

Better Pork - August 2007

Nutrition

Time to take a look at alternative feed ingredients for your pigs?

Rising corn prices are making alternative feed sources more attractive. But, prior to committing to any ration change, it is important for producers to do some research and weigh the options carefully to avoid compromising performance

by JANICE MURPHY

The rising cost of corn and its declining availability has resulted in increased retail pork prices and pork production costs over the past year. And further increases are expected, according to a new study conducted by the Center for Agricultural and Rural Development (CARD) at Iowa State University.

The study assesses the potential size of the U.S. biofuels sector and estimates the subsequent impact on crop markets, the livestock and poultry sectors, exports, as well as wholesale and retail food prices.

The researchers estimate that, since last August, ethanol production has boosted pork production costs by 30 per cent – about \$20 million a week – with similar increases in the dairy, beef, egg and poultry sectors. Those increases translate into higher U.S. retail food prices to the tune of \$14 billion annually.

The CARD study suggests that this amount could reach \$20 billion in a scenario where crude oil prices range from \$65 to \$70 per barrel and U.S. corn prices jump to \$4.42 per bushel. The study also projects that, if U.S. ethanol production reaches the estimated 30 billion gallons by 2012, it would consume more than half of U.S. corn, wheat and other coarse grain production.

As the demand for grains for the bio-fuel industry increases, the cost of feed energy will continue to increase globally. It had been previously estimated that the cost of feed energy will increase by 10 per cent, while the cost of feed protein will likely decline by more than 20 per cent between 2006 and 2012. The assumption is that feed protein will become cheaper because of increased supplies of protein-rich co-products from the bio-fuel industry, such as distillers' grains and distillers' solubles. So, as heavy users of feed energy, pork producers will be looking for more cost-effective alternatives.

Researchers Hans Stein of the University of Illinois and Kees de Lange of the University of Guelph recently collaborated on a presentation at the London Swine Conference, which looked into some of these alternative ingredients and their nutritional value.

Distillers' dried grains with solubles (DDGS)

DDGS is a co-product from the fuel ethanol industry. Ethanol can be produced from barley, wheat, sorghum or corn, so the resulting nutritional value of the DDGS is patterned after the grain that was used. However, even when the same grain is used, chemical composition of DDGS may vary.

When formulating diets with DDGS for growing pigs or lactating sows, the researchers recommend using energy values similar to corn and that formulations be based on standardized ileal digestible amino acids and digestible phosphorus.

Because the protein in DDGS is relatively poor in lysine, additional crystalline lysine is a necessary addition to the diet. They suggest this rule of thumb: for each 10 per cent of DDGS that is used, crystalline lysine should be increased by 0.1 per cent (Table 1). By following this principle, approximately 4.25 per cent of soybean meal and 5.7 per cent of corn can be removed.

In addition, because of the greater level and digestibility of phosphorus in DDGS compared to corn and soybean meal, approximately 0.2 per cent monocalcium phosphate can be removed from the diet for each 10 per cent of DDGS, but more limestone must be added to balance the level of calcium.

When formulating diets with DDGS for gestating sows, less soybean meal can be removed because gestating sows have a relatively greater requirement for tryptophan than lactating sows and growing pigs. Since tryptophan levels in DDGS are low, the reduction in soybean meal is limited to 2.4 per cent for each 10 per cent of DDGS included in the diet. As a consequence, if 10 per cent of DDGS is included in gestating diets, the concentration of corn in the diet can be reduced by 7.4 per cent.

Based on current knowledge of feeding DDGS, the researchers have come up with recommended inclusion rates for different phases of production (Table 2).

Item	Gestation diets	All other diets
Corn	↓7.40	↓5.70
Soybean meal, 48 per cent	↓2.40	↓4.25
MCP, per cent	↓0.22	↓0.20
Fat	↓0.10	↓0.05
L-lysine HCL	↑0.03	↑0.10
Limestone	↑0.09	↑0.10

Wheat shorts

Wheat shorts are a co-product of the wheat flour industry. Many experiments have explored the nutritional value of wheat shorts for use in pig diets. These studies suggest that their nutritional value is comparable to barley and lower than corn, largely because of the lower starch and higher fibre content.

In spite of extensive research, resistance exists among pork producers and nutritionists to the use of substantial amounts of wheat shorts in pig diets. This reluctance may be attributed to various factors, including inconsistency between batches, low bulk density, variable inclusion of high-fibre wheat bran fractions, high mycotoxin levels or negative interactions between high dietary fibre and fat levels on the pig's digestive function. Like any co-product, the nutritional value of wheat shorts varies between batches of ingredients. Therefore, nutrient analysis is a vital step that must be conducted routinely in order to monitor differences and adjust estimated nutritional values. In particular, close attention should be paid to the fibre content.

When the nutritional value of wheat shorts is taken into consideration, the use of substantial amounts of wheat shorts does not compromise pig performance. The maximum recommended inclusion rate for wheat shorts is 10 per cent of the diet for starter pigs and 40 per cent of the diet for growing-finishing pigs and sows. However, when the nutritional value of wheat shorts has been well defined, inclusion levels may exceed these suggested levels without compromising pig performance.

Because of their low bulk density, wheat shorts can cause problems with flowability and separation in mash feeds. It is for this reason that wheat shorts are more commonly used in pelleted feeds. Pelletting also slightly enhances the utilization of energy in wheat shorts and, in turn, the wheat shorts enhance pellet quality.

Liquid feed ingredients

Liquid feeding of pigs is not new but, driven by the availability of inexpensive co-products from the food and bio-fuel industries, computer-controlled liquid feeding systems will likely continue to gain popularity in Ontario. These products, such as whey, whey permeate, corn distillers' solubles, brewers' yeast, sugar syrup and corn steep water, offer many opportunities for producers looking for alternative feeding options.

As an industry leader in this area of research, the University of Guelph has been actively characterizing the nutritional value of these products. In addition, through laboratory experiments, they have been able to enhance the nutritional value of corn distillers' solubles, corn steep water and high-moisture corn mixed with water by steeping them with enzymes or inoculating them with beneficial bacteria.

Based on the results of a series of experiments, some key points are revealed. When the nutritional value of these liquid co-products is estimated, based on dry matter content and levels of key nutrients (ash, crude protein, crude fat, starch, sugars, remaining organic material) in dry matter, all of these co-products can be used for growing-finishing pigs at levels up to 15 per cent of diet dry matter content without compromising pig performance, carcass or meat quality.

In some cases, significant improvements in pig growth performance result. For example, improved growth rates were observed when replacing dry corn with liquid whey permeate in phase three pig starter diets, or including five per cent of corn steep water in growing pig diets.

Improvements in growth performance can also be expected when feeding liquid whey. Unfortunately, its availability continues to decline as whey is increasingly being further processed to isolate specific whey proteins that are marketed as value-added and functional foods in the human market.

The use of liquid feed ingredients requires specialized liquid feeding equipment and the capacity to store the ingredients, both factors to consider when preparing cost-benefit analyses. Another important consideration is that liquid feeding tends to increase manure volume compared to conventional dry feeding. Finally, with changing suppliers, nutritional values, and ingredients, or to account for extremely high sodium, chloride and potassium levels in some co-products, specialized expertise is needed to formulate liquid feeds and to manage the computerized liquid feeding systems.

Dried distillers grains with solubles, wheat shorts and liquid feed ingredients all have a role to play in feeding pigs while maintaining performance. When using these alternative ingredients, it is important to monitor the nutritional quality of the ingredients in order to ensure that the resulting diets are properly formulated.

Prior to committing to any ration change, it is important for producers to do some research on the alternatives and weigh the options carefully. Cheaper feed ingredients may decrease feed cost per tonne but, if they compromise pig performance to the point that overall cost of production suffers, what has been gained in the long run?

Weigh the pros and cons of switching to by-products by considering not only price, but availability, nutritional value, storage and handling issues, the limitations of your feeding system, as well as implications on pig performance, pork quality and safety. **BP**

Table 2. Recommended and maximum inclusion levels in diets fed to different categories of swine.

Category	Recommended	Maximum
Gestation	30	50
Lactation and nursery, after week 2	20	30
Nursery, week 0-2	0	20
Grower and early finisher	20	35
Late finisher	20	20

^aRecommended inclusion levels based on a review of experiments in which DDGS was included in diets fed to swine.
^bMaximum levels of DDGS that have been successfully used under field conditions. These inclusion levels may not always maximize pig performance.

Janice Murphy is the former Swine Nutritionist with the Ontario Ministry of Agriculture, Food and Rural Affairs.

Sources:

Sources: Stein, H. and de Lange, K. 2007. Alternative feed ingredients for pigs. *Proceedings of the London Swine Conference: Today's Challenges... Tomorrow's Opportunities.* p. 103. <http://www.londonswineconference.ca/proceedings.htm>

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