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## NON-POINT SOURCE POLLUTION And The North Carolina Agriculture Cost Share Program

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### ▀ *Agricultural Pollution and Best Management Practices*

Agricultural pollution is a serious problem throughout the United States. Since primary point sources of pollution have been controlled stringently during the past decade, regulatory attention has shifted toward reducing non-point source pollution, primarily the pollution associated with agricultural production. Agriculture contributes to water quality problems in nearly three-fourths of the nation's river miles (USDA). Soil erosion remains one of agriculture's biggest problems. Agricultural analysts believe that nonirrigated agriculture contributed to more than half of the human-induced sediment which enters the nation's waterways. Nationwide, environmental damage due to agricultural erosion is extensive. Almost half of the nation's cropland erodes at a rate greater than soil-loss tolerance levels estab-

lished by soil scientists. Agricultural economists estimate that the economic damage from soil erosion ranges between \$3 and \$6 billion annually.

One response to the problem of non-point source agricultural pollution has been the promotion of best management practices (BMPs). BMPs define a set of recommended input use levels or management practices which consider both environmental and economic factors. BMPs reduce the amount of non-point agricultural pollution by identifying practices which farmers should adopt and then regulatory authorities provide farmers with economic incentives to implement these practices. Economic considerations indicate that BMPs should be adopted if the installation and maintenance costs of the practice are less than the sum of the private and public benefits. This guideline provides the motivation for development of an administered cost share system of incentives which would encourage farmers to adopt BMP practices. The cost share provision, of course, ensures that federal and state governments will play a pivotal role in controlling non-point pollution. The method of establishing BMP guidelines and encouraging farmers to adopt them is consistent with the goal of efficient agricultural pollution reduction if the cost share agencies have all the relevant cost and benefit information. With complete information, an agency can include in the package only

**Table 1. Top 10 Most Funded BMPs in NCACSP, 1986-1995 (in 1995 \$)**

BMP	Expenditures	% of Total
1. Cropland Conversion - Grass*	\$8,128,151	13
2. Grassed Waterways *	\$7,794,747	12
3. Lagoons	\$6,749,438	11
4. Field Borders *	\$4,707,733	8
5. Water Control Structures	\$3,373,488	5
6. Conservation Tillage*	\$3,117,666	5
7. Ponds	\$2,476,880	4
8. Sod Based Rotation*	\$2,398,990	4
9. Cropland Conversion - Trees *	\$2,140,186	3
10. Trough or Tank	\$2,081,105	3
Remainder (34 BMPs)	\$15,462,720	32
<b>TOTAL</b>	<b>\$62,842,599</b>	<b>100</b>

\* Indicates soil erosion or sediment control BMP

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# North Carolina Agriculture Cost Share Program

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those practices for which total benefits exceed total costs. The cost-share incentive would be determined by subtracting private benefits from installation costs such that BMPs would involve no net money transfers from the government to participating farmers. The usual objection to government regulation of economic decisions is that the government is less informed than private decision makers so government imposed decisions are often inefficient in achieving the desired objectives.

## ▀ *The North Carolina Agriculture Cost Share Program*

Despite notable improvements in recent years, agricultural pollution remains a serious problem for North Carolina citizens. Over 30 percent of North Carolina rivers and streams are degraded and nearly two-thirds of the degradation is due to agricultural runoff of sediments and nutrients (NC Division of Soil and Water Conservation). To deal with local agricultural pollution problems, North Carolina introduced an Agriculture Cost Share Program (NCACSP) for selected counties in 1984. In 1989, the program was expanded to include all North Carolina counties (more information on the federal conservation programs available to North Carolina farmers is continued in the next issue of the NC State Economist).

Agricultural BMPs in the NCACSP are funded through a multi-stage process. The General Assembly appropriates funds for the NCACSP. The Division of Soil and Water Conservation, an agency within the

Department of Environment, Health and Natural Resources, is in charge of administering and distributing funds under the NCACSP to local soil and water conservation districts. In general, soil and water district boundaries correspond closely with county boundaries. In order to determine how much money to give to districts, the division requires each district to submit an annual strategy plan. To put together strategy plans, district personnel solicit applications for assistance from farmers interested in participating in the program. The strategy plan identifies water quality problems in the county and recommends the BMPs needed to remedy those problems. The parameters used for allocating the cost share program budget among districts are based on the level of agricultural activities in a given district, its surface water quality, the size of a district's program in previous years, and the availability of technical assistance.

After receiving funds, districts must decide which applications to accept. Upon approval of the application by the district, the applicant (farmer) and the district enter into a cost share agreement. The cost share agreement includes the BMPs to be cost shared with state funds, their average costs, incentive payments to the farmer, and the expected implementation date. The conservation plan of operation which outlines the procedures to be used to implement the BMPs becomes part of the cost share agreement. After review and approval by the District Board of

**Table 2. Cost-Effectiveness of the Stand-Alone Soil Erosion BMPs (1986-1995)**

BMP	Expenditures	% Expen.	Acres	Ton	Saved	TS/\$
Conservation Tillage	\$2,505,430	9.0%	224,875	973,421		0.3885
Strip cropping	\$275,349	1.0%	4,209	51,132		0.1857
Sod Based Rotation	\$1,677,291	6.0%	24,167	273,251		0.1629
Cropland Conv. - Trees	\$884,558	3.2%	8,415	142,825		0.1615
Cropland Conv. - Grass	\$3,984,445	14.3%	38,907	445,850		0.1119
Diversions	\$85,277	0.3%	1,336	8,427		0.0988
Critical Area Planting	\$425,753	1.5%	4,568	29,814		0.0700
Grassed Waterways	\$1,751,212	6.3%	25,537	86,111		0.0492
Field Borders	\$950,709	3.4%	20,138	28,532		0.0300
Other Erosion BMPs	\$15,248,846	54.9%	208,540	1,514,085		0.0993
<b>TOTAL</b>	<b>\$27,788,870</b>	<b>100%</b>	<b>560,692</b>	<b>3,546,463</b>		<b>0.1276</b>

## How Was the Cost Share Money Spent?

Supervisors, the agreement is sent to the Division of Soil and Water Conservation. Upon approval by the division, the agreement becomes a contract between the state, the district and the applicant. Once construction of the BMPs is completed and inspected, the farmer receives the cost share funds. The contracts for most BMPs requires a farmer to maintain the BMP for ten years.

In general, the standard NCACSP cost share agreement for enacting BMPs is 75 percent of the average cost of implementation. In comparison, the 75 percent cost-sharing level is consistent with the cost-sharing level used by many other states. Most cost share programs do not attempt to evaluate on-farm costs and benefits, but rather use a fixed percentage in setting the cost share figure. The NCACSP also provides participating counties with a 50 percent cost share for providing technical assistance.

### How Was the Cost Share Money Spent?

Between 1986 and 1995, the agency signed 23,903 cost share contracts. During that period \$62.8 million was spent on various types of cost-sharing BMPs. Of the total amount of money spent, nearly 45 percent (\$28 million) was devoted to control erosion. There has been a recent increase in funding for non-erosion BMPs because of widespread increasing concern about a number of animal waste pollution problems. The emphasis on animal waste BMPs is associated with the large increase in number of intensive livestock operations operating in eastern North Carolina. Table 1 contains a list of the most frequently funded

BMPs during the 1986-1995 period. Erosion and sediment control BMPs dominate the funding mix with six of the top ten funded BMPs. Erosion and sediment control accounted for 54 percent of the total cost share expenditures during the past decade.

Comparison of the effectiveness of various BMPs is rather complicated. There is no common denominator available to compare the performance of the animal waste BMPs. However, the performance of the soil erosion and sediment control BMPs can be measured by the tons of sediment saved or prevented from eroding. Using the "universal soil loss equation," tons saved can be estimated as the difference between expected soil loss before implementing the BMP and the expected soil loss after implementing the BMP. Based on this indicator, the average cost effectiveness of various BMPs can be defined as the ratio of tons saved per dollar cost shared. In Table 2, this was done for the group of most frequently implemented individual erosion BMPs.

The discrepancy between dollar amounts for the same BMPs in Tables 1 and 2 comes from the fact that Table 1 lists total amounts of money spent on individual BMPs regardless of whether they appear as a stand-alone practice or in combination with other BMPs. Table 2, however, lists only those soil erosion and sediment control BMPs implemented as single, stand-alone practices. The data show that during the past decade most money has been spent on cropland conversion - grass, whereas the most cost effective BMP was the conservation tillage with 0.389 tons of

Table 3: Soil Erosion BMP Expenditures and County Characteristics (1986 - 1995)

County	Expenditures	Square Miles	% Agriculture	% Erosion	Tons Saved
Person	\$1,371,175	398	46%	76%	132,559
Alamance	\$1,214,808	433	36%	64%	76,595
Northampton	\$1,098,691	538	50%	28%	36,304
Orange	\$1,019,800	400	32%	77%	72,106
Caswell	\$927,148	428	48%	50%	58,952
Granville	\$839,347	534	47%	78%	121,268
Johnson	\$766,938	795	46%	32%	136,847
Rockingham	\$763,285	569	38%	62%	65,048
Nash	\$752,031	540	54%	65%	41,480
Guilford	\$708,150	651	31%	61%	65,648
Others	\$18,327,495				2,739,656
<b>TOTAL</b>	<b>\$27,788,868</b>				<b>3,546,463</b>

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soil saved for each dollar spent. The most ineffective BMP was field borders with only 0.03 tons of soil saved per dollar spent. Based on this measure of effectiveness, there seems to be little correlation between the frequency of funding and the cost-effectiveness of BMPs.

However, a ton of soil erosion prevented in one water district may have a different environmental value from a ton of soil erosion prevented in another district. This notion motivated investigation of the geographical distribution of cost share funds for soil erosion prevention. The counties (districts) with the most cost share soil erosion BMPs funds allocated to them during the past ten years are listed in Table 3. Table 3 also shows the 1987 Natural Resources Inventory (NRI) data on the percentage of a county area in farmland and the percentage of the land suitable for agriculture which is experiencing erosion problems. The NRI Land Capability Class index consists of 8 classes with LCC=1 describing land with no significant limitations for raising crops, and LCC=8 being land best suited for wildlife habitat, recreation and other nonagricultural uses. The

presented soil erosion indicator is the percentage of acres that are classified as LCC 2-4 with erosion as the chief limitation.

Data analysis revealed that the percentage of acres devoted to agriculture in the top ten counties was greater than 30 percent and that eight of the top ten counties experienced erosion problems on more than half of the land suitable for agriculture. This finding suggests that cost share money was sent to districts with major erosion control problems. Future research should provide more definitive answers about the efficiency of the North Carolina Cost Share program.

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