Farmer Perceptions of Soil and Water Conservation Issues: Implications to Agricultural and Extension Education

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The rapid transfer of technology has contributed to the expansion and success of American agriculture. Unfortunately, technology has contributed to many environmental problems while it has enhanced crop yields and increased agricultural prosperity (Francis, 1987; Freshwater Foundation, 1987).

Many concerns exist today in rural and urban sectors about the threat to natural resources because of the problems agricultural production practices are causing, i.e. use of chemicals affecting the quality of life (Padgitt, 1987; Hallberg, 1986; Baker, Kanwar & Austin, 1985). Through the use of chemical fertilizers, herbicides, and pesticides farmers are able to produce a reliable source of affordably priced food, which has enhanced the quality of life for the urban consumer (Padgitt, 1987).

Across the corn belt, the average nitrogen application rate increased from 45 pounds per acre in 1965 to 143 pounds per acre in 1984, to meet the increased demand for agricultural products (Hallberg, 1986). According to Madison and Brunett (1984) nitrates can react to form carcinogenic chemicals thought to be linked to human cancers. However, the risk of nitrate contamination is not yet fully understood. It is interesting to note that most wells in the corn belt have excessive amounts of nitrates (Hallberg, 1986).

In addition, pesticides are used by farmers on over 90 percent of the corn and soybean fields in the Midwest (Freshwater Foundation, 1987). Most soybean and corn fields in that region received two pounds per acre of pesticide chemicals each year (Freshwater Foundation, 1987). Pesticides enter the groundwater through spills, poorly managed wells, improper disposal of wastes and containers, agricultural drainage wells, sinkholes, and leaching (Hallberg, 1986). Ultimately, groundwater is the only source of drinking water for 97 percent of the rural population in the United States.

According to an Environmental Protection Agency report, 17 pesticides in low concentrations have been found in the groundwater of 23 states. The pesticide found most often was the corn herbicide, atrazine. The chronic long-term effects of this herbicide in drinking water are unknown (Freshwater Foundation, 1987; Hallberg, 1986). If there is a long term problem we are only beginning the process of evaluating the effect.

Over the years, agricultural extension educators helped farmers learn new production practices which ultimately contributed to current environmental problems. Many practices were selected which helped the farmer compete economically but threatened the quality of the environment (Rasmussen, 1989). At the same time, many educators have worked hard to teach farmers how to reduce the magnitude of soil erosion and other environmental challenges. What role do educators have in addressing the issues of improved production practices and environmental protection?

In analyzing these issues, a number of critical questions need to be addressed. Should farmers alter or reduce the application rates of nitrogen to protect groundwater? What factors influence decisions to use alternative farming methods (e.g.. tradition, cost/profit, commercial fertilizer tests growers pride)? What role can agricultural and extension educators play in helping farmers make more informed decisions? What sources of

information do farmers find useful when confronted with environmental issues? How should educational programs be planned? These questions, and the identification of the major environmental concerns of farmers, framed the focus of this study.

Purpose and Objectives

The purpose of this study was to identify the perceptions of farmers regarding selected soil and water conservation practices. **A** secondary purpose was to determine the implications of these perceptions to educational practice. Specific objectives of the study were to identify perceptions of farmers regarding the use of chemicals and reduced tillage practices and resources that farmers use in acquiring information about chemicals, pesticides, fertilizers, and tillage.

Methods and Procedures

The study was the result of a need expressed by the Iowa Association of Soil Conservation District Commissioners. Cooperators in the study included the Department of Agricultural Education at Iowa State University, the President of the Iowa Association of Soil Conservation District Commissioners, the Iowa State Agricultural Stabilization Conservation Service (ASCS), soil conservation district commissioners, and Iowa farmers.

The study used a descriptive design. A mailed questionnaire was used to collect the data. Various segments in the questionnaire had a Likert-type scale. Other parts of the questionnaire used open-ended questions. The survey instrument was developed based upon previous research conducted on this topic. Items were designed to assess perceptions regarding issues in soil and water conservation, educational techniques and program usefulness, and the usefulness of various sources of information. Respondents were encouraged to give written comments on the questionnaire.

The instrument was refined through consultation with an advisory committee consisting of educators and soil conservation leaders. Post-hoc reliability tests using the Cronbach's alpha procedure estimated the reliability of the scales on the instrument. The composite reliability coefficient for the instrument was determined to be .84. The items were divided into five subgroups for analysis. The alpha coefficients for the subgroups ranged from .79 to .95.

The population of the study consisted of all farmers in the state (109.367) as determined by the Agricultural Stabilization and Conservation Service (ASCS). A sample of 731 farmers was selected and it was stratified and proportioned by conservation district so as to have a representative group of respondents across the state. Each conservation district, which corresponds to a county, was represented based on its size and the number of farmers in the district. Some districts had many more farmers than others so an attempt was made to make sure that each district was proportionately represented. A total of 432 usable responses were received and formed the basis for the analysis of data. There were two follow-up attempts to collect more survey questionnaires. These attempts were successful in acquiring sufficient data for analysis. However, farmers traditionally do not respond well to mailed questionnaires. A nearly 60 percent return rate was deemed appropriate for analysis of the data. In comparing respondents with nonrespondents, no significant differences were found. Descriptive statistical procedures sub-program of the Statistical Package for the Social Sciences was used in analyzing and summarizing the data in this study (Norusis, 1983).

Findings

As indicated in Table 1. the perception item ranked first by the respondents was that farmers might have benefited from the Conservation Reserve Program (CRP) even though these farmers might have caused the soil erosion and water quality problem. Many farmers wrote comments on the questionnaire indicating that they would like to have farm program control at the local level. Farmers see what is occurring on their neighbor's fields. If it were left up to them, exemptions would be made on the local level to exclude individuals from the program.

Table 1. Rank of Means and Standard Deviations Regarding the Level of Agreement of Respondents Concerning Perceptions About Environmental Issues (N=432)

Rank	Item	Mean[a]	S D
1	Farmers have benefited from Conservation Reserve Program (CRP) even through they may have caused the problem	4.37	0.82
2	Urban threat of chemicals is as great a threat as farm chemical use	4.32	0.92
3	More precise, unbiased education is needed for agri-chemical management	4.20	0.89
4	Improved communication and information about chemical management is needed	4.16	0.91
5	Ground water contamination is a serious problem	4.07	1.04
6	I know what I have to do in order to meet provisions of the Food Security Act	3.98	1.09
7	Side dressing is an acceptable alternative practice to broadcasting	3.96	1.10
8	Farmers should attend fertilizer management clinics to gain knowledge	3.94	0.97
9	Chemicals pose a serious threat to groundwater	3.91	1.11
10	Information about pesticide application would reduce risk of contamination	3.87	0.98
11	Crop residue is adequate to control erosion on my farm at planting time	3.85	0.98
12	Industry should provide training for pesticide use	3.79	1.08
13	Farmers apply too much nitrogen per acre	3.57	1.31
14	Nitrogen fertilizer rates should be reduced to avoid contamination	3.54	1.16
15	In conservation tillage, farmers use more pesticides	3.52	1.23
16	Chemical application rates are higher when using reduce tillage	3.52	1.30
17	Banding herbicides is an effective measure to reduce tillage systems	3.51	1.23
18	Farmers use more herbicides than necessary	3.31	1.23
19	No-till planting is a conservation practice that will work on my farm	3.26	1.31
20	A cover crop planting in HEL would be an acceptable alternative practice to no-till	3.24	1.17
21	Federal government should give higher payments to enroll more acres in CRP	3.00	1.29
22	Agricultural pesticides, if used correctly, pose no threat to water quality	2.97	1.19

[a]Scale: 1=Strongly disagree; 2=Somewhat disagree; 3=Neutral; 4=Somewhat agree; 5=Strongly agree.

Table 1 continued.

Rank	Item	Mean[a]	S D
23	Commercial soil test labs recommend correct ***amounts*** of fertilizer	2.91	1.10
24	Groundwater research should be funded through a surtax on pesticides	2.88	1.30
25	Fertilizer equipment is adequately designed for conservation tillage	2.82	1.09
26	Atrazine should be banned until the potential effects are **known**	2.80	1.32
27	Nitrogen rates could be **reduced** on my own farm	2.72	1.17
28	Conservation tillage results in reduced crop yields	2.62	1.26
29	Relaxing soil loss requirements by the USDA is an appropriate plan	2.46	1.34
30	Groundwater warning statements found on pesticide labels are effective	2.46	1.16
31	Fertilizer rates need to be higher when using reduced tillage systems	2.31	1.09
32	Increased use of reduced tillage systems is a threat to water **quality**	2.28	1.21

The low ranking of items relating to banning atrazine and reducing nitrogen fertilizer use indicates dependence upon these substances. These findings support the literature (Hallberg, 1986) that reported farmers are so accustomed to using these substances that making changes becomes more difficult as these practices become entrenched. The respondents indicated that they agreed to some extent that farmers apply too much fertilizer per acre. Responses from these farmers indicated they did not agree that the rules for the Food Security Act should be relaxed.

As a result of the 1987 water quality legislation in Iowa, pesticide containers must have warning labels to inform users of potential dangers and contamination possibilities. The respondents indicated they did not feel this was an effective method of transferring information. The rush of field work by farmers in a typical spring season provides them with little opportunity to read container labels.

The ratings of statements concerning reducing nitrogen fertilizer rates, pesticide use in conservation tillage and higher chemical application rates with reduced tillage systems indicated slight agreement with these concepts. However, the education and fairness issues were the primary concerns of the respondents.

Field demonstrations (tours) and country meetings were the two highest rated items related to the process of diffusion of new information and technology, as shown in Table 2. This interest was attributed to a sense of community participation and ownership. Based upon these findings, educational specialists should incorporate these two techniques into conservation program planning strategies. Magazines were ranked third. The fact that the respondents in this study selected field demonstrations and tours to be the most useful source of information appears to support the idea that farmers trust information from other farmers more than other ***sources*** of information. Radio and TV (video tapes) were among the lowest rated sources of useful information. Little has been done with these forms of media in the area of conservation education. One-farm consultation ranked the lowest source of information. The finding was somewhat surprising in view of what agricultural educators do with farmers regarding on-site

instruction. As indicated by Korshing and Nowak (1983). this finding maybe attributed to the lack of emphasis by educators in these consultations regarding conservation issues.

Table 2. Means and Standard Deviations by Rank Regarding the Usefulness of Selected Dissemination Techniques and Programs According to the Respondents (N=432)

Rank	Dissemination techniques and programs	Mean[a]	S D
1	Field demonstrations (tours)	4.18	0.83
2	County and local meetings	4.00	0.80
3	Magazines	3.85	0.86
4	Printed materials (brochures)	3.77	0.83
5	Trade shows and fairs	3.69	0.97
6	Visual materials (slides, photographs)	3.61	1.02
7	Other, i.e., discussions	3.59	1.15
8	Television programs (video tapes)	3.51	1.03
9	Radio	3.49	0.99
10	On-farm consultation	3.16	1.15

[a]Scale: 1=Of no use at all; 2=Not very useful; 3= Uncertain; 4=Somewhat useful; 5=Very useful

The Soil Conservation Service was ranked as the most useful human resource for information as shown in Table 3. University specialists and the country extension services were also useful sources for information. It was somewhat surprising that seed/fertilizer/chemical dealers were perceived to be the fourth most useful human resource for information relating to soil and water conservation. It could be conjectured that since many aspects of conservation tillage are dependent upon specific knowledge possessed by technical chemical specialists, the users of these systems rely heavily upon the retail distributor of pesticides for information concerning use and application. Neighbors and friends and soil conservation district commissioners were also considered useful sources of information. The respondents tended to be uncertain about the usefulness of vocational agriculture instructors as sources of soil and water conservation information. Teachers are not perceived to be experts in soil and water conservation but were considered to be helpful in finding sources of information.

Table 3. Means and Standard Deviations by Rank Regarding the Usefulness of Human Resources According to the Respondents (N=432)

Rank	Human Resources	Mean[a]	S D
1	Soil Conservation Service	4.15	0.91
2	County Extension Service	3.98	0.98
3	Iowa State University Specialists	3.90	0.88
4	Local seed/chemical/fertilizer dealers	3.75	0.96
5	Neighbors and friends	3.71	0.87
6	Soil conservation District Commissioners	3.54	0.95
7	Other, e.g., ASCS	3.41	1.08
8	Vocational Agriculture Instructors	3.27	1.02
9	Machinery dealers	2.94	1.01

[a]Scale: 1=Of no use at all; 2=Not very useful; 3=Uncertain; 4=Somewhat useful; 5=Very useful.

Conclusions

The following conclusions were drawn from the findings of the study;

Groundwater and water quality issues seem to be of greater concern to farmers than soil conservation issues.

Field demonstrations and county meetings are useful techniques to use when presenting information about soil and water conservation issues.

Governmental agencies such as Soil Conservation Service, County Extension Service and state university specialists are seen by farmers as the most useful sources of information regarding soil and water conservation issues.

Farmers believe improved communications and education are needed to ensure proper management of chemicals used in agriculture.

Recommendations

Baaed on the findings and conclusions of the study, and the related literature, the following recommendations were formulated.

Targeted and unbiased education regarding conservation and environmental issues should be incorporated into educational programs for farm, urban and industry individuals and groups.

Agricultural educators should use field demonstration research plots and group learning techniques and strategies to facilitate the conservation education process.

Farmers, researchers, industry representatives and county education resources should collaborate to facilitate the conservation education process.

Implications to Agricultural and Extension Education

If the 1990's is indeed the decade of the environment, then the results of this study provide some useful information as educators plan environmental education programs. More importantly. the role of agricultural education in the process of helping people manage and care for their environment becomes critical. The rapid transfer of technology requires responsible stewardship of the resources used to make technology not only appropriate but also safe (Francis, 1987; Freshwater Foundation, 1987). The goal is to promote a more sustainable environment for growth. Agricultural and extension education has a responsibility to not only help disseminate new technology related to environmental and conservation issues but also help ensure that appropriate delivery systems be used to enhance the utilization of the technology.

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