INSURING NITROGEN BEST MANAGEMENT PRACTICES

Thomas J. Buman
Agren
312 W. 3rd St., Carroll, Iowa
Phone: 712-792-6248
Fax: 712-792-6175
Email: agren@netins.net

Abstract

Whether real or perceived, the risk of losing profit by implementing best management practices (BMPs) is a major barrier in a farmer's decision process to adopt these environmentally and economically positive practices. Farmers have come to rely on agri-chemicals and fertilizers to reduce risk. Even when scientific evidence proves they are unneeded, many are slow to reduce their reliance on these inputs. Farmers need assurance that the occasional failure of best management practices will not cause significant loss of income.

Agflex is working to develop and market BMP risk management instruments in the form of BMP insurance throughout the United States in conjunction with private insurance companies. It is the belief of Agflex that these instruments will provide a powerful incentive for farmers to adopt environmentally benign, cost-reducing BMPs and IPM techniques. Two nitrogen BMP policies are currently being piloted in Iowa. The purpose of each is to reduce commercial fertilizer application by accurately crediting legumes and/or manure.

Introduction

Profitable crop production requires significant amounts of nutrients in the form of commercial fertilizers, animal manures, and legumes, portions of which can subsequently runoff into surface waters or leach into groundwater. According to EPA, nutrient pollution is the leading cause of water quality impairment in lakes and estuaries and the third leading cause of water quality impairment in rivers. As an example, nitrate is a concern in drinking water when it exceeds a certain level. EPA has established a maximum contaminant level of 10 mg/liter for nitrate in public drinking systems. Above this level, nitrates can cause methemoglobinemia, a condition that prevents the transport of oxygen in the bloodstream of infants and may be a cancer risk to humans (US EPA 1992, USDA 1997).

The growing concern over the effect of agriculture on the environment has increased the interest of researchers in developing "best management practices" (BMPs) or integrated pest management (IPM) practices. By implementing these BMPs or IPM practices, farmers can increase the efficiency of nutrient and pesticide applications. Unfortunately, although many BMPs and IPM practices have been developed, the adoption of these practices has been slow. This poor adoption rate is due to several barriers; one of the most important being risk of failure.

Risk As A Inhibitor Of BMP and IPM Adoption

Numerous studies have found that risk is a major reason that farmers are not adopting conservation technologies such as IPM and nutrient management systems.

- In 1996, the National Research Council Board on Agriculture stated, "Risk plays a large role in a grower's decision to adopt a new pest-management system." Risk even prevents adoption of IPM and nutrient management systems that farmers believe are profitable (NRC 1996).

- A USDA Economic Research Service Study, *Voluntary Incentives for Reducing Agricultural Nonpoint Source Water Pollution*, surveyed a number of farmers to determine why they are not adopting these win-win practices. The study concludes that although farmers understand the practices, and think they cut costs, they still do not adopt them. In probing further, the study found that with regard to both IPM and nutrient management, "risk" is one of the two principal reasons that best management practices are not being used (Feather 1995).

- In the landmark report, *Soil and Water Quality, An Agenda for Agriculture*, the same conclusion regarding nitrogen management was reached.

  "Producers face a management dilemma because the effectiveness and efficiency of nitrogen management cannot be assessed, economically or environmentally, until the growing season is over. A crop that produces poor yields because of inclement weather will result in poor nitrogen use efficiency and uptake and nitrogen lost to the environment, no matter how carefully a management plan was designed. Since producers must make nitrogen applications without being able to predict weather and crop yields, the potential for being wrong is always present and will always occur in some years" (NRC 1993).

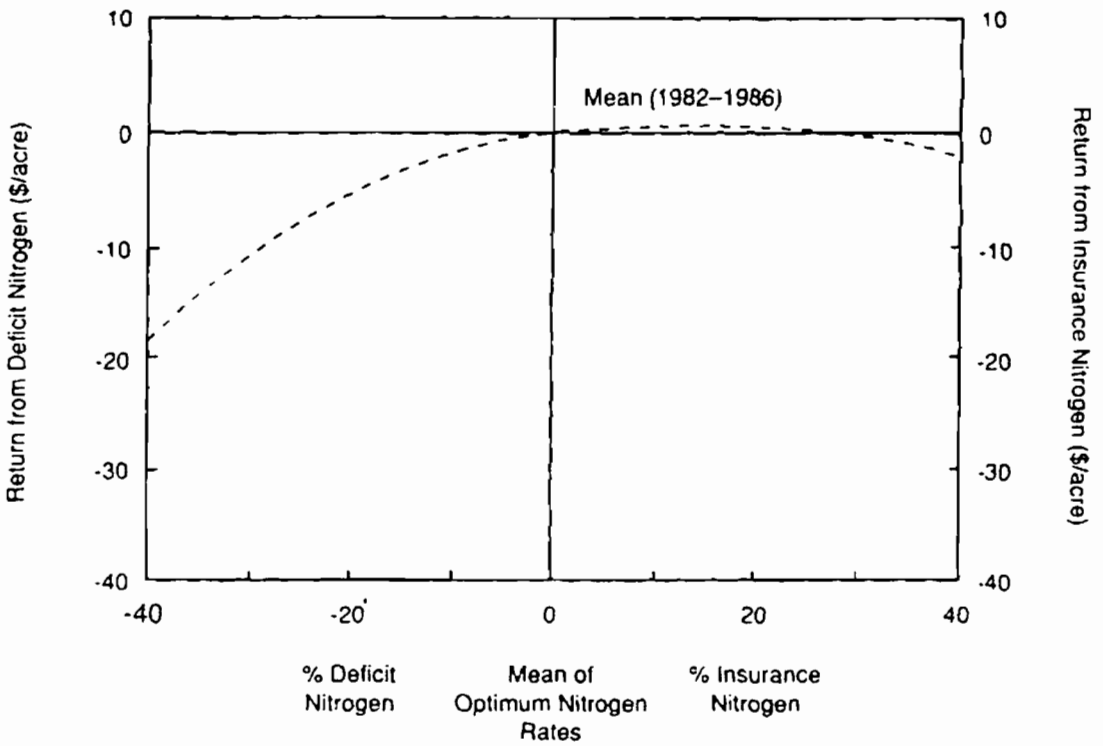
- The National Research Council Report, *Ecologically Based Pest Management New Solutions for a New Century*, reached similar conclusions.

  "The interaction of economic feasibility and risk largely determines the likelihood that an ecologically based pest management system will be adopted or implemented by growers" (NRC 1996).

Insurance as a Tool to Manage Risk

Farmers rely on pesticides, fertilizers, and other agricultural inputs to protect and increase crop yields. In practice, farmers apply extra inputs for insurance, rather than testing or scouting to determine actual input needs. For example, many farmers opt to apply a soil-applied insecticide for corn rootworm prior to knowing if rootworm will be a problem in the given crop year. This prophylactic application of insecticide is for insurance purposes- a concept referred to as "product insurance". As a second example, many farmers apply animal manure as a soil supplement and fertilizer source. However, few reduce their commercial fertilizer application rate. This over-application of nutrients is "product insurance".

The following graph demonstrates why farmers are reluctant to lower nitrogen applications even when they can save input costs. If a farmer miscalculates the optimum nitrogen rate (the vertical line in the middle of the graph), he/she runs the risk of reducing profit (Bock, 1991). Therefore, since nitrogen is inexpensive, farmers are able to "self-insure" their losses by applying higher than recommended rates of nitrogen.



BMP Insurance Policy For Manured Soils

Problem:

Although commonly viewed as waste, manure has potential to be a significant resource of livestock production. It can be an extremely valuable resource to crop producers. Manure can replace the use of all commercial nitrogen when it is properly tested, credited, agitated, and applied.

Unfortunately, few farmers who apply manure to their land use the best management practice of nutrient crediting. Even among those who do, it appears over-application of nutrients is the norm rather than the exception. As a result, considerable amounts of nutrients are being lost to the environment and contributing to nutrient pollution of ground and surface water.

The 1995 Iowa Farm and Rural Life Poll found that over one-half of producers applying manure to their land did not adjust the commercial fertilizer rate. This same survey found that only 1 percent of livestock producers use manure analysis as a major factor in determining the manure

application rate, and 60 percent of producers relied on their own judgment as the major factor in determining the correct application rate (Lasley 1995).

Data was collected form 1,928 Wisconsin farms between 1990 and 1998 to assess nutrient management practices used by farmers. The results focus on the use of best management practices and the resulting affect on total nutrient application rates. Findings from the study confirm that farmers are over-applying commercial nitrogen and phosphorus; one-half of the farmers surveyed over apply nitrogen. In fact, the range and variation in application rates further exemplifies a problem with over application of nutrients. While on average farmers applied an excess of 38 lb/acre of nitrogen, application rates of up to 806 lb/acre were discovered. Furthermore, it was discovered that 14 percent of farmers applied 318 lb/ac or greater, and 6.9 percent applied nitrogen at rates exceeding 400 lb/acre.

This same study examined attempts made by farmers to credit nutrients in animal manures. Only 36 percent of all the producers applying animal manure made an effort to credit manure nitrogen. Of those attempting to credit manure, 83 percent underestimated manure nitrogen by greater than 10 percent. Only 3 percent of the farmers who credited manure did so within 10 percent of University of Wisconsin recommendations. In conclusion, less than 2 percent of producers applying manure on corn fields do so with any degree of accuracy. Only one-third of producers even make an attempt to credit the manure they apply.

Crediting for nitrogen available from animal manures requires more time and knowledge and implies greater risk than simply applying a full to nearly-full rate of commercial fertilizer. The farmer must have a comprehensive understanding of nitrogen management and manure crediting. The farmer must trust the nutrient value of manure as well as his/her own judgment or the opinion of an expert. If the estimate is wrong, the resulting nitrogen deficiency can decrease the farmer's income. Thus, the practice of applying extra nitrogen in a prophylactic manner is a form of insurance- "product insurance".

Solution:

An insurance policy has been developed to protect farmers against the risk of insufficient nitrogen and provide technical assistance when crediting manure. This policy is currently being piloted in Iowa. In addition to alleviating risk for the farmer, the insurance policy will have a positive impact on reducing commercial fertilizer use and improve the farmer's cost of production.

Basic Outline of the Policy:

Step #1: Farmer decides whether or not to adopt the use of manure nitrogen crediting.

Step #2: If the farmer opts to credit and then he/she must decide:

- If he/she is willing and financially able to accept the risk of failure on his/her own, OR
- If he/she is unwilling to accept the risk of failure and will buy a nitrogen BMP insurance policy.

Step #3: If the farmer decides to purchase an insurance policy, an accredited agronomist will meet with the crop producer and determine if the grower is eligible for the program. To be

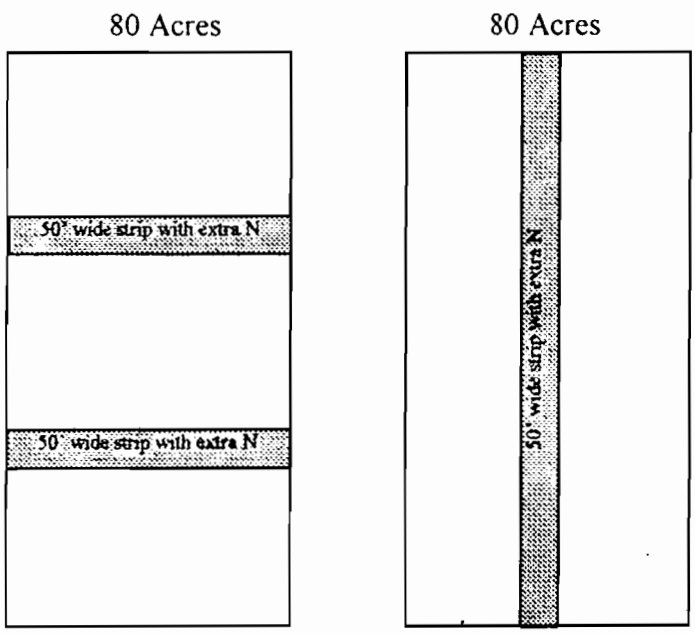
eligible, the manure must be well agitated, analyzed for nutrient content by a reputable laboratory, and be evenly spread on the field. The agronomist will also determine the nitrogen needs of the crop based on yield goals and determine nitrogen credits that are already present in the field. This information will be used to calculate the net nitrogen requirement for the field. Finally, the agronomist will determine the amount of nitrogen supplied in the manure and an acceptable application rate.

Step #4: The farmer manages the subsequent corn crop as he/she traditionally has, with the exception of fertilizer application. The farmer applies manure at the rate recommended by the accredited agronomist. An "extra-nitrogen" strip (see Figure 1) is fertilized with additional commercial nitrogen at a rate the farmer feels comfortable with (typically the rate the farmer has traditionally used).

Step #5: Prior to harvest, the farmer can request that the insurance company adjust the field. The adjustment procedure will compare the yield of the strip with extra nitrogen against the adjacent BMP nitrogen rate applied in the majority of the field.

Step #6: If the yield loss on the BMP acres exceeds the policy deductible, the farmer is compensated for the loss.

Figure 1.



BMP Insurance Policy For First Year Corn After Alfalfa

Problem:
Nitrogen fixed by legume crops is an important source of nitrogen for subsequent corn crops. Regrettably, few farmers take full credit for this fertilizer source. Surveys have found that a majority of farmers do not adequately decrease the commercial fertilizer application rate. This excess nitrogen application contributes to nutrient pollution of ground and surface water, obvious fundamental concerns of government regulatory agencies

In Wisconsin, where many farmers plant nitrogen-fixing legume crops, few accurately credit the fixed nitrogen (N) when fertilizing the following crop. One study of 740 farmers rotating from legumes (alfalfa, clover, or soybean) to corn found that more than half did not credit nitrogen from the legume. Furthermore, farmers who did credit legume-fixed N underestimated its value by 67 lbs/acre (Nowak, 1997).

This same study discovered, on first-year corn following alfalfa/clover legume crop, nitrogen amounts per source averaged:

Purchased nitrogen	= 63.42 lbs./acre
Legume nitrogen	= 130.0 lbs./acre
Manure nitrogen	= 147.29 lbs./acre
Average total N available	= 340.71 lbs./acre

In many cases, the legume nitrogen alone should have met the nitrogen demands of the growing corn crop. However, not only is manure applied, additional commercial nitrogen is also applied. The total nitrogen available to the average corn crop in this study is greater than two times the crop requirement.

Crediting for nitrogen available from alfalfa requires more time and knowledge and implies greater risk than simply applying a full to nearly full rate of commercial fertilizer. The farmer must have a comprehensive understanding of nitrogen management and legume crediting and trust his own judgment or the opinion of an expert. If the estimate is wrong, the resulting nitrogen deficiency can decrease the farmer's income. Thus, the practice of applying extra nitrogen in a prophylactic manner is a form of insurance- product insurance.

Solution:
An insurance policy has been developed to protect farmers against the risk of insufficient nitrogen and provide technical assistance when crediting legumes. This policy is currently being piloted in Iowa. In addition to alleviating risk for the farmer, the insurance policy will have a positive impact on reducing commercial fertilizer use and improve the farmer's cost of production.

Basic Outline of the Policy:
Step #1: Farmer decides whether or not to adopt the use of alfalfa nitrogen crediting.

Step #2: If the farmer opts to credit and then he/she must decide:

- If he/she is willing and financially able to accept the risk of failure on his/her own, OR
- If he/she is unwilling to accept the risk of failure and will buy a nitrogen BMP insurance policy.

Step #3: If the farmer decides to purchase an insurance policy, an accredited agronomist will visit the farm and verify that the alfalfa field has an average stand of at least 4.5 plants/sq ft AND the stand is 1 to 5 years old. In addition, the agronomist will calculate the additional amount of commercial nitrogen, in any, that is needed to provide sufficient nitrogen for the upcoming corn crop.

Step #4: The farmer manages the subsequent corn crop as he/she traditionally has, with the exception of fertilizer application. The farmer applies commercial fertilizer (when necessary) at the rate recommended by the accredited agronomist. An "extra-nitrogen" strip (see Figure 1) is fertilized with additional commercial nitrogen at a rate the farmer feels comfortable with (typically the rate the farmer has traditionally used).

Step #5: Prior to harvest, the farmer can request that the insurance company adjust the field. The adjustment procedure will compare the yield in the strip with extra nitrogen against the adjacent BMP nitrogen rate applied in the majority of the field.

Step #6: If the yield loss on the BMP acres exceeds the policy deductible, the farmer is compensated for the loss.

Potential for BMP Insurance Policies

Agflex is optimistic about the future of BMP implementation. It is the belief of Agflex that BMP insurance policies will provide a powerful incentive for farmers to adopt environmentally benign, cost-reducing BMPs and IPM techniques. The scope of prospective policies is nearly unlimited. In the nitrogen arena, policies are being explored to insure against weather events affecting the split application of nitrogen, nitrogen diagnostic tests including the preplant nitrate test and late-spring nitrate test, as well as the possibility of insuring sound agronomic "rules of thumb" for commercial nitrogen application.

Works Cited

Feather, P.M., J. Cooper. 1995. *Voluntary Incentives for Reducing Agriculture Nonpoint Source Water Pollution.* Agriculture Information Bulletin No. 716. Economic Research Service, US Department of Agriculture.

Lasley, P. 1995. *Iowa Farm and Rural Life Poll, 1995 Summary Report.* Pm-1628. University Extension, Iowa State University, Ames, IA.

National Research Council. 1996. *Ecologically Based Pest Management, New Solutions for a New Century.* Committee on Pest and Pathogen Control through Management of Biological Control Agents and Enhanced Cycles and Natural Processes, Board on Agriculture.

National Research Council. 1993. *Soil and Water Quality, An Agenda for Agriculture.* Board on Agriculture.

Shepard, R. 2000. "Nitrogen and phosphorus management on Wisconsin farms: Lessons learned for agricultural water quality programs." *Journal of Soil and Water Conservation*, Vol 55:1, 63-67.

US Department of Agriculture. 1997. *Agricultural Resources and Environmental Indicators, 1996-1997.* Economic Research Service Agricultural Handbook No. 712.

US Environmental Protection Agency. 1992 *National Water Quality Inventory: 1990 Report to Congress.* EPA 503-9-92-006.

PROCEEDINGS OF THE

THIRTIETH NORTH CENTRAL EXTENSION-INDUSTRY SOIL FERTILITY CONFERENCE

Volume 16

November 15-16, 2000
St. Louis Westport Holiday Inn
St. Louis, Missouri

Program Chair:
Mr. Jim Gerwing
South Dakota State University
Ag Hall, Box 2207A
Brookings, SD 57007
605/688-4772

Published by:
Potash & Phosphate Institute
772 – 22nd Avenue South
Brookings, SD 57006
605/692-6280