Economic Assessments of Best Management Practices and Environmental Policy Options for Attaining the Total Maximum Daily Load (TMDL) Goal in Louisianas Major Milkshed

Basic Information

Title:	Economic Assessments of Best Management Practices and Environmental Policy Options for Attaining the Total Maximum Daily Load (TMDL) Goal in Louisianas Major Milkshed
Project Number:	2003LA19B
Start Date:	3/1/2003
End Date:	2/29/2004
Funding Source:	104B
Congressional District:	6
Research Category:	Water Quality
Focus Category:	Water Quality, Economics, Methods
Descriptors:	Dairy Waste, BMP, TMDL, Optimization, Policy tools, Spatial Allocation
Principal Investigators:	Krishna P. Paudel, Wayne M. Gauthier

Publication

SYNOPSIS

Title: Economic Assessments of Best Management Practices and Environmental Policy Options for Attaining the Total Maximum Daily Load (TMDL) Goal in Louisianas Major Milkshed

Problem and Research Objectives: The primary goal of this study is to suggest the way of using dairy waste as crop nutrient source that is both economically profitable and environmentally consistent. The other goal of this project is to find the cost impact of implementing different BMPs and their efficacy in controlling point and nonpoint sources of pollution consistent with the TMDL goal set for the region by the EPA and DEQ. The major objectives of this study are:

1. To identify the economics of using dairy manure as a source of plant nutrient and identify an optimal spatial distribution of dairy farms with and without considering BMPs,

2. To identify the effects of extreme weather on dairy-related point and nonpoint sources of pollution with and without BMPs, and

3. To compare alternative environmental policies to control dairy production related pollution and relate them to pareto optimal solution.

Methodology

Objective 1: To identify the economics of using dairy manure as a source of plant nutrient, and identify an optimal spatial distribution of dairy farms with and without considering BMPs

Procedures:

Actual location of dairy operations, impaired waterbodies, crop and pasture lands, and numbers of dairy cows will be assessed using the GIS software and secondary data supplied by the EPA and USDA. The total amount of manure production in a year from dairy facilities in these three parishes will be estimated. Potential outlets of manure as sources of nutrients for crops and pasture will be calculated assuming that manure will be applied based on the plant nutrient uptake, slope of the land, distance from the nearby waterbodies, soil pH, and cropping history. First, the cost of hauling and spreading of liquid manure or slurry will be compared to the cost of chemical fertilizer. Nutrient application will be calculated based on the lowest nutrient element required by plants. If the phosphorus requirement of a crop is the lowest among three macronutrients (nitrogen, phosphorus, and potash), then the application will be based on that element. When applying dairy manures, the concentration of major nutrients in the nearby waterbodies would be considered.

Most of the producers in the region apply dairy manure on pasture land. Therefore, in addition to other considerations, manure application will be also based on what BMPs are adopted in the farm. Farm profits and costs will be calculated under each of the alternative scenarios where farmers do or do not adopt BMPs. Optimal spatial allocation of dairy facilities within the subsegment of the watershed will be calculated assuming BMPs are adopted and nutrient application reflects land character, nutrient needs of the crop, and economics of nutrient transportation and application.

Objective 2. To identify the effects of extreme weather on dairy-related point and nonpoint sources of pollution with and without BMPs

Procedures:

Current CAFO and AFO regulations state that the manure lagoons should not overflow under conditions of less than 12 inches of rainfall within 24 hours (EPA 2000). In Louisiana, there are few days when the rainfall exceeds this level. Using historical data, we would find the probability of rainfall exceeding the level set by the EPA. Estimates of different levels of rainfall and temperature on dairy waste hazards for the waterbodies would be made. The increase in cost of adopting precaution measure under such circumstances would be weighted against normal scenarios.

Objective 3. To compare alternative environmental policies to control dairy production related pollution to meet the TMDL goal and relate them to pareto optimal solution

Environmental policies such as tax, subsidies, marketable permit, and quota with standard would be compared considering that there is uncertainty involved due to weather factors in the undepletable externality situation. The uncertainty arises from both physical factors such as rainfall and absence of knowledge about the marginal benefit and marginal costs to dairy producers of various environmental policies. The standard Pigouvian result from the certainty situation will be compared to the marketable emission permit system. Situations when dairy manure gets dispensed to one or multiple water sources would be developed to find the pareto optimal solution in each case. Dynamic effect of pollutant and dynamic optimal solution of dairy manure disposal policies would be developed under the undepletable externality scenario outlined in the introduction. Dynamic and spatial dimensions would be considered relative to water level assimilation fluctuation from receiving sources. Since the Tangipahoa River drains into the Lake Ponchatrain, the potential for water pollution would be considered.

The implementation of any of the environmental policies, especially those improving water qualities, would have positive effects on the public's well being. These policies, if implemented, would provide clean water, which would promote recreation and minimize the processing cost of potable water. However, an individual dairy producer will incur costs either in the form of adopting BMPs or by reducing the number of dairy cows. Standard benefit cost analysis will be used to evaluate the net effect of increased water quality due to the implementation of new environmental policies. Regression techniques and secondary data will be used to estimate the number of visitors in the Tangipahoa River for a given time period. The regression model would consider the number of visitors as a function of water quality (different parameters such as nitrogen, phosphorus concentration). The marginal effects of decreasing these pollutants in the waterbodies will be assessed relative to the number of visitors. Numbers of visitors would be converted into total welfare by using how much money a median visitor spends during his/her visit looking at both the direct expense and the time value of the visitors visiting the recreational site.

Principal Findings and Significance

We have finished designing the dairy survey. The response obtained from the survey would help us to understand the BMP adoption pattern of farmers, and how dairy waste is allocated in Florida Parishes in Louisiana.

The survey was mailed to dairy farmers on May 27, 2004. We have used an incentive mechanism to get the maximum response back from the dairy producers in the region. Accordingly, every one of the first 50 respondents would be paid a $10 check. We have started receiving the survey responses back from the dairy farmers. We will compile the information obtained from the survey and analyze the data obtained. The analysis should help us to properly design the effective dairy manure management policy to meet the TMDL goal in the region.

Additionally, we are inputting the needed parameters in the TMDL model. We will start running the model as soon as we get all parameters needed for the model in place.