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RESEARCH
REPORT

Pennsylvania Farms and Improved Nitrogen Management

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SUMMARY REPORT OF 1994 SURVEY WITH¹
DAIRY FARMERS IN PENNSYLVANIA

by

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EXECUTIVE SUMMARY

On average, the dairy farmers who responded to this mail survey were 48 years old and about half completed high school. About one third of the respondents worked off-farm during 1993. Most farmers expected to continue farming at their present location for less than 20 years.

The average herd size was 64 cows (both dry and lactating) and sales of milk accounted for over 90% of farm revenue. In 1993, annual milk production ranged from 8,000 pounds per cow to as much as 27,000 pounds. The survey average was 16,985 pounds per cow. Farmers received an average of \$12.77 per hundredweight, although this figure ranged from a low of \$8.00 to a high of \$24.00.

Most farmers do not store manure; it is spread daily. For those who do store manure, the most popular means of doing so is in tank, pond or pool. About half of the farmers do not incorporate manure until tillage and 15% reported that they did not incorporate manure at all. Manure was most heavily applied on corn silage acreage and corn grain acreage. Respondents reported lighter applications on soybeans, alfalfa, grass hay, and permanent pasture.

Few farmers have made physical improvements to manage nitrogen pollution. However, of those farmers who have made improvements, the construction of an animal waste collection facility was cited most frequently. About one third of the respondents used rotational grazing as a manure management technique. A variety of soil and water conservation techniques were used by the farmers in this sample. The most popular was sod waterways followed by permanent vegetative cover on critical areas.

The majority of respondents did not feel that farms in general, or their farm in particular, were significant sources of nitrogen pollution. Almost half of the farmers indicated that farmers should not be expected to clean up their water pollution until non-farm sources are cleaned. Over 50% of the respondents disagreed with the statement, "Farmers should be held liable for the damage done by nitrogen pollution that originates on their farm."

There was no overwhelming support for any of the possible solutions to nitrogen pollution identified in the questionnaire. Indeed, most farmers felt that since every farm is different, no general solutions exist for the management of nitrogen pollution. Taxes, penalties and regulations were not seen as effective means of reducing nitrogen pollution. There was, however, basic agreement with several statements suggesting that the costs associated with nitrogen management were not overly burdensome.

This report summarizes the results of a mail survey of Pennsylvania Dairy farm principal operators, conducted during the Spring and Summer of 1994. The purpose of the survey was to develop a profile of current dairy farming practices, especially nitrogen and manure management practices. To accomplish this, questions focused on general farm and farmer characteristics, manure and fertilizer management practices, knowledge of alternative practices, use of conservation technologies, barriers to the adoption of new technologies, attitudes about the prevalence of and responsibility for managing farm generated nitrogen pollution, perceptions about other sources of nitrogen pollution,

attitudes about possible solutions to nitrogen pollution, and general environmental attitudes.³

This report is organized in seven sections. These include general dairy farm characteristics, characteristics of the farmers who answered the survey, milk production in 1993, crop yields and manure applications, nitrogen management and conservation practices, sources of information for fertilizer and manure management decisions, attitudes about pollution and the environment, and ASCS payments received by farmers in 1993.

GENERAL DAIRY FARM CHARACTERISTICS

Dairy and Other Livestock

Nearly 70% of the respondent's dairy farms had a milking herd (both dry and lactating) of between 26 and 75 milk cows (Table 1). The average herd contained approximately 64 cows, although the median herd size was only 50 cows. Slightly over half (51.8%) of the dairy farms had 50 or fewer cows while nine percent had more than 100.

Over 97% of the farmers surveyed reported that they kept other livestock including dairy bulls over age 1, beef cows on lot, beef cows on pasture, and a host of other animals ranging from chickens to sheep (Table 2). The average number of other animals kept was 52 and the median was 38.

Table 1
Total Size of Milking Herd
(Dry and Lactating)

Herd Size	Number of Respondents	Percent of Total
Less than 10	9	1.9
10 - 25	37	7.8
26 - 50	201	42.1
51 - 75	128	26.8
76 - 100	58	12.2
101 - 125	18	3.8
126 - 200	22	4.6
7200	4	0.8
Survey Average	63.6	
Survey Median	50	
Total Usable Answers	477	100%

³ See Appendix A for survey methodology

Table 2
Other Livestock

Number of Animals	Number of Respondents	Percent of Total
Less than 10	32	6.7
10 - 25	111	23.3
26 - 50	183	38.4
51 - 75	79	16.6
76 - 100	33	6.9
101 - 125	19	4.0
126 - 200	13	2.7
7200	7	1.5
Survey Average	52.4	
Survey Median	38	
Total Usable Answers	477	100%

Acres Farmed

Total acres farmed (both owned and rented) ranged from 118 acres to 2500 acres (Table 3). The survey average of 232 acres was considerably larger than the median of 190 acres due to the inclusion of 21 farms of more than 500 acres.

Table 3
Total Acres Farmed

Number of Acres	Number of Respondents	Percent of Total
0 - 50	25	5.4
51 - 100	81	17.6
101 - 150	75	16.3
151 - 200	82	17.6
201 - 250	65	14.1
251 - 300	40	8.6
301 - 400	58	12.5
401 - 500	18	3.9
501 - 1000	16	3.4
Over 1000	5	1.1
Survey Average	232	
Survey Median	190	
Total Usable Answers	465	100%

Acreeage of Fields With Standing Water During Spring (Last 3 Years)

Approximately 46% of respondents reported that they had fields with standing water during spring (Table 4). Of these, 187 farmers provided detailed

information about the acreage of such fields. Almost 60% had fewer than 10 acres with standing water. Only about eight percent reported standing water in more than 50 acres. Because 9 respondents had 100 or more acres with standing water, the survey average of 22.2 acres was higher than the median of five acres.

Table 4
Acreage of Fields with Standing Water During Spring (last 3 years)

Average Acreage	Number of Respondents	Percent of Total
Less than 10	110	58.8
10 - 20	36	19.3
21 - 30	11	5.9
31 - 40	8	4.3
41 - 50	7	3.7
More than 50 Acres	15	8.0
Survey Average	22.4	
Survey Median	5	
Total Usable Answers	187	100%

Surface Material of Confinement Yard

The majority of respondents (66%) indicated that the surface material of their confinement area was composed of dirt or mud (Table 5). The remainder (34%) had surface material composed of either stone (3.3%) or pavement or concrete (30.9%).

Table 5
Surface of Material of Confinement Area

Surface Material	Number of Respondents	Percent of Total
Packed Dirt or Mud	119	65.7
Stone	6	3.3
Pavement or Concrete	56	30.9
Total Usable Answers	181	100%

Types of Manure Storage Used

Most farmers (55.9%) in this survey do not store their manure; it is spread daily (table 6). For those who do store manure, the most popular means of doing so is in liquid form in tank, pond, or pool (32.9%), followed by storage in a pack under roof (15.9%), and storage in a pack outside (13.4%).

Table 6
Types of Manure Storage Used

Type of Storage	Number of Respondents	Percent of Total*
Stored in Liquid in tank, Pond or Pool	157	32.9
Stored in Pack Under Roof	76	15.9
Stored in Pack Outside	64	13.4
No Storage Used, Spread Daily	267	55.9

*Percentage of total based on total N(N=477)

Percent Revenue From Various Sources

Tables 7, 8, and 9 present farm revenue from the following sources: milk, crop sales, and animal sales. As might be expected, the vast majority of dairy farmers (92%) generate more than 75% of their revenue from the sale of milk. On average, 87% of farm revenue is generated by milk sales.

Approximately 92% of those surveyed generate 20% or less of their revenue from crop sales. The survey average is nine percent and the median is five percent. Only about eight percent of farmers in this sample reported generating more than 20% of revenue from crop sales.

A similar pattern holds for revenue from animal sales. Virtually all farmers (95%) generate 20% or less of their revenue through the sale of animals. Fewer than five percent reported that animal sales accounted for more than 20% of farm revenue. On average, about 10% of farm revenue comes from animal sales.

Table 7
Percent Farm Revenue From Milk
Number of Respondents

Percentage Revenue	Number of Respondents	Percent of Total
Less than 50%	6	1.3
50% - 75%	31	6.8
More than 75%	424	92.0
Survey Average	87%	
Survey Median	90%	
Total Usable Answers	461	100%

Table 8
Percent Revenue From Crop Sales

Percentage Revenue	Number of Respondents	Percent of Total
Less than 50%	101	63.1
10% - 20%	46	28.8
More than 20%	13	8.1
Survey Average	9.0%	
Survey Median	5.0%	
Total Usable Answers	461	100%

Table 9
Percent Revenue From Annual Sales

Percentage Revenue	Number of Respondents	Percent of Total
Less than 10%	173	40.5
10% - 20%	232	54.5
More than 20%	21	4.9
Survey Average	10.5%	
Survey Median	10.0%	
Total Usable Answers	426	100%

Farm Income

Farmers were asked their level of gross farm income for the years 1990, 1991, and 1992. Slightly over half of the respondents reported gross farm incomes of more than \$100,000 (Table 10). Only about five percent had incomes below \$20,000. Approximately six percent reported incomes above \$300,000.

Table 10
Average Gross Farm Income (1990, 1991, 1992)

Income	Number of Respondents	Percent of Total
Less than \$20,000	21	4.9
\$ 20,000 - \$ 39,999	31	7.2
\$ 40,000 - \$ 59,999	33	7.7
\$ 60,000 - \$ 79,999	50	11.6
\$ 80,000 - \$ 99,999	60	14.0
\$100,000 - \$199,999	156	36.3
\$200,000 - \$299,999	51	11.9
\$300,000 or More	28	6.5
Total Usable Answers	430	100%

Percent Income From Off-Farm Sources

Approximately 33% of the farmers surveyed derived income from off-farm sources in 1993 (Table 11). Of these, 29% reported receiving more than 40% of their income from off-farm sources. The survey average of 28.7% was considerably higher than the median (15%) because of six farmers who derived more than 75% of their income from off-farm sources.

Table 11
Percent of Income from Off-Farm Sources

Percentage Income	Number of Respondents	Percent of Total
10% or Less	73	46.5
11 - 20%	14	8.9
21 - 30%	16	10.2
31 - 40%	8	5.1
41 - 50%	19	12.1
More than 50%	27	17.2
Survey Average	28.7%	
Survey Median	15.0%	
Total Usable Answers	157	100%

Assets and Liabilities

The market value of farm assets and estimated total liabilities are reported in Tables 12 and 13. The average market value of farm assets was slightly over \$500,000 in 1993 while the median was \$400,000. The values ranged from a reported low of \$0 to a high of \$3,000,000. Almost 70% of respondents reported assets of less than \$600,000.

Estimated total liabilities ranged from a low of \$0 to a high of \$857,000. Farmers averaged slightly over \$100,000 in liabilities with a median of \$55,000. Over 63% of those surveyed reported liabilities of less than \$100,000.

Table 12
Market Value of Farm Assets

Market Value of Assets	Number of Respondents	Percent of Total
Less than \$199,000	67	19.1
\$200,000 - \$399,000	104	29.7
\$400,000 - \$599,000	72	20.6
\$600,000 - \$799,000	47	13.4
\$800,000 - \$999,000	20	5.7
\$1,000,000 or More	40	11.4
Survey Average	\$508,514	
Survey Median	\$400,000	
Total Usable Answers	350	100%

Table 13
Estimated Total Liabilities

Estimated Liabilities	Number of Respondents	Percent of Total
Less than \$100,000	226	63.5
\$100,000 - \$199,000	63	17.7
\$200,000 - \$299,000	37	10.4
\$300,000 - \$399,000	13	3.7
\$400,000 - \$499,000	9	2.5
\$500,000 or More	8	2.2
Survey Average	\$101,576	
Survey Median	\$ 55,000	
Total Usable Answers	356	100%

FARMER CHARACTERISTICS

Age

The average age of farmers in this sample was approximately 48 and ranged from a low of 20 to a high of 84 (Table 14). The majority of respondents were between the ages of 35 and 64 (71.6%). Approximately 16% were 34 or younger while 12% were 65 or older.

Table 14
Age of Respondent

Age	Number of Respondents	Percent of Total
Less than 25	9	2.0
25 - 34	65	14.3
35 - 44	137	30.2
45 - 54	105	23.1
55 - 64	83	18.3
65 and Older	55	12.1
Survey Average	47.6 Yrs.	
Survey Median	5 Yrs.	
Total Usable Answers	187	100%

Education

Almost half (47%) of the respondents completed high school (Table 15). However, a substantial portion (23%) received less than a high school education. Approximately 19% received formal training beyond high school.

Table 15
Education of Respondent

Education	Number of Respondents	Percent of Total
Some High School or Less	103	23.0
High School Graduate	210	47.0
Vocational School	50	11.2
Some College	38	8.5
College Graduate or More	46	10.3
Total Usable Answers	447	100%

Years Respondent Expects to Continue Farming at Present Location

Given the age distribution of this sample it is not surprising that over 70% of respondents expected to continue farming at their present location for less than 20 years (Table 16). Of these, almost 42% reported that they expected to continue for less than 10 years. Only about nine percent expected to continue farming at their present location for more than 30 years.

Table 16
Years Respondent Experts to Continue Farming at Present Location

Years	Number of Respondents	Percent of Total
10 Years or Less	130	41.8
11 - 20	95	30.5
21 - 30	59	19.0
31 - 40	16	5.1
More than 40	11	3.5
Survey Average	17 yrs.	
Survey Median	15 yrs.	
Total Usable Answers	311	100%

Off-Farm Work in 1993

Approximately 32% of respondents reported working off-farm during 1993 (Table 17). Contrary to what might be expected, there was not a great deal of seasonal variation in hours per week of off-farm work. Respondents averaged the most hours in Fall (29.8) and Spring (29.4), followed by Winter (27.8) and Summer (26.9).

Table 17
Hours Worked Off Farm in 1993

Hours	Winter	Spring	Summer	Fall
	Percent			
0 - 10	20.8%	16.2%	23.5%	17.5%
	(8)	(6)	(8)	(7)
11 - 20	27.5	24.3	20.6	20.0
	(11)	(9)	(7)	(8)
21 - 30	10.0	16.2	14.7	15.0
	(4)	(6)	(5)	(6)
33 - 40	27.5	29.7	23.5	30.0
	(11)	(11)	(8)	(12)
More than 40	15	13.5	17.6	17.5
	(6)	(5)	(6)	(7)
Total	100%	100%	100%	100%
	(40)	(37)	(34)	(40)
Survey Average	27.8	29.4	26.9	29.8
Survey Median	24	30	27.5	30
Total Usable Answers	151			

MILK PRODUCTION

Annual Milk Production

In 1993, farmers reported an average milk production of 16,985 pounds per cow. The various production levels, ranging from less than 8,000 pounds per cow to 27,000 pounds per cow, are presented in Table 18. Slightly more than 20% of respondents reported production of 20,000 pounds or more of milk per cow.

Table 18
Annual Milk Production in Pounds Per Cow

Per Cow (pounds)	Number of Respondents	Percent of Total
Less than 8,000	16	4.0
8,000 - 14,999	62	15.6
15,000 - 15,999	40	10.1
16,000 - 16,999	38	9.5
17,000 - 17,999	34	8.5
18,000 - 18,999	69	17.3
19,000 - 19,999	49	12.3
20,000 - 20,999	35	8.8
21,000 - 21,999	25	6.3
22,000 - 22,999	18	4.5
23,000 - 27,000	12	3.0
Survey Average	16,985	
Survey Median	18,000	
Total Usable Answers	398	100%

Milk Price Received

The average milk price received in 1993 was \$12.77 per hundredweight (Table 19). Farmers reported a wide range of prices from a low of \$8.00 per hundredweight to a high of \$24.00.

Table 19
Average Milk Price Received

Average Price (\$ per cwt)	Number of Respondents	Percent of Total
Less than \$10.00	5	1.3
\$10.00 - 10.99	10	2.6
11.00 - 11.99	21	5.5
12.00 - 12.99	187	49.2
13.00 - 13.99	123	32.4
14.00 - 14.99	19	5.0
15.00 - 15.99	7	1.8
Greater than \$16.00	8	2.1
Survey Average	\$12.77	
Survey Median	\$12.60	
Total Usable Answers	380	100%

CROP YIELDS AND MANURE APPLICATIONS

Crop Yields

Tables 20, 21, and 22 present annual yields for the following crops: corn grain, corn silage, and alfalfa. The average annual corn grain yield per acre for 1993 was approximately 112 bushels (Table 20). Yields ranged from less than 90 bushels per acre to more than 140.

Corn silage yields ranged from less than half a ton per acre to 200 tons per acre (Table 21). The survey average of 26.5 tons per acre was considerably higher than the median of 15 tons per acre due to five respondents who reported unusually high yields.

Alfalfa yields ranged from less than four tons per acre to more than eight tons per acre (Table 22). The majority of respondents (60.6%) reported yields between four and seven tons per acre. The survey average was 7.1 tons per acre.

Table 20
Average Corn Grain Yield Per Acre

Corn Grain (BU/ACRE)	Number of Respondents	Percent of Total
Less than 90 Bu/Acre	65	24.4
90 - 104 Bu/Acre	64	24.1
105 - 139 Bu/Acre	68	25.6
140 Bu or more per Acre	69	25.9
Survey Average	111.7 BU/ACRE	
Survey Median	109 BU/ACRE	
Total Usable Answers	266	100%

Table 21
Average Corn Silage Yield Per Acre

Corn Silage (Tons/Acre)	Number of Respondents	Percent of Total
Less than 10 Tons/Acre	44	21.2
10 - 19 Tons/Acre	97	46.6
20 - 29 Tons/Acre	52	25.0
30 Tons or more per Acre	15	7.2
Survey Average	26.5 Tons/Acre	
Survey Median	15 Tons/Acre	
Total Usable Answers	208	100%

Table 22
Average Alfalfa Yield Per Acre

Alfalfa (Tons/Acre)	Number of Respondents	Percent of Total
Less than 4 Tons/Acre	61	22.4
4 - 5 Tons/Acre	104	38.2
6 - 7 Tons/Acre	61	22.4
8 Tons or more per Acre	46	16.9
Survey Average	7.1 Tons/Acre	
Survey Median	5 Tons/Acre	
Total Usable Answers	272	100%

Application of Manure to Various Crops

Tables 23-28 present the percent of various crop acreages to which manure was applied during 1993. About half of the respondents (50.3%) applied manure to more than 75% of their corn silage acreage (Table 23). Very few respondents (8.6%) applied manure to less than 25% of their silage acreage. On average, farmers applied manure to approximately 70% of their corn silage acreage.

Table 23
Application of Manure to Corn Silage Acreage

Percent of Acreage	Number of Respondents	Percent of Total
Less than 25%	32	8.6
25 - 50	112	30.1
51 - 75	41	11.0
More than 75%	187	50.3
Survey Average	69.3%	
Survey Median	80%	
Total Usable Answers	372	100%

Slightly less than half of the respondents (42.6%) applied manure to more than 75% of corn grain acreage (Table 24). The remainder (47%) applied manure to between 25 and 75% of grain acreage. The average for all farmers was 60%.

Table 24
Application of Manure to Corn Grain Acreage

Percent of Acreage	Number of Respondents	Percent of Total
Less than 25%	29	10.7
25 - 50	102	37.5
51 - 75	25	9.2
More than 75%	116	42.6
Survey Average	64%	
Survey Median	60%	
Total Usable Answers	272	100%

Relatively few farmers (46) grew soybeans in 1993 (Table 25). Of these, approximately 60% applied manure to 50% or less of their soybean acreage. The survey average was just over 50%.

Table 25
Application of Manure to Corn Grain Acreage

Percent of Acreage	Number of Respondents	Percent of Total
Less than 25%	14	30.4
25 - 50	14	30.4
51 - 75	2	4.3
More than 75%	16	34.8
Survey Average	52.5%	
Survey Median	50%	
Total Usable Answers	46	100%

The vast majority (81%) of farmers who grew alfalfa applied manure to 50% or less of alfalfa acreage (Table 26). The average was 36.5% while the median was just 20%.

Table 26
Application of Manure to Alfalfa Acreage

Percent of Acreage	Number of Respondents	Percent of Total
Less than 25%	78	50.3
25 - 50	47	30.3
51 - 75	5	3.2
More than 75%	25	16.1
Survey Average	36.5	
Survey Median	20%	
Total Usable Answers	155	100%

Just over half (55.8%) of those respondents who grew grass hay applied manure to 50% or less of their acreage (Table 27). However, a substantial portion (34.5%) applied manure to more than 75% of grass hay acreage. On average, farmers applied manure to about 55% of grass hay acreage.

Table 27
Application of Manure to Grass Hay Acreage

Percent of Acreage	Number of Respondents	Percent of Total
Less than 25%	66	26.5
25 - 50	73	29.3
51 - 75	24	9.6
More than 75%	86	34.5
Survey Average	55.4%	
Survey Median	50%	
Total Usable Answers	249	100%

The majority of farmers (67.2%) applied manure to less than 25% of their permanent pasture acreage (Table 28). Only 11% of the respondents applied manure to more than half of their pasture acreage. The survey average was 25% and the median was 10%.

Table 28
Application of Manure to Permanent Pasture Acreage

Percent of Acreage	Number of Respondents	Percent of Total
Less than 25%	90	67.2
25 - 50	29	21.6
51 - 75	3	2.2
More than 75%	12	9.0
Survey Average	25.2%	
Survey Median	10%	
Total Usable Answers	134	100%

Time Between Spreading and Incorporation of Manure

Approximately half of the farmers surveyed reported that they did not incorporate manure until tillage (Table 29). About 15% did not incorporate manure. The remainder incorporated manure within one month or less of spreading.

Table 29
Time Between Spreading and Incorporation of Manure

Length of Time	Number of Respondents	Percent of Total
Within 48 Hours of Spreading	82	18.5
Within One Week of Spreading	45	10.1
Within One Month of Spreading	23	5.2
Not Incorporated Until Tillage	229	51.6
Manure Not Incorporated	65	14.6
Total Usable Answers	444	100%

NITROGEN MANAGEMENT AND CONSERVATION PRACTICES

Physical Improvements to Manage Nitrogen

Farmers were asked if they made any of the following four physical improvements to manage nitrogen pollution: construction of an animal waste collection facility, installation of drains and lagoon for barn or milkhouse drainage, installation of an animal waste processing facility, and installation of a barnyard drainage system to lagoon or storage. As Table 30 indicates, most farmers have not taken any of these actions. However, of those farmers who have made improvements, the construction of an animal waste collection facility was cited most frequently (43.8%), followed by the installation of drains and lagoon for barn and milkhouse drainage (38.2%). The least often cited improvements were the installation of a barnyard drainage system to lagoon or storage (19.7%), and the installation of a waste processing facility (6.3%).

Table 30
Physical Improvements to Manage Nitrogen

	Yes	No	Total
Constructed Animal Waste Collection Facility	161(43.8%)	207(56.3%)	368(100%)
Installed Drains and Lagoon for Barn and Milkhouse Drainage	134(38.2%)	217(61.8%)	351(100%)
Installed Animal Waste Processing Facility	21(6.3%)	315(93.8%)	336(100%)
Installed Barnyard Drainage System to Lagoon or Storage	67(19.7%)	273(80.3%)	340(100%)

Grazing Techniques to Manage Nitrogen

Approximately 34% of the respondents used rotational grazing to manage nitrogen (Table 31). The second most popular technique was grazing cows on hay fields (27%), followed by grazing on wet fields (15.5%), and grazing on crop residue (10.7%). One in five farmers did not graze their cows.

Table 31
Grazing Techniques to Manage Nitrogen

Technique	Number of Respondents	Percent of Total*
Craze on Crop Residue	51	10.7
Graze on Hay Fields	129	27.0
Rotational Graze	162	34.0
Graze on Wet Fields	74	15.5
Do not Graze Animals	101	21.2
<hr/>		
Total Usable Answers		

*Percentage based on entire sample (N=477); Total is greater than 100% because categories are not mutually exclusive.

Use of Conservation Techniques

Farmers reported using a variety of soil and water conservation techniques (Table 32). For those respondents who answered this question, sod waterways were mentioned most frequently (65.4%), followed by permanent vegetative cover on critical areas (63.9%). Other techniques included the use of a fall cover crop (44.6%), and sediment retention, erosion or water control structures (36.7%). Only about five percent had constructed a wetland system for agricultural waste.

Table 32
Use of Conservation Techniques

	Yes	No	Total
Regularly Use Fall Corn Crop	44.6% (179)	55.4 (222)	100% (401)
Permanent Vegetative Cover on Critical Areas	63.9% (255)	36.1% (144)	100% (399)
Sediment Retention, Erosion or Water Control Structures	36.7% (137)	63.3% (236)	100% (373)
Sod Waterways	65.4% (236)	34.6% (139)	100% (402)
Constructed Wetland System	5.2% (19)	94.8% (344)	100% (363)

INFORMATION SOURCES FOR FERTILIZER AND MANURE MANAGEMENT DECISIONS

Usefulness of Information Sources

Respondents were asked to score the usefulness of eight information sources for fertilizer and manure management decisions on a scale ranging from 1 to 5, where 1 meant not useful and 5 meant very useful. The information sources, the percentage of farmers in each numeric category who answered the question, and the means for each information source are presented in Table 33. The data indicate that the most useful information sources were farm business and seed dealers, cooperative extension, and neighbors, friends and other farmers, respectively. Field days and on-farm demonstrations, County Conservation District Staff, private farm organizations such as DHIA, bankers, and radio and TV programs ranked 4,5,6,7 and 8, respectively.

Table 33
Usefulness of Information Sources for Fertilizer and Manure Decisions

Source of Information	Score					Mean
	1	2	3	4	5	
	Percent					
Cooperative Extension	15.2	9.8	29.5	21.9	23.6	3.3
County Conservation District Staff	24.3	13.2	29.0	16.7	16.7	2.9
Farm Businesses/Dealers	6.1	8.0	24.9	27.5	33.4	3.7
Bankers	57.1	21.6	13.0	4.6	3.7	1.8
Private Farm Organizations	45.6	23.5	16.8	8.3	5.8	2.1
Neighbors, Friends, other Farms	16.2	12.5	34.8	21.4	15.0	3.1
Radio or TV Programs	66.2	17.2	11.1	1.8	3.7	1.6
Field Days, on Fair Demos	21.3	14.1	23.6	26.1	14.9	3.0

ATTITUDES ABOUT POLLUTION AND THE ENVIRONMENT

Farmer Attitudes About Sources and Extent of Nitrogen Pollution

Respondents were asked to indicate their level of agreement with five statements about the sources and extent of nitrogen pollution by ranking their responses on a scale ranging from 1 to 5, where 1 meant strongly disagree and 5 meant strongly agree. The Responses are presented in Table 34. The first three statements in the table suggest that farmers are a significant source of nitrogen pollution and that the extent of pollution is widespread. As their responses indicate, most farmers did not agree with this assessment. For instance, almost half (47.5%) either disagreed or strongly disagreed with the statement, "Farming is an important source of nitrogen pollution of the Chesapeake Bay." Only 18% agreed or strongly agreed with this statement. Similarly, approximately 40% disagreed or strongly disagreed with the statement, "Most nitrogen pollution of water results from inadequate manure management." An even higher percentage (55%) disagreed or strongly disagreed with the statement, "Nitrogen pollution has negatively affected groundwater in my county." However, it should also be noted that for each of these statements more than 25% of respondents indicated that they were undecided.

When presented with the two statements which suggested that farms are not a significant source of nitrogen pollution, a different response pattern emerged. Approximately 55% of the respondents agreed or strongly agreed with the statement, "Non-farm sources of pollution contribute more to nitrogen pollution than farm sources." Only 12% disagreed or strongly disagreed with this statement. Over 60% of the respondents agreed or strongly agreed that "Nitrogen pollution of water is not occurring from my farming activities." Only 10% disagreed or strongly disagreed with this statement. Over 25% indicated that they were undecided about these issues.

Table 34
Farmer Attitudes About the Sources and Extent of Nitrogen Pollution

Item	Score					Total
	1	2	3	4	5	
	Percent					
Farming is an Important Source of Nitrogen Pollution of the Chesapeake Bay	25.3 (98)	22.2 (86)	34.8 (135)	10.6 (41)	7.2 (28)	100% (388)
Most Nitrogen Pollution of Water Results from Inadequate Manure Management	20.5 (81)	19.9 (79)	34.3 (136)	11.9 (47)	13.4 (53)	100% (396)
Nitrogen Pollution From Farming has Negatively Affected Groundwater in my County	33.4 (15)	21.9 (25)	25.4 (114)	9.3 (114)	10.1 (132)	100% (400)
Non-Farm Sources of Pollution contribute more to Nitrogen Pollution than From Sources	6.4 (25)	5.1 (20)	33.3 (131)	20.1 (79)	35.1 (138)	100% (393)
Nitrogen Pollution of Water is not Occurring from my Activities	3.8 (15)	6.3 (25)	28.5 (114)	28.5 (114)	33.0 (132)	100% (400)

Farmer Attitudes About Responsibility for Managing Nitrogen Pollution

Respondents' attitudes about who should be responsible for managing nitrogen pollution are presented in Table 35. Approximately 45% agree or strongly agree that farmers should not be expected to clean up their water pollution until non-farm sources are cleaned up. Almost 25% disagree or strongly disagree with this statement. Slightly less than one third are undecided. The majority of farmers (55.5%) did not agree that farmers should be held liable for damage done by nitrogen pollution that originates on their farm. Only 15% supported this statement. Again, almost one in three farmers were undecided about where the responsibility lied.

Table 35
Farmer Attitudes About Responsibility for Managing Nitrogen Pollution

Item	Score					Total
	1	2	3	4	5	
	Percent					
Farmers Should Not be Expected to Clean Up Their Water Pollution Until Non-Farm Sources are Cleaned Up	10.5 (42)	13.5 (54)	30.7 (133)	16.7 (67)	28.7 (115)	100% (401)
Farmers Should be Held Liable for Damage Done by Nitrogen Pollution That Originates on Their Farm	33.0 (132)	22.5 (90)	29.5 (118)	9.8 (39)	5.3 (21)	100% (400)

General Environmental Attitudes

In addition to the specific statements concerning sources, extent, and responsibility for managing nitrogen pollution, respondents were asked to indicate their agreement with two statements designed to elicit information about general attitudes toward the environment. As Table 36 indicates, most of the farmers surveyed (83.8%) agreed or strongly agreed that farmers have a moral obligation to protect soil and water for future generations. Similarly, over 70% agreed or strongly agreed with the statement, "I am concerned about the environmental impacts of my farming activities."

Table 36
General Environmental Attitude

Item	Score					Total
	1	2	3	4	5	
	Percent					
Farmers Have a Moral Obligation to Protect Soil and Water for Future Generations	2.9 (12)	2.0 (8)	11.2 (46)	25.9 (106)	57.9 (237)	100% (409)
I am Concerned About the Environmental Impacts of My Farming Activities	7.6 (31)	3.9 (16)	17.0 (69)	28.7 (117)	42.8 (174)	100% (407)

Farmer Attitudes About Possible Solutions to Nitrogen Pollution

As Table 37 indicates, there was no overwhelming support for any of the statements concerning possible solutions to nitrogen pollution. The idea that each watershed should allow farmers to bid for permits to pollute groundwater and surface water received the least support; only 7.2% of the respondents agreed or strongly agreed with this statement. A higher percentage of respondents (32.3%) either agreed or strongly agreed with the statement, "Specific watershed programs involving all farmers should be developed to manage nitrogen pollution." However, an almost equal number disagreed with this statement. The highest level of agreement was recorded for the final statement, "Every farm is different. To my knowledge no general solutions exist to manage farm nitrogen pollution of water." Almost half (47.3%) of the respondents agreed or strongly agreed with this statement.

Table 37
Farmer Attitudes About Possible Solutions to Nitrogen Pollution

Item	Score					Total
	1	2	3	4	5	
	Percent					
Each Watershed Should Allow Farmers to Bid for Permits to Pollute Groundwater and Surface Water	67.4 (261)	11.1 (43)	14.2 (55)	1.8 (7)	5.4 (21)	100% (387)
Specific Watershed Programs Involving All Farmers Should be Developed to Reduce Water Pollution	16.9 (66)	14.9 (58)	35.9 (140)	18.7 (73)	13.6 (53)	100% (390)
Every Farm is Different to My Knowledge no General Solutions Exist to Manage Farm Nitrogen Pollution of Water	11.8 (47)	14.0 (56)	26.8 (107)	19.5 (78)	27.8 (111)	100% (399)

Farmer Attitudes About Regulations and Penalties

Responses to three statements concerning regulations, taxes, and penalties as a means of reducing nitrogen pollution are presented in Table 38. Very few farmers (5.5%) agreed or strongly agreed with the statement, "Regulatory standards with penalties are needed to force farmers or reduce nitrogen pollution." Approximately half (50.5%) of the respondents agreed or strongly agreed with the statement, "A tax on fertilizer would have little impact on my farming activities." Approximately 31% disagreed with this statement, suggesting that a tax on fertilizer would affect their farming

activities. Only 23.5% of the respondents agreed or strongly agreed with the final statement, "Taxes or penalties on the estimated contribution of my nitrogen application to my watershed's nitrogen pollution would be effective incentives for me to reduce nitrogen pollution." Almost half (46.1%) disagreed or strongly disagreed with this statement.

Table 38
Farmer Attitudes About Efficacy of Regulations/Penalties

Item	Score					Total
	1	2	3	4	5	
	Percent					
Regulatory Standards With Penalties are Needed to Force Farmers to Reduce Nitrogen Pollution	50.6 (202)	21.8 (87)	22.1 (88)	2.0 (8)	3.5 (14)	100% (399)
A Tax on Fertilizer Would Have Little Impact on My Farming Activities	19.5 (77)	10.9 (43)	19.0 (75)	20.0 (79)	30.6 (121)	100% (395)
Taxes on Penalties on Estimated Contribution of My Nitrogen App. to My Watershed's Nitrogen Pollution would be Effective Incentives for me to Reduce Nitrogen Pollution	36.1 (137)	10.0 (38)	30.3 (115)	13.7 (52)	9.8 (37)	100% (379)

Farmer Attitudes About the Cost of Nitrogen Management

The final set of attitude statements concerning nitrogen pollution focused on the costs of nitrogen management. Responses are presented in Table 39. For the most part, respondents indicated that the costs of nitrogen management were not overly burdensome. For instance, while about 25% agreed or strongly agreed with the first statement, "Farmers could reduce their use of commercial nitrogen by more precise application but for me the savings would not be worth the added time and effort," 42% disagreed or strongly disagreed. Respondents were almost evenly split over statement #2, "The cost of equipment and structures needed to reduce nitrogen pollution are high. They would put me out of business if I had to pay for them." Approximately 32% agreed or strongly agreed with this statement while 30% disagreed or strongly disagreed. Almost 60% of the respondents agreed or strongly agreed with the final statement, "Farmers could reduce nitrogen pollution without losing money by better management of manure." Only 14.8% disagreed or strongly disagreed with this statement.

Table 39
Farmer Attitudes About Costs of Nitrogen Management

Item	Score					Total
	1	2	3	4	5	
	Percent					
Regulatory Standards With Penalties are Needed to Force Farmers to Reduce Nitrogen Pollution	21.6 (85)	20.4 (80)	33.3 (131)	11.5 (45)	13.2 (52)	100% (393)
A Tax on Fertilizer Would Have Little Impact on My Farming Activities	16.9 (66)	14.9 (58)	35.9 (140)	18.7 (73)	13.6 (53)	100% (390)
Taxes on Penalties on Estimated Contribution of My Nitrogen App. to My Watershed's Nitrogen Pollution would be Effective Incentives for me to Reduce Nitrogen Pollution	8.1 (33)	6.7 (27)	26.4 (107)	29.6 (120)	29.3 (119)	100% (406)

ASCS PAYMENTS RECEIVED

ASCS Farm Related Program Payments

The vast majority of farmers did receive any ASCS farm related program payments in 1993 (Table 40). Of those respondents who did receive payments, only about five percent received \$1,000 or more. The survey average was \$157.83.

Table 40
ASCS Farm Related Program Payments
Number of Recipients

Payment	Number of Respondents	Percent of Total
0	273	91.3
Less than \$1,000	10	3.3
\$1,000 or More	16	5.4
Survey Average	\$157.83	100%
Survey Median	0	
Total Usable Answers	299	

ASCS Conservation Payments

Approximately 80% of respondents reported that they did not receive conservation payments in 1993 (Table 41). For those who did receive payments, the modal category was \$1,000-\$4,999. However, the survey average was just \$389.26.

Table 41
ASCS Conservation Payments

Payment	Number of Respondents	Percent of Total
0	260	80.5
Less than \$1,000	17	5.3
\$1,000 - \$4,999	39	12.1
\$5,000 - \$9,999	6	1.9
\$10,000 or More	1	0.3
Survey Average	\$389.26	100%
Survey Median	0	
Total Usable Answers	323	

ASCS Commodity Program Payments

As was the case with conservation program payments, 80% of respondents reported that they did not receive commodity program payments in 1993 (Table 42). Again, the modal category was \$1,000-\$4,999 while the survey average was \$867.67.

Table 42
ASCS Commodity Payment

Payment	Number of Respondents	Percent of Total
0	267	80.2
Less than \$1,000	12	3.6
\$1,000 - \$4,999	40	12.0
\$5,000 - \$9,999	7	2.1
\$10,000 or More	7	2.1
Survey Average	\$867.67	100%
Survey Median	0	
Total Usable Answers	333	

APPENDIX A

The sample of dairy farmers used in this study was drawn from the Pennsylvania Department of Agriculture's Brucellosis Ring Test list. This list contains the names and addresses of approximately 12,000 dairy farms. After this list was obtained, a stratified random sample of 1,600 dairy was drawn from four geographically distinct sections of the state using the first three numbers of area zip codes (see table A 1 for distribution of farms by region). A total of 41 respondents were deleted because they were either no longer farming, deceased, or no longer living at the address on the Brucellosis Ring Test list, leaving a sample of 1,559.

The survey mailing schedule followed the Total Design Method developed by Dillman (1978).⁴ The first round of surveys were mailed in May of 1994. One week later a postcard reminder was sent to all respondents. Three weeks after the initial mailing, a letter and replacement questionnaire was mailed to nonrespondents. Seven weeks after the original mailing, a final replacement questionnaire was sent to the remaining nonrespondents. This procedure resulted yielded 477 completed questionnaires, for a response rate of 30.6%.

Table A-1
Regional Distribution of Dairy Farms

Region	Number of Respondents	Percent of Total
West	92	20.2
North	126	27.6
Central	112	24.6
South East	126	27.6
Total Usable Answers	456	100%

⁴ Dillman, Don A. 1978. Mail and Telephone Surveys: The Total Design Method. New York, NY: John Wiley and Sons.

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