

ENVIRONMENT

Title: Implementing Mass Nutrient Balance Procedures on Swine Production Facilities. NPB # 07-133

Investigator: Richard Koelsch

Institution: University of Nebraska

Date Submitted: March 11, 2010

Scientific Abstract:

It is often a challenge for an animal feeding operation to know when it has achieved environmental “sustainability”. Typically, environmental sustainability is measured in terms of compliance with environmental regulations – receipt of appropriate permits, completeness of records, and implementation of some minimum set of best management practices. Such measures of regulatory compliance represent an indirect indicator of environmental sustainability focused on only one aspect of nutrient management on a swine farm.

Whole farm nutrient balance (WFNB) is a tool for defining the efficiency of nutrient utilization by the entire farm operation including animal and crop production components. It is a mass balance approach for measuring nutrients entering and exiting the farm as managed products. Losses to the environment or accumulations within the farm are estimated by the difference of measured inputs and managed outputs.

The project team applied the principles of WFNB to 13 swine operations for two one-year periods (2006 and 2007). These farms ranged in size from 2,000 to 16,000 head finishing capacity with most farms being wean to finish or feeder pig to finish. The experiences and knowledge from these on-farm experiences were compared against existing nutrient practices and farm characteristics to identify the ability of these indicators to explain the observed variation in WFNB

On average, 1.5 lbs of nitrogen entered these farms from off-farm sources for every 1 lb of nitrogen leaving as managed outputs or products. From a phosphorus perspective, a very similar performance level was observed. These farms demonstrated significantly better nutrient management over previous studies that applied WFNB to animal feeding operations.

Feed was the single largest source of inputs on average (79 and 85% of all N and P inputs, respectively) of all inputs. The combination of feed nutrient concentration and feed utilization efficiency provided the best explanation of the variation observed for WFNB. Manure storage selection and cropping system nutrient plan implementation were important factors influencing WFNB. However, cropping system nutrient planning

These research results were submitted in fulfillment of checkoff-funded research projects. This report is published directly as submitted by the project's principal investigator. This report has not been peer-reviewed.

For more information contact:

National Pork Board • PO Box 9114 • Des Moines, IA 50306 USA • 800-456-7675 • Fax: 515-223-2646 • pork.org

showed little value for future improvements on the 13 participating farms because of current practices which had eliminated most commercial fertilizer use. Animal density (animal population per unit of land) explains a very limited amount of the variation observed. Factors such as farm size have almost no influence on nutrient efficiency. The value of differentiating the need for regulatory permit or practice application based upon size was not supported by the results of this project.

The results and experiences resulting from this project have been packaged into a series of web products accessible through the national eXtension web site for Animal Manure Management. The products include a series of 1) seven educational fact sheets summarizing Lessons Learned, 2) six tools including a spreadsheet calculator for estimating WFNB for pork systems, and 3) three archived seminars summarizing the lessons learned from this project.