

Reducing Nitrogen Levels in Hog Manure by Diet Manipulation

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The amount of hog manure that can be applied to a unit acreage crop land would depend on the level of nitrogen it contains. A reduction of nitrogen in manure would result in more manure applied per unit acreage. This presents an opportunity to spread more hog slurry on the same acreage of land.

The bulk of manure (sixty to seventy percent) in a farrow to finish operation is produced by growing-finishing pigs; therefore the manure from this category will be discussed. Although manure phosphate is an environmental concern, reduction of nitrogen levels in the Fraser Valley needs more attention, hence possible ways of reducing nitrogen will be covered in this discussion. The following are several ways to reduce the level of nitrogen in manure.

ENHANCING NUTRIENT DIGESTIBILITY

One way of enhancing nutrient digestibility is by choosing highly and easily digestible feed ingredients. Fibrous ingredients are not only poorly digestible, but they also increase excretion by the intestine. Choosing highly digestible ingredients is not always practical, and so processing of the ingredients may be required to enhance digestibility.

A number of processing methods can be used to increase feed digestibility. Those commonly used are grinding, rolling, and steam pelleting. Any one of these processes changes the physical form or particle size of the feed ingredients. The cell walls of feed particles are broken in the process. This makes feed easier to be digested by stomach enzymes especially the ones that digest the energy part of the diet. Consequently the digestibility of the feed is increased and nutrient over-supply can be reduced. A survey of 117 farms showed that growth rate and feed efficiency increased by 7.9 % on average due to pelleting. This translates into 3 % reduction of nitrogen in the manure. The benefit derived from pelleting depends on the nature of the ingredients. For example, barley is more fibrous than corn and wheat, and greater improvement is expected from barley based diets when pelleted. Enzymes can be used in feed to make the nutrients more digestible.

FACTSHEET



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Enzymes are natural proteins found in all living things. They facilitate the breakdown of large feed particles or molecules into smaller ones. This makes nutrients in the feed more readily available for digestion. Thus, enzymes increase the digestibility of feedstuff, and consequently less feed may be used per unit gain. For example, Porzyme SF is a recommended enzyme for barley based grower diets. It can be purchased from feed companies in the Fraser Valley. Research showed that when this enzyme is added to diets fed to growing pigs, it took 0.14 lb. less feed per lb. of gain compared to a control diet. If a grower-finisher puts on 176 lb., then the amount of feed that can be saved with the use of enzyme is 25 lb. (176×0.14) per market hog. This is equivalent to 5 % less nitrogen in the manure and \$3 less in feed cost per market hog. The estimated cost for this enzyme ranges from \$5 to \$6 per tonne of feed or \$1.4 to \$1.7 per market hog. It follows that more than \$1 can be saved per finished hog with the use of this enzyme.

CHANGING INGREDIENT COMPOSITION

Some practical growing-finishing diets formulated on farm are based on crude protein. Pigs do not have a requirement for protein, but amino acids that make up protein. Some of these are put together by the pig, and are called non-essential amino acids. But others amino acids must be supplied in the diets, and are referred to as essential amino acids. Four of these, lysine, methionine, threonine and tryptophan are generally limiting in growing-finishing diets. This means that they become deficient in swine diets in the same order as above as the protein level in the feed is reduced. Lysine is the first limiting amino acids in swine diets. Feeds have been formulated to contain specific level of protein to ensure enough lysine is present in the diet. This results in an oversupply of nutrients which end up in the manure as nitrogen in addition to other minerals. Studies showed the level of nitrogen in pig manure can be reduced if the diets are balanced on the basis of amino acids to meet the requirements of the animals.

Commercial or synthetic lysine, methionine, tryptophan and threonine are available from feed companies in the Fraser Valley. The crude protein content of growing-finishing diets can be reduced by formulating with more than one synthetic amino acid. A percentage unit reduction in crude protein content of growing-finishing diets can be obtained with the use of synthetic lysine and methionine, and this can bring about up to 8.5% reduction in nitrogen in the manure. If synthetic lysine, methionine, threonine and tryptophan are used in the diets, it is possible to reduce crude protein levels in the diets by 2 percentage units, thereby reducing nitrogen excretion by 17%. If the diet is barley based, there may be no need to use tryptophan. The use of synthetic amino acids reduces the level of nitrogen in hog manure, but their use may be associated with additional cost of \$5 to \$10 per tonne or \$1.4 to \$2.8 per market hog.

ENSURE BETTER AGREEMENT BETWEEN NUTRIENT SUPPLY AND REQUIREMENT

This is called phase feeding. It means feeding more than one diet to pigs from the time they arrive in the feeder barn until they reach market weight. This method of feeding allows producers to closely meet the nutrient requirement of the pig at different stage of growth or to meet the nutrient requirements for barrows and gilt. A practical approach to

phase feeding is to formulate three diets based on feed intake and live body weight. This approach reduces the supply of excessive

ENHANCING ANIMAL UTILIZATION OF NUTRIENTS

Management practices that reduce feed to gain ratio are expected to reduce the level of nitrogen because less feed is used to produce the same gain. Studies on growing-finishing pigs with similar growth rate and fed the same diets showed 12.5 % lower excretion when feed to gain ratio improved from 3.2 to 2.8. More attention must be paid to good herd health, housing, nutrition and breeding stock in order to increase feed efficiencies and ultimately reduce nitrogen levels in manure.

The table above shows reduction in the levels of nitrogen that can be achieved by using the above mentioned options. These reduction percentages in the table are not necessarily additive. You would need to choose one or a combination of the above recommendation(s) that would work best for your farm based on your own resources and unique circumstances. In addition, the option(s) you choose would depend on the cost of the changes to be made and economic benefits to the operation. The information provided in this factsheet is intended to provide some dietary and management options in helping you to make that choice.

SUMMARY

Diet Manipulation Methods	Expected Nitrogen Reduction in Manure (%)
Pelleting	3
Use of enzyme	5
Use of synthetic amino acids to reduce crude protein content of diet by: (a) one percentage point (b) two percentage points	8.5 17.0
Phase feeding: from two to three phases	9
Enhancing animal utilization	12.5

IN CONCLUSION:

Enhance nutrient digestibility by either processing and/or use of enzyme.

Change the ingredient composition of the diet by using synthetic amino acids.

Ensure a better agreement between nutrient supply and requirement through phase feeding.

Enhance utilization of feed by ensuring sound health, nutrition, breeding and management practices.

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