

# Environmental Issues: Farmers' Perceptions About Usefulness of Informational and Organizational Sources

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The public, governmental agencies and the scientific community have recently expressed concerns about the effects of agricultural practices on the environment and the quality of life in general. During the past several years, numerous researchers have attempted to address these and related concerns. However, most of the proposed solutions address the effects of agricultural practices on the environment rather than the solutions to such problems through educational efforts. Perhaps the most important factor often ignored is educating farmers about environmental issues. Against this backdrop, the national task force on extension priorities included water quality as one of eight key issues for extension programming (Extension Service/USDA, 1988). Furthermore, water quality has been listed as the number one priority for fiscal year 1992 by the national committees on extension, agricultural research and northeast regional council (Joint Council on Food and Agriculture, 1990). Extension educators are concerned about how to deliver efficient and effective educational information on environmental issues.

Understanding the communication process between educators and farmers must include the context in which farmers live, operate, and make decisions. Historically our approaches to agricultural changes have tended to treat farmers' methods of gaining information as a closed system. However, it has become more obvious that farmers' systems of information acquisition and decision making are involved with linkages in a broad social context as shown in Figure 1.

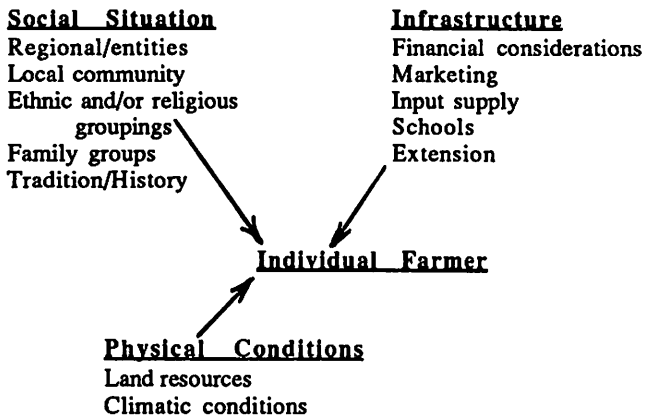


Figure 1. Social complex of factors which influence farmers in decision making. (Source, Fliegel, 1984)

Effective communication requires a thorough knowledge of the linkages which affect decisions. Educators must utilize models which enhance the information-transfer capabilities of information flow (Fliegel, 1984). Further evidence is given by Lionberger & Gwin (1982), "the educator, to be effective, must know the social situation, physical conditions and infrastructure of the individual farmer,"

## Related Literature

A host of media and methods are used by extension educators to communicate with farmers. For example, print-based media provide the public with answers to a myriad of topics. Other media such as audio and videotapes are used to provide information without personally involving agents. Mass media such as radio, television, and newspapers are used to advertise events, anticipate client needs, and report agricultural business information (Fedele, 1985). Iams & Marion (1991) indicated that learning preferences of people depends on the subject matter they are learning. For example, people preferred television, newspaper, and radio to learn about energy conservation, while pamphlets, correspondence courses, and telephone messages were preferred to know more about health and financial management information. Further, when the subject was changed to environmental education, the preferred information sources were videotapes, educational meetings, workshops and bulletins.

A number of studies have indicated that farmers use various communications media and methods to meet their information needs (Bouare & Bowen, 1990; Richardson, 1989; Martin & Omer, 1988; Kramic, 1987). Bouare and Bowen (1990) found that office calls, telephone calls, bulletins, and newsletters were the methods used most often by Ohio extension agents to deliver instruction to farmers. Methods used least were radio, television, magazines, and teleconferencing. North Carolina farmers (Richardson, 1989) preferred newsletters, meetings, farm visits, telephone calls, and on-farm tests. However, newer information delivery techniques such as teleconferencing, videotapes, audio-cassettes and cable television were not preferred by these farmers. Iowa young farmers rated local community meetings, newspaper articles, and county meetings highest for planning and conducting educational programs (Martin and Omer, 1988). Ohio farmers ranked meetings and clinics conducted by extension agents first both in importance and confidence.

Okai (1986), in a Missouri study, found that small-scale farmers were satisfied with the source of agricultural information made available to them. When presented with a list of eight information sources, Missouri farmers ranked extension education assistants, extension publications, friends and neighbors, radio and TV as the top four information sources. However, vocational agricultural instructors and area extension specialists were ranked lowest.

Few researchers have examined the information sources that farmers find useful to learn about environmental issues. Padgitt (1987) found that over 60% of Iowa farm operators used farm magazines/newspapers, radio and television to obtain information on groundwater quality. However, regarding the reliability of information delivered, university extension specialists, CES, Soil Conservation Service, and personnel from soil conservation district and state natural resource agencies were considered most reliable. Local agricultural dealers, chemical representatives, and radio and television were considered the least reliable sources. Bounaga (1989) indicated that landowners of highly erodible soils in Iowa preferred neighbors, friends, family and other farmers, the Soil Conservation Service, Agricultural Stabilization and Conservation Service, the CES and agribusinesses as major information sources. In addition, when asked to rate the education methods for past and future use landowners gave high ratings for "face-to-face discussions." Newspaper and magazine articles, and newsletters were placed second and third in importance, respectively.

The foregoing review of literature indicates that farmers prefer printed materials such as newsletters, magazines and manuals. In addition, face-to-face discussions such as demonstrations and on-farm consultations are also preferred by farmers, suggesting that farmers believe what they see and confirms the popular adage that "seeing is believing."

Further, the review also suggests that farmers rely extensively upon both private and public sources to gain information about environmental issues.

### **Purpose and Objectives**

The major purpose of this study was to determine Pennsylvania farmers' perceptions about environmental issues and to identify their information sources relative to environmental issues. The specific objectives of the study were to:

Determine farmers' perceptions about environmental issues.

Identify information sources that farmers find useful relative to environmental issues.

Identify the usefulness of human resource organizations upon which farmers depend for information about environmental issues.

Determine relationships between the farmers' perceptions about environmental issues and demographic characteristics (age, educational level, type of farming, and years in farming).

### **Procedures**

This study utilized descriptive survey research methodology. The target population consisted of 23,481 farmers in Pennsylvania. The frame was obtained from the Agricultural Stabilization and Conservation Service (ASCS) of the Pennsylvania Department of Agriculture (1989). A random sample of 374 farmers was selected based on the formula provided by Krejcie and Morgan (1970) to provide a 5% margin of error.

The questionnaire, adapted from one developed and used by Bruening (1989), consisted of three sections. Section one contained 25 statements that measured the perceptions of farmers about environmental issues on a five-point, Likert scale that ranged from "Strongly disagree" to "strongly agree." Section two contained statements designed to elicit demographic information including age, educational level, years of farming, type of farming, retirement plans and farming plans. Section three included questions regarding the usefulness of information sources and human resource organizations extending information on environmental issues. Responses were measured on a five-point, Likert-type scale that ranged from "no use at all" to "very useful." Questionnaire face and content validity were established using a panel of experts composed of four agricultural education faculty members at The Pennsylvania State University.

Two hundred and forty-six farmers responded to the questionnaire yielding a return rate of 65%. Because nonrespondents tend to be similar to late respondents (Miller & Smith, 1983), farmers who responded during the first four weeks were compared with those responding during the last four weeks. No significant differences were found ( $p > .05$ ) between early and late respondents on five statements that measured farmers' perceptions about environmental issues. Three of the five statements related to manure mismanagement and one each to water pollution and nutrient mismanagement. These statements were concerned with governmental programs on environmental issues, thereby limiting the generalizability of findings to the population. Using data collected from the sample, Cronbach's alpha reliability coefficients were .88 for perceptions about environmental issues, .87 for usefulness of information sources and .87 for usefulness of human resource organizations.

## Findings

### Demographic Profile of Farmers

The mean age of the farmers responding was 53 years, with the youngest being 21 years and the oldest 84 years. Thirty-one percent of the farmers had completed at least 11 years of formal education while 34% had completed high school education, and the remaining 35% had some post-secondary education. Farmers indicated that they had been farming an average of more than 25 years (26.6). Almost 33% of the farmers had been farming for more than 30 years. A little over 50% of the farmers indicated that they were farming full-time, while the others (48%) were farming part-time.

### Objective One

The farmers were asked to indicate their perceptions about four environmental issues. A scale that ranged from 1 = strongly disagree to 5 = strongly agree was used to measure their perceptions. The summated mean scores for the four environmental issues revealed that three (water pollution, manure mismanagement and nutrient mismanagement) were above the theoretical midpoint. However, groundwater contamination as an environmental issue was close to the theoretical midpoint (Table 1). The data presented in Table 1 indicate that water pollution is a serious environmental issue (3.79), followed by manure mismanagement (3.60), nutrient mismanagement (3.37), and groundwater contamination (2.89).

Table 1. Means and Standard Deviations for Farmers' Perceptions about Environmental Issues

Environmental issue	Summated mean score	Theoretical midpoint	Mean*	SD
Water pollution (4-20)	15.15	12.0	3.79	1.01
Manure mismanagement (8-40)	28.77	24.0	3.60	1.19
Nutrient mismanagement (10-50)	33.69	30.0	3.37	1.12
Groundwater contamination (3-15)	8.67	9.0	2.89	1.20

Note: Figures in parentheses indicate the possible range of scores.

\*Mean computed on a scale 1 = strongly disagree to 5 = strongly agree.

### Objective Two

The farmers were asked to indicate the usefulness of various information sources (on a scale that ranged from 1 = no use at all to 5 = very useful) about environmental issues. The information sources were grouped into three categories: printed materials, audio-visuals, and educational activities. Results are found in Table 2. Information sources that farmers found either "somewhat useful" or "very useful" in the printed materials category were newsletters (79%), followed by manuals and magazines (68%), brochures (67%), and technical notes/fact sheets (61%). However, only 57 % of the farmers found newspapers either "somewhat useful" or "very useful" in informing them about environmental issues.

Table 2. Frequencies, Means, Standard Deviations and Rankings for Usefulness of Information Sources

Information source		Scale value					Mean	SD
		1 <sup>a</sup>	2	3	4	5		
<b><u>Printed Materials</u></b>								
Brochures	N	5	13	35	77	33	3.73	.97
	%	3.1	8.0	21.5	47.2	20.2		
Manuals		4	8	39	72	38	3.82	.93
		2.5	5.0	24.5	44.5	23.5		
Technical notes-fact sheets		7	13	43	60	40	3.69	1.06
		4.3	8.0	26.4	36.8	24.5		
Newsletters		4	8	22	91	41	3.95	.89
		2.4	4.8	13.5	54.8	24.5		
Magazines		3	9	42	78	36	3.80	.90
		1.8	5.4	25.0	46.4	21.4		
Newspapers		11	19	40	65	30	3.51	1.11
		6.7	11.5	24.2	39.4	18.2		
<b><u>Audio-Visual Sources</u></b>								
Slides		10	16	52	60	20	3.40	1.04
		6.3	10.1	32.9	38.0	12.7		
Videotapes		12	9	39	61	36	3.64	1.13
		7.7	5.7	24.8	38.9	22.9		
Television		21	14	38	52	40	3.46	1.29
		12.8	8.5	23.0	31.5	24.2		
Photographs/Charts		7	10	51	62	29	3.60	1.00
		4.4	6.3	32.1	39.0	18.2		
Radio		27	30	46	46	15	2.95	1.22
		16.5	18.3	28.0	28.0	9.2		
<b><u>Educational Activities</u></b>								
Public meetings		5	8	37	65	44	3.84	.98
		3.1	5.0	23.3	40.9	27.7		
Trade shows		9	18	68	50	16	3.29	.98
		5.6	11.2	42.2	31.1	9.9		
Demonstration fields, Tours and Plots		3	2	37	55	70	4.12	.92
		1.8	1.2	22.2	32.9	41.9		
On-farm Consultation		4	5	24	56	76	4.18	.96
		2.4	3.0	14.5	33.9	46.2		

<sup>a</sup>Scale value descriptors: 1=No use at all, 2=Not very useful, 3=Uncertain, 4=Somewhat useful, 5=Very useful.

In the audio-visuals category, farmers indicated that videotapes (62%) and photographs and charts (57%) and television (57%) were either "somewhat useful" or "very useful" information sources. Only 37% of the farmers indicated radio was a useful source of information.

On-farm consultations (80%), demonstrations, tours and plots (75%) and public meetings (69%) were the information sources that farmers felt either "somewhat useful" or "very useful" in the educational activities category. A little over 42% of the farmers were uncertain about the usefulness of trade shows.

### **Objective Three**

The farmers were asked to indicate the usefulness of human resource organizations in providing information about environmental issues. The results presented in Table 3 indicate that 85% of Pennsylvania farmers ranked the Soil Conservation Service either

"somewhat useful" or "very useful" as an information resource followed by the Penn State Cooperative Extension county offices (81%), Penn State University faculty (75%), county conservation districts (73%), and the Agricultural Stabilization and Conservation Service (ASCS) (67%). However, a little over a third of farmers were uncertain about the usefulness of personnel in crop management associations (41%), farm machinery dealers (40%) the Environmental Protection Agency (EPA) (34%), and the Pennsylvania Department of Environmental Resources (DER) (35%).

Table 3. Frequencies, Means, Standard Deviations and Rankings for Usefulness of Resource Organizations

Resource organizations	1 <sup>a</sup>	Scale value					Mean	SD
		2	3	4	5			
Soil Conservation Service	N 4 % 2.2	3	19	69	84	4.26	.88	
County Extension Service	6 3.4	5 2.8	22 12.3	66 36.9	80 44.6	4.17	.98	
Penn State University Faculty	7 4.0	5 2.9	32 18.5	69 39.9	60 34.7	3.98	1.01	
County Conservation Districts	3 1.7	4 2.3	40 22.9	81 46.3	47 26.8	3.94	.86	
Adult/High School Agriculture Instructors	9 5.3	21 12.3	54 31.6	63 36.8	24 14.0	3.42	1.04	
Machinery Dealers	19 10.9	24 13.8	69 39.7	48 27.6	14 8.0	3.08	1.08	
Local Seed/Chemical/Fertilizer Dealers	8 4.6	12 6.9	54 30.9	71 40.6	30 17.0	3.59	1.00	
Neighbors, Friends and/or Family Members	5 2.8	14 8.0	51 29.0	73 41.5	33 18.7	3.65	.97	
Crop Management Association Technicians	9 5.2	12 7.0	70 40.7	57 33.1	24 14.0	3.44	.99	
Agricultural Stabilization and Conservation Serv.	8 4.6	11 6.3	38 21.7	65 37.1	53 30.3	3.82	1.07	
Environmental Protection Agency	34 19.4	22 12.6	61 34.9	49 28.0	9 5.1	2.87	1.17	
Department of Environmental Resources	33 19.0	28 16.1	62 35.6	40 23.0	11 6.3	2.81	1.17	
Pennsylvania Department of Agriculture	12 6.9	13 7.5	59 34.2	63 36.4	26 15.0	3.45	1.06	

Scale value descriptors: 1=No use at all, 2=Not very useful, 3=Uncertain, 4=Somewhat useful, 5=Very useful.

#### Objective Four

Correlation coefficients were computed to determine if relationships existed between the farmers' perceptions about the seriousness of environmental issues and selected demographic characteristics such as age, educational level, years of farming, and type of farming. The results are found in Table 4.

Age was independent of farmers' perceptions about the seriousness of environmental issues. Low significant positive relationships existed between educational level of farmers and their perceptions about water pollution, manure mismanagement, and nutrient mismanagement. Perceptions that farmers had about ground water contamination and their educational level were unrelated.

Low significant negative relationships existed between farmers' perceptions about manure mismanagement, nutrient mismanagement and the number of years they had been farming. However, farmers' perceptions about water pollution and ground water contamination were not related to the number of years they had farmed.

Low significant relationships existed between farmers' perceptions about water pollution, manure mismanagement, groundwater contamination, and whether or not they were full- or part-time farmers. Perception about nutrient mismanagement, however, was not related to being a full- or part-time farmer.

Table 4. Relationships Between Farmers' Perceptions about Environmental Issues and Demographic Characteristics

Environmental Issue	Age	Demographic Characteristic		Type of farming
		Education level	Years of farming	
Water pollution	.08	.22*	-.15	.19*
Manure mismanagement	-.06	.24*	-.24*	.16*
Nutrient mismanagement	.07	.20*	-.16*	.16
Groundwater contamination	.08	.09	-.12	.18*

\* $p < .05$  level

Notes: Age (continuous data collapsed into two levels--21 through 53 and 54 through 84 years); Educational level (continuous data collapsed into two levels--6 through 12 and 13 through 18 years); years of farming (continuous data collapsed into two levels--one through 15 and 16 through 40 years); type of farming (discrete data: 1=full-time farmer and 2=part-time farmer).

## Conclusions and Discussion

Pennsylvania farmers perceive that water pollution and manure mismanagement are the most serious environmental issues. However, the findings suggest that farmers are uncertain if nutrient mismanagement and groundwater contamination are serious environmental issues. Bruening (1990) reported that Iowa farmers had similar perceptions about the seriousness of groundwater contamination and nutrient mismanagement as an environmental issue.

Pennsylvania farmers prefer educational activities such as on farm consultations, demonstrations, tours and plots to learn about environmental issues. These findings indicate that farmers believe what they see, in essence "seeing is believing" for these farmers. Printed materials such as newsletters, manuals and magazines were important sources to learn about environmental issues. This finding closely matches those of Iowa farmers (Bruening, 1990; Bounaga, 1989; and Padgitt, 1987) and North Carolina farmers (Richardson, 1989).

The Soil Conservation Service, Penn State Cooperative Extension county office, Penn State University faculty, county conservation districts, and the ASCS were identified as useful human resource organizations to gain information about environmental issues. In addition, neighbors, friends, and family members, and local seed/chemical/fertilizer dealers were also considered useful resources for gaining information. Interestingly, Pennsylvania farmers were uncertain about the Pennsylvania Department of Environmental Resources and the EPA as resource organizations. Bruening's (1990) findings for Iowa farmers closely parallel most of the findings resulting from this study. Similar findings were reported by Padgitt (1987) and Bounaga (1989).

Farmers who had more than a high school education perceived water pollution, manure mismanagement, and nutrient mismanagement as more serious environmental issues than those farmers who had not completed high school. Farmers who have been farming fewer than 26 years perceived manure and nutrient mismanagement as serious environmental issues. Examination of mean scores indicated that part-time farmers perceived water pollution, manure mismanagement, and groundwater contamination more serious environmental issues than did full-time farmers.

### **Recommendations**

The findings provided a basis for the following recommendations.

Extension educators at the county level should use the findings of this study to design educational programs and materials that will benefit farmers in learning about environmental issues.

Extension educators and communicators should consider the demographic/farm characteristics of their audiences before planning educational programs on environmental issues.

Future researchers should examine possibilities of collaborative efforts between public and private sector agencies, extension educators, and communicators to effectively deliver environmental educational programs which involve farmers in local meetings and demonstration plots.

### **References**

- Bouare, D. & Bowen, B. E. (1990). Communications methods used by agricultural extension agents. Journal of Applied Communications, 74(1), 1-7.
- Bounaga, L. (1989). Preferred sources and methods of obtaining information related to adoption of soil conservation practices by landowners of highly erodible fields in Franklin county, Iowa. Unpublished master of science thesis, Iowa State University, Ames.
- Bruening, T. H. (1989). Perceptions of Iowa farm operators and soil conservation district commissioners regarding selected soil and water conservation practices. Unpublished doctoral dissertation, Iowa State University, Ames.
- Bruening, T. H. (1990). Communicating with farmers about environmental issues. Research paper abstracts, 1990 International Meeting of Agricultural Communicators in Education, St. Paul, Minnesota.
- Davis, J. A. (1971). Elementary survey analysis. Englewood, NJ: Prentice Hall
- Extension Service (1988). Cooperative extension system national initiatives. Focus on issues. Washington, DC: United States Department of Agriculture.
- Fedele, S. V. (1985). The potential of interactive video for extension information delivery (ASEA Technical Report 85-5015).

- Fliegel, (1984). "Extension communication and the adoption process" in Burton E. Swanson (Ed), Agricultural Extension - A reference Manual, Rome: Food and Agricultural Organization of the United Nations.
- Iams, D. R. & Marion, M. H. (1991). Reactions to alternative delivery methods - cost effective environmental education options. Journal of Extension, 31, 12-14.
- Joint Council of Food and Agriculture (1990). Fiscal year 1992 priorities for research, extension and higher education. Washington, DC: US Government Printing House.
- Kramic, J. L. (1987). The level of impact of agricultural information sources on production and marketing decisions of Ohio farmers. Unpublished master of science thesis, The Ohio State University, Columbus.
- Krejcie, R. V. & Morgan, D. W. (1970). Determining sample size for research activities. Educational Psychological Measurement, 30, 607-660.
- Lionberger, H. F. & Gwin, P. G. (1982). Communication strategies: A guide for agricultural change agents. Danville: The Interstate Printers and Publishers, Inc.
- Martin, R. A. & Omer, M. H. (1988, Spring), Factors associated with participation of Iowa young farmers in agricultural extension programs. The Journal of the American Association of Teacher Educators in Agriculture, 29(1), 45-52.
- Miller, L. E. & Smith, K. (1983). Handling nonresponse issues. Journal of Extension, 24, 11-13.
- Okai, M. N. (1986). The delivery of agricultural information to small farmers. Unpublished doctoral dissertation, University of Missouri-Columbia, Columbia.
- Padgitt, S. (1987). Agriculture and groundwater issues in Big Spring Basin and Winnesheik County, Iowa. Survey of farm and nonfarm households on perceptions, attitudes, and farming practices. Cooperative Extension Service, Iowa State University, Ames.
- Pennsylvania Department of Agriculture (1989). Agricultural Stabilization and Conservation Service, Harrisburg, Pennsylvania.
- Richardson, J. C. (1989). Extension information delivery methods: Detecting trends among users. ACE Quarterly, 72(1), 23-27.