SOCIOLOGICAL FACTORS INFLUENCING FARMERS' ADOPTION OF BEST MANAGEMENT PLANS FOR ENHANCING WATER QUALITY IN THE MISSISSIPPI DELTA MANAGEMENT SYSTEMS EVALUATION AREA

Duane A. Gill

Social Science Research Center and the
Department of Sociology, Anthropology and Social Work
Mississippi State University

INTRODUCTION

The Mississippi Delta Management Systems Evaluation Area (MSEA) has been identified as an area with water quality problems related to intensive agricultural production. Agriculture is a major source of non-point water pollution. One response has been to develop best management plans (BMPs) which modify agricultural practices in order to enhance water quality. However, to be effective, BMPs must be adopted by a substantial number of farm operations in a specific watershed area. Though adoption of new agricultural practices has traditionally been based on economic measures and traits, other factors such as cultural values, norms, attitudes, and social structural characteristics are also important influences on the innovation decision process and must be considered.

Consequently, the extent to which BMPs are successfully adopted by farm operators can be enhanced by understanding the social and economic factors underlying such decisions. This paper presents a research strategy designed to gain a clearer understanding of adoption decisions as it is applied to agriculture in the Mississippi Delta MSEA. The expected result would be observable changes in agricultural practices in the direction of the BMP.

BACKGROUND

In Mississippi, the Delta is comprised of 18 counties in the northwest part of the state. Myles and Reinschmiedt (1992) note that this area contains three distinct geophysical districts: the Mississippi Alluvial Plain; the Bluff Hills; and parts of the North Central Hills. The Mississippi Alluvial Plain is contained in 11 counties which comprise the "Core Delta" (Myles and Reinschmiedt 1992). The Core Delta is the area of interest for the MESA project.

Approximately 77% of Core Delta non-federal land is in cropland (SCS 1982). There are approximately 3,200 farm operations with an average size of approximately 1,000 acres. In terms of farm tenure, less than 30% of the farms are operated by full owners, about 35% by part owners, and almost 38% by tenants.

Core Delta agricultural operations primarily engage in production of cotton, soybeans, and rice. Soybeans are raised on over 70% of the farms operated, cotton is raised on 54%, and rice is raised on about one-fourth of the farms. To a much lesser extent, crops such as corn and wheat are produced in the Core Delta. Agricultural practices include intensive tillage and use of chemical pesticides and herbicides. It is these practices which have major impacts on water quality as they increase the amount of sediments, nutrients, pesticides, and herbicides in the water.

The Core Delta area contains numerous natural oxbow lakes, rivers, and streams. In addition, there are various man-made bodies of water constructed primarily for flood control and community water supplies. Map 1 indicates typical hydrological features in the Core Delta. The water quality of these water bodies are diminished by the intensive agricultural practices in the region.

BEST MANAGEMENT PLANS (BMPS)

Currently, research is being planned to develop best management plans to improve water quality in the Core Delta. Various practices have been identified and classified according to effectiveness and type of non-point pollution (i.e., sediment, nutrients, and pesticides) (Lipe and Schreiber 1995). For example, some of the most effective practices to reduce sediments are no-till, conservation tillage, vegetative practices (e.g., field covers, cover crops, riparian zones, filter strips), crop rotations, contour farming, and structural practices (e.g., debris basins, terraces, dikes, precision land grading, etc.). Some of the most effective practices for pesticides are integrated pest management, improved storage, handling and disposal, and efficient use. Practices for reducing nutrients include soil testing, fertilizer incorporation, precision application, split nitrogen applications, crop rotations, cover crops, and sediment reduction practices.

Some of these practices are currently being used by some farm operators in the Delta. Others are seem economically unsound or have not been perfected for use in the Delta. One of the primary goals of the MESA research project is to evaluate various practices in terms of impacts on oxbow lakes and determine which is the best practice for managing water quality. An important component of BMP identification is understanding current management practices and developing a cropping history. More importantly, the economic costs of a BMP must be considered. For these reasons, it is essential that farm operators be involved at all stages of the research.

ADOPTION OF BMPS

To achieve desired outcome of a reduction in non-point source pollution from agricultural practices, BMPs must be incorporated into agricultural operations. Models of adoption of new practices and technology are typically based on economic measures and traits (Rogers and Shoemaker 1971). Such models assume behavior is primarily motivated by material interests and that adoption is best understood by assessing these objective measures. However, research suggests that economic considerations do not fully account for adoption behaviors. This may be particularly true in water quality issues.

Until the early 1980s, little attention was given to water quality issues and farm operator adoption of alternative practices for protection and improvement of water quality. Sociologists have included water quality issues as part of broader natural resource studies such as soil conservation (e.g., Lovejoy and Napier 1986; Nowak 1984). However, Pamel and Van Es (1977) and Heffernan (1984) question the appropriateness of these broader studies to the issue at hand. Specifically, there has been a lack of attention to social and community factors associated with adopting practices which improve water quality (Buttel and Swanson 1986; SCS 1989).

Recent research indicates that social factors such as social characteristics, norms, values, beliefs, attitudes, and social institutional characteristics need to be included in the adoption model. For example, Thomas, Ladewig, and McIntosh (1990) found that cotton growers' personal characteristics such as age, level of education, and farm income were influential in decisions to adopt or reject an innovation. Younger growers with higher levels of education and income were more likely to adopt innovations than their older, less educated, and lower income counterparts (Thomas et al. 1990). In addition, this study found that growers with more information resources and positive attitudes toward technology are more likely to accept new technology.

Research by Rikoon (1991) and Rikoon and Heffernan (1989a, 1989b) support the need to understand socio-cultural factors in the adoption process. These studies emphasize the need to understand operator motivations, objectives, and constraints when deciding to adopt an innovation. They also note the importance of education in communicating the risks of groundwater contamination, physical science information on water quality, and improved farming practices to farmers and non-farmers. Farmer linkages with educational communication agencies is thus an important key in increasing the chances of successful implementation of BMPs within the Mississippi Delta MSEA.

Other socio-cultural variables could potentially influence the adoption process. These include concern for the environment, responsibility for future generations, concern for recreational activities, and religious beliefs. Taken together, there is substantial evidence that such non-economic factors play an important role in the innovation adoption process. Thus, research is needed to better understand sociological factors which might potentially influence the adoption of BMPs.

A RESEARCH DESIGN FOR ADOPTION OF BMPS

A research design is needed to acquire sociological information that will enhance the successful adoption of BMPs in the Mississippi Delta MSEA. The proposed research strategy has two phases: pre-implementation of a BMP and post-implementation of a BMP. The first phase involves developing a profile of relevant sociological and economic characteristics of farm operators and a valuation of alternative BMPs. The second phase involves an assessment of the degree to which the plan is being successfully adopted, an evaluation of informational linkages used to promote adoption, and monitoring of continuing social and economic impacts. In the remainder of this section, objectives, methodologies, and expected results are presented.

Objectives

The research design has five major objectives which are listed below. Methodological techniques to achieve these objectives are described in the next section.

1. Profile. The first objective is to develop a profile which describes relevant sociological and economic characteristics of farmers in the Mississippi Delta MSEA. The profile will include descriptions of economic costs and returns, existing attitudes and behaviors toward farming practices and water quality issues, as well as information linkages. This profile provides baseline data which can be used to assess BMP adoption potential and develop adoption strategies.

2. Valuation. Alternative BMPs will be evaluated and ranked according to the potential each has for being adopted. This process will include analysis of profile data and estimates of economic costs and returns of alternative BMPs.

3. Assessment. Once the BMPs have been developed and implemented, the next objective is to assess the impact of BMP adoption strategies on farmers. This involves measuring changes in farming practices and farmers' attitudes toward the alternative practices.

4. Evaluation. The next objective is to evaluate the effectiveness of informational linkages for adoption strategies. Education and extension activities are key components of the adoption process and an evaluation of these information linkages provide an opportunity to increase the adoption of BMPs.

5. Monitor. The final objective is to implement a process of monitoring the social and economic impacts of adopting BMPs. Currently, there is concern that some form of economic subsidy will be needed to cover the increased costs of adopting some BMPs. As market and social conditions change, these subsidies need to be re-evaluated. Monitoring provides an opportunity to obtain feedback from farmers who have adopted BMPs. This information can be used to reform BMP adoption policies.

Methodology

A variety of research methods will be used in this project. The primary methodology, however, involves personal interviews with a random sample of farm operators.

The methodology of the profile consists of two basic components. The first involves secondary data analysis. Existing research on the agricultural practices and the social and economic characteristics of the Mississippi Delta MSEA need to be reviewed. Data sources include the U.S. Census Bureau, the City-County Data base, the U.S. Soil Conservation Service, and the U.S. Department of Agriculture. Data from these sources provide preliminary information needed to develop a profile of the Delta area and to guide in the development of primary data collection instruments.

The second methodological component of profile involves primary data collection which combines quantitative and qualitative research. Using a combination of personal interviews and survey research methods, data on sociological and economic factors influencing adoption decisions can be collected. Ideally, 400 person-to-person interviews of randomly selected farmers from the 11 county Core Delta should be conducted. This provides an acceptable level of sample error and provides greater confidence in the ability to generalize the results.

The survey instrument should be based on previous research findings and the input of county extension agents, soil conservation officials, and other experts who work with farm operators in the region. Minimally, the instrument should obtain demographic characteristics of farmers, their attitudes, values, and beliefs regarding environmental and water quality issues, current farming practices (e.g., number of acres of various crops in production, current water quality practices, use of pesticides, etc.), sources of information about farming practices, and economic factors of the farm operation.

Once BMPs are identified and implemented, impacts need to be assessed. This can be done through follow-up data collection from the sample of farmers. Mail survey research methods can be used to minimize the costs of data collection. The instrument should contain indicators which will allow comparisons with data collected for the profile. This provides the basis for measuring socio-cultural changes and changes in farm practices.

The follow-up data collection process will also provide an opportunity for evaluation. Informational linkages identified through the profile can be evaluated to determine which sources were most effective. Measures of effectiveness include the farmers' evaluation and changes in farmers' perceptions of water quality issues. In addition, key personnel from organizations providing information to the farmers can assist in the evaluation information linkages.

The monitoring objective can be achieved by developing a research strategy to document long-term social impacts from the overall MSEA project. This should involve some type of systematic follow-up after the BMP adoption strategy has been in place for a few years. Ideally, interviews should be conducted with farmers from the original study although it is not necessary that the total sample be interviewed.

Expected Benefits

The expected benefits of this research strategy include a contribution to improved water quality through the adoption of BMPs in agricultural production. The research design identifies social factors tied to the adoption of water quality practices which can be used by those whose mission is to implement programs and educate farmers. The research strategy will contribute to the scientific understanding of adoption decisions and assist in developing better models of the adoption process. This benefits policy planners by giving them greater predictive capabilities which enhances policy formation and implementation. More importantly, the research design benefits farmers by involving them in the process and by demonstrating that in addition to economics, personal and social concerns guide their behavior.

CONCLUSIONS

The extent to which BMPs are adopted by farmers can be enhanced by understanding the social and economic factors underlying such decisions. This research design attempts to gain a deeper understanding of adoption decisions, specifically applied to agriculture in the Mississippi Delta MSEA. As a result, there should be observable changes in agricultural practices in the direction of the BMP and a higher level of water quality to benefit all residents of the region.

ACKNOWLEDGEMENTS

Support for this research has been provided by the Mississippi Agricultural and Forestry Experiment Station (Project #MIS-4333), Mississippi State University.

REFERENCES

Buttel, F.H., and L.E. Swanson. 1986. Soil and water conservation: a farm structural and public policy perspective. In Lovejoy, S. and T. L. Napier (eds.). Conserving Soil: Insights from Socioeconomic Research. Ankeny, IA: Soil Conservation Society of America, 26-39.

Heffernan, W.D. 1984. Assumptions of the adoption/diffusion model and soil conservation. In English, B.C., et al., (eds.). Future Agricultural Technology and Resource Conservation. Ames, IA: Iowa State University Press, 254-269.

Lipe, B., and J.D. Schreiber. 1995. Communication to Mississippi Delta ManagementSystems Evaluation Area Best Management Plan Subcommittee.

Lovejoy, S., and T.L. Napier. 1986. Conserving Soil: Insights from Socioeconomic Research. Ankeny, IA: Soil Conservation Society of America.

Myles, A., and L. Reinschmiedt. 1992. Delta economy: the agriculture base. In Cosby, A. G., M. W. Brackin, T. D. Mason and E. R. McCulloch (eds.). A Social and Economic Portrait of the Mississippi Delta. Mississippi State, MS: Social Science Research Center and Mississippi Agricultural and Forestry Experiment Station, 256-278.

Nowak, P.J. 1984. Adoption and diffusion of soil and water conservation practices. In English, B.C., et al., (eds.). Future Agricultural Technology and Resource Conservation. Ames, IA: Iowa State University Press, 214-237.

Pamel, F., and J.C. Van Es. 1977. Environmental quality and issues of adoption research. Rural Sociology 42:57-71.

Rikoon, J.S. 1991. Farmer and non-farmer responses to surveys on pesticide use and ground water issues. Contract report for Environmental Protection Agency (Region VII).

Rikoon, J.S., and W. Heffernan. 1989a. Factors affecting farmers' participation in the conservation compliance program. Journal of Soil and Water Conservation 44(5):409-415.

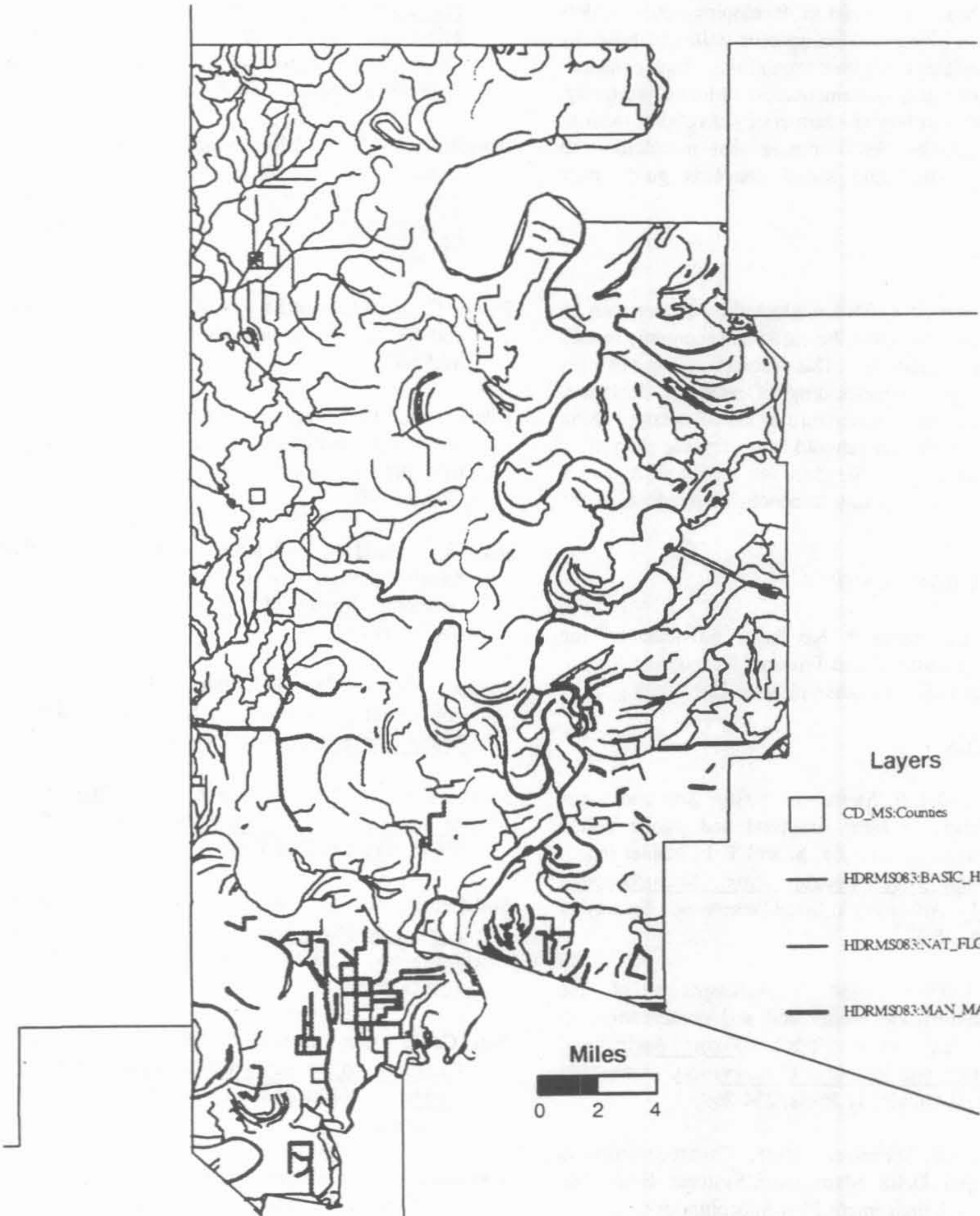
Rikoon, J.S., and W. Heffernan. 1989b. The district conservationist on the firing line. Journal of Soil and Water Conservation 44(5):416-418.

Rogers, E.M., and F.F. Shoemaker. 1971. Communication of Innovations: A Cross-Cultural Approach. New York, NY: The Free Press.

Soil Conservation Service. 1982. Mississippi Nonfederal Land Resources: Summary of National Resources Inventory. Jackson, MS: U.S. Department of Agriculture.

Soil Conservation Service. 1989. Soil and Water Conservation Research and Education Progress and Needs. Washington, DC: U.S. Department of Agriculture.

Thomas, J.K., H. Ladewig, and W. McIntosh. 1990. The adoption of integrated pest management practices among Texas cotton growers. Rural Sociology 55(3):395-410.



Map 1: Natural and Man-Made Hydrology

of Leflore County, MS