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Computer modelling suggests DDGS can cut feed costs

Merging economics with animal science, research suggests that incorporating dried distillers grains with solubles (DDGS) can reduce feed costs by almost 13 per cent

Stewart Skinner, born and raised in Listowel, has always been involved in the hog industry. Over the

past two years, he has undertaken a master's project with Drs. Alfons Weersink and Kees de Lange with the hope that their research can lower costs for Ontario hog producers.

The research is a joint project that merges economics with animal science, studying the effect of dried distillers' grains with solubles (DDGS) on feed cost and environmental quality.

The initial research, based on work done between May 2009 and January 2010, indicates that there is an economic advantage to feeding DDGS with a feed cost reduction of 12.8 per cent. DDGS reduce feed cost by acting as a substitute for energy, protein and phosphorus. However, the introduction of DDGS can have environmental implications as well. If rations containing 25 per cent DDGS are fed to finishing pigs, nitrogen and phosphorus excretions will increase by 20.3 per cent and 6.5 per cent respectively. Nitrogen emissions increase because the amino acids (protein) found in DDGS are not as digestible as other sources such as soybean meal.

DDGS also have high levels of total phosphorus and, while they allow for reduced di-calcium phosphate use, rations will still have higher levels of total phosphorus, leading to increased emissions in the manure.

Skinner never had to enter a barn to conduct this research, using computer modeling to estimate results. "Linear programming was used to create two

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separate, three-phase grow-finish feeding programs. One allowed the use of DDGS, while the second excluded DDGS from available ingredi-

ents," Skinner says.

The nutritional requirements of each phase were developed using the National Research Council's 10th edition of Nutritional Requirements for Swine (1998). Further guidance was provided by a commercial feed manufacturer to ensure that the diets used in research were consistent with those being used here in Ontario.

A model created at the University of Guelph was used to estimate the nutrient content of manure. Nitrogen and phosphorus emissions were calculated using a whole farm mineral accounting system. This model, the Swine Manure Estimator (SME), was developed in part by Skinner's co-advisor, Kees de Lange, using previous work from the Netherlands.

"When the Nutrient Management Act was being developed, policy-makers wanted to create a software package that could ease the process of creating a nutrient management plan," Skinner says. "The Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) brought together policy-makers and researchers from various fields to create NMAN software for this

purpose. The SME is actually incorporated into this program.

"I input the nutrients entering the farm through the feed and then . . . it accounts for the amount (of nutrients) the pig would take out, including variables like feed wastage.

Phosphorus poses a greater challenge than nitrogen as it is almost always the limiting nutrient when developing nutrient management plans.

"There is a whole realm of variables that can affect the answer," Skinner notes, "but the end result is the estimated content of the manure if that pig was fed the inputted diet."

Nutrient retention is another factor included in the model that Skinner uses.

"I cannot explain the exact biological process, as I am an economics student who is trying to grasp swine nutrition, but I can provide a basic explanation," says Skinner. "When DDGS are included in rations, the level of total phosphorus is increased. But pigs do not have requirements for total phosphorus, they require a level of digestible phosphorus. The absorption of phosphorus will not change and the increased phosphorus is excreted, hence the lower nutrient retention." He adds that the reduction in nutrient retention does not affect performance.

The next phase of the project will be to figure out the cost to farmers when utilizing the extra nitrogen and phosphorus showing up in the manure when pigs are fed DDGS.

"Every farm will have a different nutrient management situation and, because of this, there is no easy way to attribute a cost or benefit to higher emissions of nitrogen and phosphorus," says Skinner. "If a farmer is not constrained by land for nutrient application, then these findings lead to the conclusion that increased emissions are beneficial as the farmer will not have to purchase the same levels of synthetic fertilizer.


Conversely, on operations that are constrained by land, these increased emissions could force the operation to rework the nutrient management strategy to handle the higher nutrient load."

Skinner notes that phosphorus poses a greater challenge than nitrogen as it is almost always the limiting nutrient when developing nutrient management plans. "In the majority of cases, increased nitrogen will be beneficial, because corn requires high levels of nitrogen and hog farmers will almost always need to purchase supplementary nitrogen.

"For the purpose of my thesis, a farm scenario was developed where a 2,000-head finishing barn is constrained by land and is forced to acquire land for nutrient disposal," Skinner said. "When DDGS were not present, 157 hectares were required to utilize the phosphorus. When DDGS were fed at a 25 per cent inclusion rate, the required acreage was increased to 168 hectares."

Skinner acknowledges that his thesis is a hybrid of economics and animal science. "At the end of the day, I hope to deliver research that is applicable at the farm level, and having this practical combination makes this goal attainable."

He has worked under the supervision of Kees de Lange, a professor in the department of animal and poultry science, and Alfons Weersink, a professor in the department of food, agriculture, and resource economics at the University of Guelph.

When the thesis is completed in May, Skinner plans to return home and take up farming on his family's farrow-to-partial-finish operation near Listowel. 

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