM) partnered with Michigan State University (MSU) to conduct DGS research. The study sought to determine if greenhouse gas emissions are influenced by feeding cattle DGS and if so, what nutritional or management practices could be implemented to reduce these emissions.

To accomplish these objectives, Dr. Steven Rust and Dr. Wendy Powers, principal researchers and animal science professors at MSU, set-up a gaseous emissions monitoring system for cattle fed DGS. The study was conducted at MSU's Animal Air Quality Research Facility (AAQRF). Environmentally-controlled rooms at AAQRF monitor incoming ambient and outgoing air from each of twelve rooms for concentrations of ammonia (NH<sub>3</sub>), methane (CH<sub>4</sub>) and hydrogen sulfide (H<sub>2</sub>S), which are gases of concern for greenhouse emissions.

Two different trials were conducted at AAQRF. In both, twelve Holstein steers were placed into environmentally-controlled rooms with four steers in each trial receiving a different dietary treatment. Three levels of DGS (zero percent, 40 percent and 60 percent) replaced corn in a finish diet in Trial 1. In Trial 2, two levels of DGS were fed (zero percent and 40 percent). In trial 2, the third feed treatment was identical to the 40 percent DGS mix, but contained six parts per million (ppm) molybdenum and sixty ppm copper. The latter treatment was called 40 percent DGS Plus.

The purpose of Trial 1 was to determine if increased inclusion levels of DGS would cause an increased emission of hydrogen sulfide gas. Additionally, the effect on ammonia and methane emissions was also

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considered. In Trial 2, hydrogen sulfide, ammonia and methane gases remained the focal point. However, dietary treatment of 60 percent DGS was replaced with 40 percent DGS plus, which served as a potential strategy to mitigate hydrogen sulfide emissions. The third objective was to determine the origin of the greenhouse gas emissions; whether they evolve directly from the animal (enteric) or from the manure (mixture of urine and feces). The collection of manure for both trials was separated into two phases to determine emissions from solid manure and urine mixture versus solid manure and urine separated.

Results from this research project demonstrated ammonia and hydrogen sulfide emissions were increased when 40 percent DGS or greater was added to high grain diets. Additionally, the study showed separation of urine and solid manure drastically reduced emission of these gases. This separation limits the access of bacteria and enzymes to the soluble components in the urine, the interaction of which causes release of the gases. The increased emission when urine and solid manure are mixed illustrates that methods of storage and land application will have a large effect on the amount of nitrogen and sulfur retained in the manure. Moreover, manure handling and removal procedures may impact gas release and further research is needed to determine strategies to reduce those emissions. It was also shown through the study that feeding high levels of DGS does not increase methane emissions, as most of the methane was produced from enteric fermentation in the rumen and hindgut of the steers. Lastly, addition of molybdenum and copper to the diet was shown to have no significant effect on lowering greenhouse gases.

“As a result of this study, Michigan’s farmers are better informed about distillers grains, nutrient management and the threshold at which DGS can be fed,” said Clark Gerstacker, CMPM president, National Corn Growers Association Corn Board member and a corn grower from Midland. “We are grateful for the work Drs. Rust and Powers have done regarding DGS. The results from their project will allow corn and livestock farmers across the state to increase their productivity and decrease their greenhouse gas emissions.”

Headquartered in Lansing, the CMPM is a legislatively-established statewide program that utilizes one-cent per bushel of Michigan corn sold. Investments are made in the areas of research, education, market development, and new uses in an effort to enhance the economic position of Michigan corn farmers. The CMPM works cooperatively with the Michigan Corn Growers Association (MCGA), a grassroots-membership association representing the state’s corn grower’s political interests since the 1970’s. Michigan’s corn industry adds more than one billion dollars to the state’s economy annually and in 2010, Michigan’s corn farmers harvested a record setting crop of more than 315 million bushels. For more information, visit the website of the MCGA and the CMPM at [www.micorn.org](http://www.micorn.org).

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