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The Impacts of Farm Policies on Soil Erosion: A Problem Definition Paper

Craig D. Osteen

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ABSTRACT

Some farm programs may encourage farmers to plant crops more likely to induce erosion without encouraging soil conservation practices. If that is true, the long-term productivity of the soil may be in jeopardy. This report examines the effects of agricultural programs dealing with foreign trade, price support and production adjustment, Federal crop insurance, dairy, and Farmers Home Administration loans on erosion and presents an agenda for empirical studies of the incentives.

Keywords: Farm policies, soil erosion.

PREFACE

The persistence of soil erosion problems has prompted Congress to call for new initiatives to deal with soil loss on cropland. The Secretary of Agriculture, with authorities granted under the 1977 Soil and Water Resources Conservation Act (Public Law 95-192), has called for more intense efforts to control the Nation's most severe soil loss problems. This study is part of an effort by the Economic Research Service to examine the consistency between Federal commodity supply management/-income maintenance programs and programs to control soil loss.

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SUMMARY

Farm programs may create incentives for farmers to plant crops that increase soil erosion without encouraging enough conservation practices to protect the soil. If true, farm programs may encourage severe erosion and productivity losses on erosion-prone lands. This study summarizes the literature, examines the arguments, and presents an agenda for more quantitative research.

Export programs, target prices, price supports, production controls, Federal crop insurance, and Farmers Home Administration (FmHA) loans may create incentives to plant crops that encourage erosion. While programs may provide revenue for farmers to invest in conservation, the programs may create greater incentives for erosion than for conservation. If so, farm programs that encourage the production of wheat, feed grains, cotton, rice, and soybeans at the expense of hay, pasture, grassland, or forest may encourage severe erosion and productivity losses where the land's natural characteristics make it susceptible to such problems. Although some programs encourage planting of crops that reduce erosion, taking land out of production, and applying conservation practices, these incentives seem weaker than those that encourage erosion.

- Export programs, by encouraging exports, may increase the demand for such crops as wheat, feed grains, cotton, rice, and soybeans, and thus increase total erosion by bringing more land into crop production.

- Price support programs, by reducing price risk and providing credit and storage payments to participants, may encourage the production of wheat, feed grains, cotton, soybeans and rice which farmers may substitute for less erosive crops like grass, hay, pasture, or forest. These programs may also, however, discourage erosion in some regions by encouraging farmers to substitute wheat or rice in place of more erosive crops.

- Target price programs may encourage the planting of wheat, feed grains, cotton, and rice by supplementing program participants' income in some years.

- Dairy programs may encourage production of feed grains and soybeans, which increase erosion, while simultaneously encouraging production of hay and pasture, which reduce erosion.

- Production control programs may reduce the planting of erosive crops in the year enacted but, if effective, they create incentives to increase planting of these crops in the long term and encourage erosion. By reducing the planting of program crops and putting those acres into conservation use

when prices are low, the programs may discourage erosion. These programs are not specifically targeted to areas with erosion problems, but participating farmers often remove their less productive acreage from production, acreage that may have higher than average erosion rates. The Acreage Conservation Reserve creates incentives to establish permanent cover on highly erosive cropland.

- Federal crop insurance (FCI) reduces production risk, potentially creating incentives to plant eligible crops in areas prone to periodic crop losses, thereby encouraging more erosion in some locations. Because farmers pay premiums for FCI coverage, the incentives to raise wheat, feed grains, cotton, and rice may be weak and, thus, discourage erosion in some locations. FCI may encourage production of soybeans, not covered by disaster payments, and thus encourage erosion in some locations.

- Farmers Home Administration (FmHA) loans probably have little impact in the aggregate. FmHA ownership and soil and water loans provide supplemental credit which could bring more land into production and increase erosion, but the requirement that recipients implement soil conservation plans could offset these problems. FmHA operating loans reduce production costs for some farmers and may encourage more crop production and erosion problems.

For more quantitative results, a number of statistical and modeling studies need to be undertaken to answer three basic questions:

1. Are there significant differences in erosion between farms that participate in programs and those that do not?

2. How significant are the program incentives for soil erosion and conservation?

3. What are the aggregate impacts of program incentives on the acres of various crops planted and erosion at the farm, regional, and national levels?

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INTRODUCTION

Many agricultural programs may create incentives to plant crops that encourage soil erosion and reduce soil productivity. But the goals of those programs--to increase farm income and stabilize agricultural prices and production--do not necessarily conflict with soil conservation goals. While the programs may create incentives to expand crop acreage, thereby increasing erosion and reducing soil productivity in some locations, they may also create the income and economic incentives needed for conservation investments to maintain soil productivity. Acreage reduction programs, for instance, may reduce erosion in some years, and some Farmers Home Administration loans, by requiring borrowers to implement soil conservation practices, may encourage conservation, if only on a limited amount of acreage.

The National Program for Soil and Water Conservation, developed by the U.S. Department of Agriculture in response to P.L. 95-192, expressed a concern that some farm programs may encourage erosion and degrade the productivity of the Nation's soils. USDA will assess the effects of farm programs on soil and water conservation and consider changing programs that condone or subsidize land uses that deplete resources (18). 1/

This report discusses the problem of consistency between farm programs and soil conservation objectives, reviews major USDA programs for their impact on soil erosion, and suggests research needed to determine if incentives (both to encourage erosion and to encourage conservation) are significant. Examined are export programs, price support programs, production adjustment programs, Federal crop insurance, and FmHA loans concentrating on cotton, soybeans, wheat, rice, feed grains, and dairy products. Soil conservation programs are not examined.

Economic trends may have encouraged farmer decisions that increase erosion. Production and export of corn, soybeans, wheat, rice, and cotton increased dramatically in the seventies. Increasing world

1/ Underscored numbers in parentheses cite sources listed in the References at the end of this report.

demand bid up prices for these crops to encourage their production. U.S. policy during the Nixon administration emphasized making agricultural production more responsive to world markets and less reliant on acreage reduction programs than in previous years (7). The resulting increase in acreage planted to export crops and decline in acreage in grass or cover crops probably increased erosion, perhaps to levels that reduced productivity in some locations (4).

As a result of increasing demand for feed grains and other export crops, farmers bid up land prices and many incurred large debt to purchase land (4, 14). The high rate of inflation during the later seventies, coupled with low real interest rates and the structure of tax laws, encouraged farmers to undertake further debt to purchase land as a hedge against inflation. As a result, many farmers needed a high cash flow to service the interest on their debt. This encouraged planting more cash crops at the expense of grass or pasture which, in turn, probably encouraged further erosion.

The developing structure of agriculture is one of fewer but larger farms specializing in crop monoculture or livestock production. Heady and Batie argue that this combination encourages more row crop production and less acreage in pasture (4, 1). The result is an increase in erosion in many locations. Input markets and technology have likewise played a role. Recently developed fertilizers, pesticides, and larger farm machinery have been substituted for labor in crop production due to the relatively low prices of manufactured inputs and high prices of labor. Chemical fertilizers and pesticides have made crop rotations less important for pest control and soil fertility, thus increasing erosion in some locations. Some farmers might be reluctant to implement conservation practices that restrict the movement of large machinery. Technological advances may raise yields thereby masking yield losses caused by erosion and reducing concern about erosion. Alternatively, new reduced tillage systems that use more manufactured inputs and less labor may reduce erosion problems.

When farmers make decisions that affect erosion, they consider the profitability of their own operation. They must consider the impacts of their decisions on profits, risk, cash flow, and value of assets. If the decisions reduce productivity, farmers must compare potential reductions in current profits to future benefits of maintaining yields. The type of operation, land tenure, and attitudes toward stewardship may be important factors. Market forces determine crop prices, input prices, and interest rates thus creating the economic incentives for various decisions. Economic trends in recent years may have encouraged erosion. Government policies may modify these incentives and further affect erosion, either for the better or the worse.

THE CONSISTENCY PROBLEM

The crux of the consistency issue is whether the goals of USDA's export, commodity, credit, and crop insurance programs are consistent with goals of soil conservation programs. Do export, commodity, credit, and crop insurance programs create significant incentives for farming activities that encourage erosion without encouraging soil conservation? If so, the programs could exacerbate erosion problems and conflict with soil conservation goals. If the commodity programs encourage high rates of erosion, they could create major problems in some areas by rapidly depleting the soils's productivity.

Public Attitudes Toward Consistency

USDA and Fischer et al. report strong public support for proposals to reduce potential inconsistencies between soil conservation and other farm programs (20, 2). However, it is difficult to determine whether the general public views consistency as a major problem.

Of the 71,000 people who responded in 1982 to a program proposed under the Soil and Water Resources Conservation Act (RCA), 80 percent "supported" or "strongly supported" the proposal of "minimizing conflicts among features of USDA farm programs that limit achievement of conservation objectives" (20). Support was slightly stronger among those who did not own or operate a farm than among those who did. In 49 States, at least 75 percent of the respondents supported the proposal. Of the 139 respondents who made narrative comments, most stressed the importance of minimizing conflict between soil conservation and other USDA programs.

Fischer et al. reported the results of a Harris and Associates public opinion survey conducted in 1979 which showed strong support for "taking benefits provided by the Department of Agriculture away from farmers if they do not properly protect the soil and water" (2). Of the total respondents, 75 percent agreed and 15 percent disagreed. The support among farmers was weaker: 62 percent agreed and 28 percent disagreed. Support for this statement was not as strong as support for such Government actions as protecting farmland from erosion and gullies; ensuring that the best farmland is not used for new houses, factories, or roads; keeping people from building homes in areas that flood regularly; making sure water is clean; informing people about the need to protect land and water resources; and making sure that natural habitats of fish and wildlife are protected. The survey did not include questions about whether farm programs encourage erosion problems, so it is uncertain whether the respondents are reacting positively to a logical statement or believe that lack of consistency between USDA production and conservation programs is an important problem.

Professional Views

Some studies have concluded that farm policies may indirectly foster soil erosion. Batie contends that the financial incentives of commodity programs increase the acreage planted to crops that encourage erosion problems (1). That line of argument is supported by Johnson et al., who claim that farm programs stabilize prices and farm incomes thus reducing the need for diversification (7). The result, Batie contends, is that the programs help encourage large-scale, mechanized farming, continuous row-cropping, and grain-fed livestock operations. By increasing row-cropping and reducing hay and pasture, the policies tend to encourage erosion.

Berg contends that some provisions of farm programs may penalize conserving farmers (32). For example, grassland does not receive the same subsidies as land planted to program crops. Also, land under conservation practices (and not in conservation use under a production adjustment program) which does produce program crops cannot be included in the base for acreage reduction programs. Berg believes that such provisions may encourage farmers to produce program crops and increase their acreage base, when production adjustment programs are not in effect, rather than implement conservation practices or maintain grassland. Others claim further that disaster payments, subsidized loans, and crop insurance subsidize farming on fragile or marginal lands that are more prone to erosion (11, 20).

Batie argues that programs that increase prices, reduce price risk, or reduce production risk may encourage conservation on land already in production (1). These policies could increase the value of land, thus increasing the value of productivity losses (7). The programs may increase financial flexibility and allow farmers to spend more on conservation practices. If farmers believe that erosion does not reduce yield for many years, discounting the returns of conservation to account for an alternative rate of return would make these incentives for soil conservation negligible. Many studies have shown that agricultural producers' incentives to conserve soil are weak (10).

EROSION PROBLEMS AND PROCESSES

Both wind and water erode soil, sometimes at rates that reduce the soil's productivity over time. Farmers influence erosion through their choices of crops, tillage practices, and conservation practices. Those decisions, coupled with the physical characteristics of the land, determine soil loss. U.S. erosion rates that are high enough to reduce productivity over time are concentrated on less than 45 percent of the cropland.2/ Corn, soybeans, cotton, and wheat are the

2/ All figures relating to soil loss are from the 1982 National Resources Inventory.

chief crops grown where excessive erosion occurs and those crops may themselves contribute to these high erosion rates.

Erosion Problems in the United States

The average rate of erosion on cultivated cropland in the United States was estimated to be 8.1 tons per acre per year (TAY) in 1982 (Table 1). This average exceeds the tolerance (T) level: soil scientists estimate that erosion generally must be kept to 1-5 TAY, depending upon soil type, to maintain long-term productivity. Of the total, 4.8 TAY resulted from sheet and rill erosion caused by rain and 3.3 TAY resulted from wind erosion. Soil erosion rates on cropland are much higher in some regions than in others. Average erosion rates varied from 13.5 TAY in the Southern Plains to 5.2 TAY in the Pacific region (Fig. 1 displays the regions.) In all regions, the average erosion rate on cultivated cropland exceeds 5 TAY. The Appalachian and Corn Belt regions have the highest rates of sheet and rill erosion. Wind is a major cause of erosion in the Southern Plains, Mountain, Lake States, and Northern Plains regions.

The highest erosion rates are concentrated on a relatively small acreage. In 1982, erosion rates (including sheet, rill, and wind) were less than the T level on 56 percent of all U.S. cropland.

Table 1--Average soil loss rates on cultivated land by regions 1/

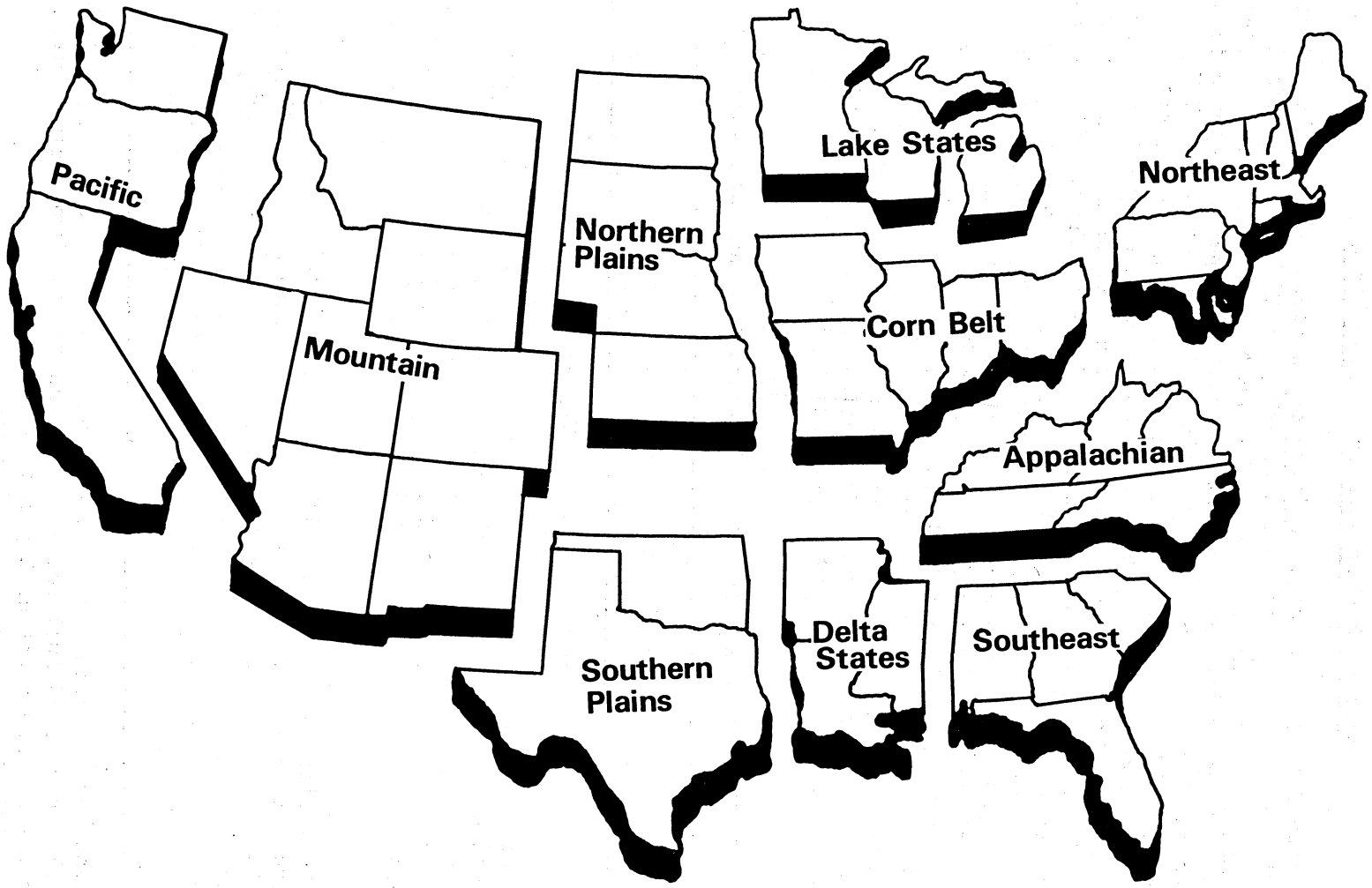
Region	Sheet and rill erosion	Wind erosion	Total
	Tons/acre/year		
Northeast	5.7	0.1	5.8
Appalachian	9.5	--	9.5
Cornbelt	7.8	.9	8.7
Lake States	3.2	3.2	6.4
Southeast	5.7	.2	5.9
Delta States	5.8	--	5.8
Northern Plains	3.3	2.7	6.0
Southern Plains	2.6	10.9	13.5
Mountain	2.5	8.2	10.7
Pacific	3.5	1.7	5.2
Total	4.8	3.3	8.1

-- = Less than 0.1 ton per acre per year.

1/ Cultivated land includes land planted to row crops, close-grown crops, summer fallow, and rotation hay and pasture.

Source: 1982 National Resources Inventory.

Figure 1. **Farm Production Regions**



Erosion ultimately could reduce productivity on 44 percent of the cropland where rates exceed the T level, but the most severe problems occur on 23 percent where erosion exceeds twice the T level.

In many areas where average erosion rates exceed 5 TAY, corn, soybeans, cotton, and wheat are produced (12). There are high erosion rates on land planted to corn and soybeans in the Piedmont areas of the Northeast, Appalachian, and Southeast regions, as well as in southern Iowa, northern Missouri, western Illinois, and eastern Nebraska. Soybean production causes much of the erosion in the Delta States, while cotton causes erosion problems in western Tennessee. Wind causes severe erosion on land planted to cotton, particularly nonirrigated cotton, in Texas and Oklahoma. Wind also causes severe erosion on land planted to wheat in Texas, Oklahoma, Colorado, Montana, North Dakota, and South Dakota.

Factors Affecting Erosion 3/

Three factors affect soil erosion from cropland: 1) the natural characteristics of the site, which determine the potential for erosion, 2) the erosion-encouraging characteristics of crops grown and tillage systems used, and 3) soil conservation practices. Farmers influence erosion by choosing the acreage and location of crops in rotation, tillage systems, and soil conservation practices.

The Universal Soil Loss Equation estimates average soil losses on a particular site due to sheet and rill erosion:

$$A = R \cdot K \cdot L \cdot S \cdot C \cdot P$$

where:

A = soil loss in tons per acre per year
R = rainfall and runoff erosivity index
K = soil erodibility factor
L = slope-length factor
S = slope-steepness factor
C = cover and management factor reflecting crop, rotation, and tillage practices
P = practice factor reflecting conservation practices.

The cover and management (C) and practice (P) factors vary with farmers' choices of crop rotation, tillage system, and conservation practices. The natural physical factors (R, K, L, S) vary between sites but are unaffected by farmers' decisions. The natural physical factors help determine the severity of erosion problems once farmers make their decisions.

The C-factor varies with the choice of crops in rotation and tillage practices. The C-factor is 1.0 for clean-tilled continuous fallow

3/ Much of this discussion is based on Wischmeier (33).

which would encourage the maximum rate of erosion. The C-factor for cropland typically varies between 0.6 and 0.01. Some crops encourage more erosion than others depending on the amount of ground cover the crop provides and the timing of rainfall in relation to when the crop provides the cover. This study groups crops into four categories with the more erosive crops having higher C-factors than the less erosive: 4/

most erosive:	cotton and soybeans
moderately erosive:	corn and grain sorghum
less erosive:	wheat, barley, oats, and rice
least erosive:	grassland, hayland, well-managed range or pasture, and ungrazed forest.

The C-factor can be modified by rotating less erosive crops with more erosive ones. Tillage practices also influence the C-factor. Leaving more crop residue and larger soil clods after completing tillage operations reduces the C-factor and soil loss.

Soil conservation practices such as terracing, contouring, and strip-cropping can be used to reduce soil erosion. The P-factor is 1.0 when none of these practices is applied and is reduced by various practices.

If soil loss exceeds the tolerance (T) level, the loss is excessive because productivity may be reduced over time. The T level is usually 3-5 tons per acre per year (TAY) for cropland and 1-3 TAY for rangeland, depending upon soil type (18). How rapidly excessive erosion depletes productivity is important for determining the severity of the problem. High rates of erosion could wash away thin topsoils and deplete their productivity more rapidly than deep topsoils. Also, the greater the excess of soil loss rate over the tolerance level, the more rapidly will productivity be depleted.

Farmers can choose combinations of crop rotations, tillage systems, and conservation practices to keep soil losses at rates below the tolerance level. The impact of planting a highly erosive crop can sometimes be offset by using a soil-conserving tillage or conservation practice. The potential of a site for soil or productivity loss is an important criterion in making these choices. Sites with a high potential for erosion will require crops, tillage systems, or conservation practices with lower C- or P-factors than sites with a lower potential in order to keep soil loss below the T level.

4/ This grouping of crops is based partly on discussions with Rick Fielder, soil scientist with SCS in Little Rock, Ark., and Cliff Williams, State resource conservationist, SCS, Temple, Tex.

Over a large area, the aggregate of farmers' decisions will determine the acreage and location of cropland, alternative crops, tillage systems, and conservation practices. The location of these choices in relation to varying natural physical factors influences the soil loss on each site. This aggregation of choices determines the total amount of soil loss in the area, the acreage and locations where soil loss exceeds T, and the severity of productivity losses on each site.

So, erosion is determined by farmers' decisions and by natural characteristics. Specifically, the choices of crops, tillage practices, and conservation practices determine the C- and P-factors of the Universal Soil Loss Equation for a site leaving other factors unchanged. In aggregate, farmers' decisions influence the severity of erosion on all cropland.

HYPOTHESES FOR EXAMINING POLICIES AND PROGRAMS

Farm programs that modify crop prices, supplement income, reduce risk of financial loss, or reduce production costs could influence farmers' choices of crops to plant, tillage systems, and conservation practices, thus affecting erosion. By having a direct influence on profits from alternative crops, the programs influence planting decisions. Depending upon the crops planted, the programs may encourage or discourage erosion. By increasing farm profits and reducing their variability, programs could give farmers more money to invest in soil conservation. Greater income could increase land values, and, thus, the future benefits of conserving soil productivity. So, the programs may create conflicting incentives, those that encourage erosion and those that discourage it.

This report hypothesizes that the financial incentives of farm programs will have a greater impact on planting decisions than decisions to modify tillage practices or install structures to conserve soil. If that hypothesis is true, programs that encourage farmers to plant more erosive crops will not encourage enough soil conservation to protect the soil. Alternatively, if programs encourage the planting of erosion-reducing crops, they discourage erosion. Based upon this hypothesis, this report focuses on how programs influence farmers' choices of crops to plant and how the crops affect erosion. The ultimate questions are: How many acres, if any, suffer productivity losses due to farm programs and what is the value of productivity lost? This study does not try to answer these questions but only suggests lines of future research.

The rationale for this hypothesis is that the economic benefits derived from soil conservation decisions often occur much further in the future than those of planting decisions. Program incentives in a particular year will modify farmers' planting decisions and influence profits in that same year. To compare future conservation benefits with

present costs and returns, the conservation benefits require discounting to account for alternative rates of return. The greater the alternative rate of return or the further in future benefits occur, the lower the present value of the future benefits will be. For farmers to invest in soil conservation they will have to perceive higher future yields with such practices than without them and that the rate of return on conservation will be greater than on alternative investments. Many studies have shown only weak incentives to invest in conservation, even if soil loss is reducing productivity (10). As a result, this report hypothesizes that program incentives will be greater for planting decisions than for soil conservation decisions.

Some programs contain provisions specifically encouraging soil conservation. Two examples are the acreage conservation reserve and the FmHA requirement that recipients of ownership and soil and water loans install conservation practices. Such provisions and their potential impact are discussed with the appropriate program.

This report also hypothesizes that program impacts on ownership characterisics will have little effect on soil conservation. Some economists propose a relationship between owner characteristics (like tenure or age) and investments in conservation. Schertz and Wunderlich cite evidence that some owner operators and tenants were more prone to invest in conservation than others (16). This evidence showed conservation investments to be positively related to farm income, education, and size of holding but negatively related to age. However, they question whether researchers have shown a strong relationship. So, this report does not consider changes in ownership characteristics caused by programs.

In the ensuing examination of export, price support, production adjustment, crop insurance, and credit programs, this report focuses on incentives for planting decisions and the resulting impacts on erosion and productivity losses. (Soil conservation programs are not the subject of examination.) The emphasis is on incentives created by program provisions with limited references to the wide variety of administrative options.

FOREIGN TRADE POLICY

The United States generally attempts to increase or stabilize export sales but sometimes employs export subsidies, import quotas, or export embargoes. Such policies could influence the relative prices of major export crops such as wheat, corn, sorghum, rice, soybeans, and cotton with respect to other crops. In doing so, these policies could modify planting decisions, thus affecting soil loss in some locations.

The United States has pursued a free trade policy to remove barriers to agricultural exports through international negotiations. However,

U.S. import quotas on cotton could help keep domestic prices above world market prices (3, 7, 26). The United States generally does not use export subsidies, but legislative authority exists to neutralize subsidies of other countries and keep American commodities competitive in world markets. Public Law 97-98 authorized an Agricultural Export Credit Revolving Fund for commercial market development and expansion (8).

The United States distributes agricultural commodities to less developed countries under P.L. 480, such shipments accounting for less than 3 percent of the value of U.S. agricultural exports (13, 19). Under Title I, a country too poor to buy food on the world market is given long-term, low-cost credit to buy specified amounts of available American commodities; this practice amounts to a subsidized sale of some American commodities. Sales under Title I account for a major (but declining) portion of U.S. rice exports and lesser portions of exports of wheat, wheat flour, and soybean oil (19). Title II includes disaster aid to other countries, donations through voluntary relief agencies, and 25 percent of the contributions to the United Nations World Food Program (13).

The United States enters into bilateral trade agreements with importing countries (3). For example, the United States made an agreement with the Soviet Union in 1976 to stabilize and increase sales of wheat and corn. These two countries made a similar agreement for corn, soybeans, and wheat in 1983. While these agreements probably had no impact on world demand, they may have helped to increase U.S. market share and stabilize prices received by farmers.

Several times since 1970, the United States reduced exports to control increases in farm prices (3). For example, soybean contracts with Japan were cancelled in 1973 and grain exports to the USSR were halted in 1976. To prevent adverse impacts to farmers, Congress authorized, under P.L. 97-98, increases in the loan level to 90 percent of parity when exports are suspended (8). When embargoes are implemented for national security or foreign policy purposes, the Secretary of Agriculture must increase the loan level to 100 percent of parity or provide a combination of increased loan levels and payments.

If trade policies encourage the planting of major export crops, farmers may plant them instead of crops that are less erosive. As a result, trade policies could increase erosion and cause productivity losses in some locations.

The policy of making domestic market prices more responsive to world market prices contributed to large increases in acreage planted to corn, wheat, cotton, and soybeans. In particular, corn, cotton, soybeans, and wheat may have encouraged more erosion than previously planted crops such as grass or pasture and contributed to soil productivity losses. Moreover, land brought into production of these

four crops may have been more erosive than the land already producing them, especially in regions with high erosion potentials. Increases in wheat production could reduce erosion rates in some areas if wheat is substituted for more erosive crops, but would increase erosion in many areas of the Southern and Northern Plains. Increases in rice acreage probably have little impact on erosion because rice is one of the less erosive crops and the locations where rice is produced have low erosion potential.

Government policies to increase or stabilize demand, export subsidies, and import quotas for cotton could increase erosion problems by encouraging farmers to plant more erosive export crops instead of less erosive crops. Export subsidies and import quotas, in effect, subsidize production of such crops. Conversely, export suspensions or embargoes could reduce demand, the acreage under cultivation, and erosion problems. However, required compensation or increases in nonrecourse loan levels would reduce the price risk of embargoes and suspensions, thus minimizing the incentives to reduce planting and erosion. P.L. 480 probably does little to increase erosion problems because it chiefly affects rice.

PRICE SUPPORT AND PRODUCTION ADJUSTMENT PROGRAMS

A series of price support and production adjustment programs stabilize and support farm income and prices. The programs work together to reduce the risk of low prices for all farmers growing program crops and to supplement income and provide credit for program participants. Price support and stabilization programs modify market price extremes while production control programs help to maintain prices higher than support levels over the longer term (7). Direct payments from target price or land diversion programs supplement the income of farmers complying with program provisions when crop prices are low. While only program participants receive direct payments, program impacts on market prices affect all farmers growing program crops. These programs may modify the level and variability of profits from program crops, thus influencing planting decisions and erosion.

This section of the report describes the provisions of each program and its potential impact on prices or production before discussing how all the programs may affect erosion and productivity.

Price Support and Stabilization Polices 5/

Nonrecourse loans and the Farmer-Owned Reserve (FOR) help to stabilize farm prices primarily by modifying short-term price extremes. Nonrecourse loans are available to producers of wheat, feed grains,

5/ This section draws heavily on (6, 7, 8, 17).

cotton, rice, and soybeans, while the FOR is also available for wheat and feed grains. These programs reduce the risk of low prices for participating farmers by removing their crops from the market and giving them credit. However, the market price impacts of modifying supplies of program crops affect all farmers whether they participate or not.

The Commodity Credit Corporation (CCC) establishes a minimum market price at the nonrecourse loan level which affects all farmers. The CCC accomplishes this by removing commodities from the market when prices are low. Producers can place wheat, feed grains, cotton, rice, or soybeans in approved storage and receive a nonrecourse loan from the CCC during the postharvest period. To do so, producers must comply with program provisions for each crop. The amount of the loan equals the loan rate for the crops multiplied by the quantity put in storage. Farm legislation defines procedures for setting loan rates. Participants can sell the commodity prior to or at maturity, redeem the loan, and pay interest (based on CCC rates from the Treasury). If crop prices are below the loan rate at maturity, the commodity pledged as collateral can serve as full repayment of the loan plus interest.

The CCC can stabilize wheat and feed grains prices and share price risk through the FOR. The FOR works with the nonrecourse loan program to establish a minimum price for wheat and feed grains by removing supplies from the market when prices are low. When the reserve is open, farmers participating in commodity programs can put the CCC grain into the FOR and receive a 3- to 5-year loan from the CCC. The farmer agrees to hold the grain in reserve until the loan matures or until the market price reaches the predetermined release (trigger) price. The grain in reserve acts as collateral for the loan. In some years, FOR loan levels have been greater than regular nonrecourse loan levels to encourage farmers to participate. The Secretary of Agriculture can waive interest rates or adjust them to low levels and provide storage payments to encourage participation. Currently, interest is charged only on the first year of the loan.

The FOR can also define an upper limit to prices. The Secretary of Agriculture determines release prices for wheat and feed grains in the FOR. When the market price reaches the release price, the Secretary can increase the rate of interest on loans or resume interest charges and end storage payments to encourage, but not require, farmers to redeem their loans. When the FOR is in effect, the CCC cannot sell any of its wheat and feed grains stocks at less than 110 percent of the release price. The Secretary can also call FOR loans, that is, require repayment or forfeiture of collateral which will force many farmers to put their grain on the market.

Nonrecourse loans and the FOR directly influence prices by removing supplies from the market when prices are low. The FOR puts supplies

back into the market when prices are high. Indirectly, these mechanisms will influence the demand for and prices of substitute crops. By reducing the risk of low prices for all farmers and supplementing income in some years, these programs may encourage the production of more wheat, feed grains, cotton, rice, and soybeans than would be produced without the programs.

Price support programs influence the prices of wheat, feed grains, cotton, rice, and soybeans because significant percentages of production are put under nonrecourse loans (table 2). Between 1977 and 1982, oats and soybeans were the only crops to average less than 10% of production under loan. However, both oats and soybeans are substitutes for some of the other crops. As a result, nonrecourse loans for other crops may help to support the prices of oats and soybeans by increasing their demand.

The accumulation of large CCC or FOR stocks during price support operations could restrict later price increases or trigger production control programs to help increase low prices. The CCC does not generally accumulate large stocks of cotton, rice, and soybeans, so rice and soybean prices can generally increase with no restrictions, but cotton import quotas can restrict price increases by permitting imports when prices are high. Prior to 1983, large stocks of wheat and all feed grains except oats accumulated in the FOR. While some inventories are desirable to restrain rising prices, the Secretary of Agriculture viewed the inventories to be excessive and implemented production control programs, discussed later, to reduce them.

Table 2--Crop production under nonrecourse loans

Crop	1977	1978	1979	1980	1981	1982	Average
				Percent			
Barley	20.6	15.1	7.9	8.6	12.6	17.0	13.6
Corn	18.0	19.0	7.0	12.6	24.1	18.9	16.6
Cotton	31.6	14.2	11.8	20.7	38.7	42.0	26.5
Oats	11.0	4.2	2.2	1.4	1.9	1.5	3.7
Rice	19.7	20.3	19.8	17.1	23.4	42.8	23.9
Sorghum	27.5	12.3	7.9	5.6	31.5	28.2	18.8
Soybeans	5.5	3.4	5.4	7.4	11.1	17.6	8.4
Wheat	29.0	14.2	8.5	14.0	16.1	23.1	17.4

Source: (18).

Target Prices and Deficiency Payments 6/

This feature of current programs helps to stabilize farm income of participants who produce wheat, feed grains, cotton, and rice. The program guarantees a minimum revenue from these crops over and above that from price supports.

With no acreage reduction in effect, the target price program creates a per-acre subsidy for a crop when the target price is greater than market price during the first 5 months of the marketing year:

$$S = Y \times AF \times (TP - MP), \text{ if } TP > MP > LR$$
$$= Y \times AF \times (TP - LR), \text{ if } TP > LR > MP$$

where:

S = deficiency payment per acre
Y = farm program payment yield 7/
AF = allocation factor 8/
TP = target price 9/
MP = average market price
LR = nonrecourse loan rate

When an acreage reduction is in effect, the allocation factor (AF) is not used. Deficiency payments are made on all acres planted for harvest when the market price falls below the target price for a specified period of time. For example, the 1983 loan rate for corn was $2.65 per bushel and the target price was $2.86. If the average market price for the first 5 months of the marketing year were $3.00, no deficiency payments would have been made. If the market price were $2.60, the payment would have been $0.21 per bushel of farm program payment yield. (The allocation factor was not in effect due to an acreage reduction program.) If the market price were $2.70, the deficiency payment would have been $0.16 per bushel. Actually, the average corn price was $3.30 and no deficiency payments were made.

6/ This section draws heavily on (8).

7/ Determined by USDA procedures for each farm and crop. No yield can be forced on farmers which is less than they can prove.

8/ National program acreage for a crop divided by estimated acreage planted for harvest. The National Program Acreage, determined by the Secretary of Agriculture, is the harvested acreage required to meet domestic and export needs less imports, as adjusted for desired changes in carryover stocks. The allocation factor varies between 80 percent and 100 percent for wheat, feed grains, and rice, and between 0 and 100 percent for cotton.

9/ Congress determines target prices for wheat, corn, upland cotton, and rice and gave authority to the Secretary of Agriculture to determine target prices for sorghum, oats, and barley according to their feed value relationship to corn.

Total deficiency and diversion (under production control programs) payments are limited to $50,000 per person per year. The amount of a crop eligible for deficiency payments is reduced by the portion receiving disaster payments. Disaster payments have been replaced by Federal Crop Insurance; both programs are discussed later.

Several factors can alter the subsidies that farmers receive. Congressionally determined target prices have trended upward over time. For example, the target price for corn rose from $2.00 in 1977 to $3.03 in 1984. Depending upon inflation in production costs, the income guarantee and incentives to plant will tend to increase. Also, the Secretary of Agriculture can raise target prices as costs of production increase to maintain the income guarantees. The Secretary can also vary the guarantees per acre by varying the National Program Acreage, and thus the allocation factor, within a congressionally specified range.

Production Control Programs 10/

Production control programs help to stablize farm income and prices by taking land out of the production of program crops for which inventories are high and prices low.

There are four types of programs: acreage reduction (ARP), set-aside, paid land diversion, and recommended voluntary reduction. The ARP, paid land diversion, and recommended voluntary reduction apply to wheat, feed grains, upland cotton, and rice. The set-aside applies only to wheat and feed grains. There are no production control programs for soybeans. Under an ARP, participating farmers reduce the acreage of a crop planted from their farm's acreage base by a fixed proportion and allocate it to conservation use. The base is the acreage planted for harvest in the previous year, including acres acres not planted due to certain factors beyond the grower's control, or the average of the two previous years. The Secretary of Agriculture can make other adjustments to determine a fair and equitable base. Under the set-aside, producers devote a certain percentage of acres planted to approved conservation uses.

Under a paid land diversion, the farmer is paid to take land out of production. As a modification in 1983, the Payment-in-Kind (PIK) program was offered. Under PIK, farmers participating in the ARP were eligible to reduce further a specific crop's acreage, generally by 10-30 percent, and receive a specified amount of the commodity as payment. The quantity was a specified percentage multiplied by the farm program yield multiplied by the acres diverted. Farmers could also make bids for further acreage reductions. Under a recommended voluntary reduction, producers receive deficiency payments on 100

10/ This section relies heavily on (8).

percent of their acreage, when an ARP is not in effect, if they reduced acreage by a recommended percentage. This program removes an incentive to plant as much as possible to maximize deficiency payments but does not provide a positive incentive not to plant.

In 1984, the acreage conservation reserve (ACR) was introduced (22, 23, 25, 26). Under the 1984 ARP, participating farmers were required to reduce planting 10-25 percent from their acreage base, depending upon the crop; participating wheat farmers were required to reduce their acreage by an additional 10 percent under a paid land diversion. Participating farmers were also required to devote cropland, equal to a percentage of the program crop's planted acreage, into the ACR. 11/ Land in the ACR must generally have been planted to row crops or small grains in 2 of the last 3 years and must be protected from wind and water erosion throughout the year. Land in the ACR with a before-treatment erosion rate exceeding twice the tolerance (T) is eligible for 90 percent cost-share payments to establish permanent cover (retirement for 5-10 years), compared with the usual 50-75 percent for conservation practices. Land where cover is established is eligible for the 1985 ACR.

Impacts of Programs on Production

The financial incentives to participate in farm programs are the payments and nonrecourse loans that farmers might forego by not participating. Payments and nonrecourse loans guarantee a minimum return and reduce risk. When acreage reduction programs are not in effect, program payments create an incentive to plant more wheat, feed grains, cotton, and rice than otherwise. When acreage reduction programs are in effect, payments encourage farmers to participate and reduce the acreage planted to program crops. Since acreage reductions limit profit by restricting production, some farmers, believing that the programs will increase prices, might not participate. They might plant more acreage or grow a crop not under an acreage reduction program.

Program payments could have a significant impact on program participation and planting decisions as shown by their contributions to value of production (table 3). The average for 1977-83 shows the payments for sorghum and cotton to be more than 9 percent, and for barley, rice, and wheat about 7 percent. For corn, the payments were lower--

11/ The percentage devoted to the ACR is the required percentage of acreage in the ARP and land diversion divided by the maximum percentage of allowable planted acreage multiplied by 100, i.e., 11.1 - 38.57, depending upon the crop.

Table 3--Program payments as a percentage of value of production by crop 1/

Crop	1977	1978	1979	1980	1981	1982	1983	Average
				Percent				
Barley	16	11.1	2.6	3.0	5.4	5.3	5.6	7.0
Corn	2.1	4.1	0	2.0	.5	1.3	6.4	2.3
Cotton	1.9	6.3	2.5	7.7	13.6	19.8	17.9	10.0
Oats	*	*	*	*	*	0	1.7	0.9
Rice	0	5.3	0	0	1.3	21.5	21.2	7.0
Sorghum	11.9	16.6	5.3	6.0	12.9	3.0	7.9	9.1
Wheat	20.9	12	0	0	4.1	4.8	NA	7.0

* = No program.
NA = No data available.
1/ Includes deficiency, diversion, and disaster payments.
Source: (22, 23, 25, 26).

2 percent. 12/ Over time, these payments appear to provide an incentive to plant more acreage of program corps than warranted by market prices except in years when production control programs are in effect.

Production control programs were in effect for wheat and feed grains in 1978, 1979, 1982, and 1983, for cotton in 1978, 1982, and 1983, and for rice in 1982 and 1983. That a substantial portion of farmers growing program crops found the incentives attractive is shown by the high percentages of the U.S. acreage base operated by participants (table 4). Thus, a substantial portion of farmers were eligible for program payments and nonrecourse loans in those years.

12/ Deficiency payments were the sole income supplement for wheat and rice during this period and were a major supplement for sorghum, barley, and, after 1980, cotton. Prior to 1983, significant disaster payments were made to cotton growers, accounting for all program payments in 1977, 1979, and 1980. Prior to 1982, disaster payments supplemented income for corn, sorghum, and barley producers. Due to the replacement of disaster payments with Federal crop insurance, discussed later, no disaster payments were made in 1983. Deficiency payments were the major supplement for feed grains in 1983 while significant payments were made to cotton and feed grain producers in 1978 (22, 23, 24, 25, 26).

When production control programs were in effect, they helped to reduce the acreage planted to program crops, as shown by the acreage base taken out of production (table 5). The impacts were particularly large in 1983. These acreage reductions contribute to reductions in output. However, farmers may put their least productive acres in the program to minimize the decline in their production.

Table 4--U.S. acreage base eligible for program payments, years with production controls, by crop 1/

Crop	1978	1979	1982	1983 2/
	Percent			
Barley	64.8	40.5	46.0	60.6 3/
Corn	40.9	21.1	29.1	70.0 4/
Cotton	84.4	0 5/	77.8	94.6
Rice	0 5/	0 5/	77.9	99.5
Sorghum	73.9	54.4	47.0	70.0 4/
Wheat	71.1	57.2	48.2	86.2

1/ No acreage reduction programs in 1980 and 1981.
2/ Preliminary figures.
3/ 1983 estimate includes oats.
4/ 1983 estimate includes corn and sorghum.
5/ No acreage reduction program.
Source: Personal correspondence with Randy Weber, Analysis Division, Agricultural Stabilization and Conservation Service, USDA.

Table 5--U.S. acreage base removed from production by supply control programs, by crop

Crop	1978	1979	1982	1983 1/
	Percent			
Barley	8	8	4	12
Corn	8	4	3	39
Cotton	2	0 2/	11	44
Rice	0 2/	0 2/	11	43
Sorghum	9	8	4	39
Wheat	15	13	7	35

1/ Preliminary estimate.
2/ No acreage reduction program.
Source: Personal correspondence with Randy Weber, Analysis Division, Agricultural Stabilization and Conservation Service, USDA.

Production control programs successfully reduced the acreage planted to certain crops in recent years, thereby reducing production and inventories and increasing prices in the short run. In the longer run, the higher prices could encourage farmers to plant more program crops in years when production control programs are not in effect.

Impacts of Programs on Erosion

Price support and production adjustment programs could provide more stable and higher average prices for program crops over time than would otherwise be the case. In addition, direct payments supplement income from program crops for participants in some years. These programs, therefore, create economic incentives to raise program crops instead of others, thus increasing the potential for erosion and soil productivity losses. The programs may also create incentives to invest in soil conservation by increasing and stabilizing farm income and increasing land values. However, as suggested above, the incentives to invest in conservation may be much weaker than those that affect planting decisions.

The programs encourage farmers to raise program crops instead of hay, pasture, grassland, or forest, which are not eligible for program benefits. The ineligible crops induce less erosion than the program crops. While the recipients of program payments receive the greatest incentives, there are incentives for nonparticipants to plant program crops as well. The risk-reducing aspects of these programs could discourage diversification, the result being fewer soil-conserving crops in the farm's crop rotation. Over time, the programs can encourage planting decisions that increase erosion, causing soil productivity losses in some areas.

Program incentives for soybeans may be less than for other program crops. Soybeans are covered by the price support program but not by target price or production control programs. Only small quantities of soybeans are under nonrecourse loans. However, increased prices for feed grains may raise demand (and prices) for soybeans. The lack of program payments for soybeans could encourage some farmers to raise other program crops in place of soybeans, thereby reducing erosion in some cases.

Production control programs encourage farmers to put some of their wheat, feed grains, cotton, or rice acreage into conservation use. That reduces erosion problems, but such programs have several limitations. The ultimate problem is that successful production control programs will create long-term incentives to grow those crops which, in turn, will encourage further erosion. Also, acreage reduction programs are not targeted to severe erosion problems and may not take severely eroding land permanently out of production of erosive crops. The programs could make a contribution to reducing erosion to accept-

able levels on some sites by periodically putting land under a less erosive crop. However, the ACR provides incentives to establish permanent cover on highly erosive cropland. If the program is in force long enough, it may be a significant factor in reducing erosion problems. Production control programs could also help reduce erosion to acceptable levels by encouraging farmers periodically to plant the land to a less erosive crop.

The impacts of these programs on erosion in different regions could become very complicated. The programs could contribute to severe erosion problems where corn, wheat, or cotton are grown on sites with high erosion potential in the Northern Plains, Southern Plains, Corn Belt, Northeast, Appalachian, and Southeast regions. The differences in program incentives for some crops may actually encourage rotations that reduce erosion in some regions. Conceivably, the wheat program could encourage wheat to be rotated or double-cropped with corn or soybeans, which would reduce erosion. The rice program could encourage some growers to rotate rice with soybeans in the Delta States; that too would reduce erosion. But, the rice program might also encourage soybean production in more erosive areas of the Delta States.

The overall impact of these programs could be an increase in acres planted to program crops and a gradual reduction in hay, pasture, grass, and forest. Such a result would increase erosion in some locations and increase soil productivity losses on fragile soils. When in force, production control programs may alleviate erosion problems on some locations by removing them from program crop production. The ACR, if enacted for a number of years, may encourage the establishment of permanent cover on highly-erosive cropland and reduce severe erosion problems. Unless production control programs put land into soil-conserving uses for a number of years, however, they may simply lead to greater erosion problems later by increasing prices for erosive crops. In some regions, the programs may actually encourage the planting of program crops that are less erosive than alternative crops. But over time, price support and production adjustment programs are likely to encourage decisions that increase erosion and productivity losses on a larger area than where they discourage them.

DAIRY PROGRAMS 13/

Dairy programs stabilize milk prices through CCC purchases of surplus butter, cheese, and nonfat dry milk. To avoid depressing market prices to the support level, the CCC makes its commercial sales at 110 percent of the purchase price. Production control programs reduce supply to help increase milk prices. Thus, dairy programs help to reduce the risk of low milk prices.

13/ This section draws heavily on (21).

The CCC's 1984 purchase prices of butter, cheese, and nonfat dry milk were set to support the price of milk (3.67-percent milk fat) at a minimum of $12.60 per hundredweight. The impacts of CCC purchases on market prices affect all producers whether they sell to the CCC or not. The support prices can be reduced to decrease incentives for production, if CCC purchases are expected to reach high levels. The support price can be reduced by $0.50 on April 1, 1985, if annual purchases of milk and milk products are expected to exceed 6 billion pounds. The support price can be reduced by another $0.50 on July 1, 1985, if annual purchases are expected to exceed 5 billion pounds. The support price can be increased by $0.50 on July 1, 1985 if annual purchases are expected to be 5 billion pounds or less. ASCS is implementing a milk diversion program from January 1, 1984, to March 31, 1985. ASCS paid producers $10 per hundredweight to reduce production by 5 to 30 percent from their milk base. (The base is the producer's choice of 1982 marketings for commercial use or the average of 1981 and 1982 marketings.) If this program is successful in reducing milk production and inventories, it could increase milk prices, and thus, create incentives to produce milk in the future.

The dairy program affects erosion through the demand for feed and the alternative uses for land used in dairy production. Major feeds for dairy are corn, soybean meal, corn silage, hay, and pasture. By supporting prices, the dairy program probably encourages more milk production and thus more feed production than without the program. When production control programs are in effect, they decrease milk production and the demand for feed in the short run. But higher milk prices in the future could increase milk production and feed demand. The dairy program could encourage a greater acreage under cultivation and, hence, more erosion. However, some of the increased acreage is hay and pasture, some of which, without the milk program, would be used for row crop production; so the program may also discourage erosion to that extent.

If there were no dairy program, two changes would probably occur. First, less acreage would be needed to produce dairy feed; that would reduce erosion problems. Second, some land currently in hay or pasture might be planted to row crops; that would increase erosion. The ultimate impacts on erosion would depend upon productivity of hay or pasture land for row crops and the agricultural alternatives available to and chosen by displaced dairy farmers.

FEDERAL CROP INSURANCE AND DISASTER PAYMENTS 14/

Federal crop insurance (FCI), administered by the Federal Crop Insurance Corporation, protects participating farmers from production

14/ This section draws heavily on (8, 27).

loss by guaranteeing a minimum payment per acre. FCI replaced the disaster payments program administered by the Agricultural Stabilization and Conservation Service (9). Wheat, feed grains, cotton, and rice are no longer eligible for disaster payments. 15/ However, the Secretary of Agriculture can authorize special disaster payments, if losses create an economic emergency too serious to be relieved by crop insurance or other Federal aid. These programs, by reducing risk, create incentives to plant crops receiving coverage, thus modifying planting decisions and erosion problems.

Farmers must pay a premium to obtain FCI coverage. The program covers wheat, feed grains, rice, cotton, soybeans, and a variety of other crops (including forage and forage seeding in three counties). FCI covers unavoidable losses due to adverse weather, insects and disease, wildlife, flood, fire, and earthquakes. 16/ Premiums vary with the crop, risk of the area, the number of years the farmer has received FCI, the number of years that the losses occur, the percentage of production guarantee, and the price at which losses are covered. The producer chooses a price and a production guarantee: 50, 65, or 75 percent of area average or proven yield. The Federal Government pays 30 percent of the premium up to 65 percent of coverage. FCI payments are made when actual yield is less than guaranteed yield.

To be eligible for disaster payments, currently unavailable, farmers must participate in commodity programs but do not pay premiums. The program covered wheat, feed grains, cotton, and rice, but not soybeans. Program participants would receive payments if actual production were less than a specified percentage of farm program payment yield (discussed under Target Prices and Deficiency Payments). Each program reduces production risk by guaranteeing a minimum revenue from eligible crops. So, each program could encourage farmers to raise eligible crops instead of ineligible crops and could encourage less diversification (crop rotation), particularly where the chances of yield loss are relatively high. FCI may induce erosion by encouraging participants to raise wheat, feed grains, cotton, rice, or soybeans instead of hay, pasture, or grass. If forage or forage

15/ Outlays for disaster payments declined in recent years. Of the crops under consideration, only cotton and feed grains received disaster payments in the past 10 years. Payments for feed grains decreased from $412 million in 1980 to $3 million in 1982; those for cotton declined from $302 to $131 million during the same period. No payments were made in 1983, the latest year for which data were published (22, 23, 25, 26).

16/ Farmers can exclude hail and fire insurance but must provide evidence of minimum private coverage to receive other FCI coverage.

seeding programs were expanded to more counties, FCI could enourage farmers to grow more soil-conserving crops. If disaster payments were in effect, they could induce erosion by encouraging program participants to raise wheat, feed grains, cotton, or rice instead of less erosive crops.

Since FCI replaced disaster payments, incentives for erosion could have decreased. FCI incentives for planting wheat, feed grains, and cotton may be less than disaster payments incentives because farmers must pay FCI premiums. FCI may lessen erosion problems and retard soil productivity losses where those crops induced high erosion rates. The greatest impact is in the Great Plains where both erosion rates and the probabilities of yield losses from wind, hail, and drought are high. For example, FCI may significantly reduce the incentives to plant cotton since disaster payments have accounted for a large portion of the value of production. However, FCI may encourage farmers to plant soybeans, not covered by disaster payments, instead of less erosive crops.

FCI premiums, even though subsidized, may discourage many farmers from purchasing FCI. In 1982, FCI participation was relatively low; the percentage of planted acres insured was 6.8 for corn, 8.7 for cotton, 2.6 for oats, 6 for sorghum, 7.9 for rice, 12.2 for soybeans, and 14.6 for wheat (19). (These percentages might be higher now that disaster payments are less available.) Where FCI participation is low, the program will not have a significant impact on erosion.

So, disaster payments, when available, and FCI may influence planting decisions and erosion. Overall, the programs probably could encourage more planting and erosion than would occur otherwise. However, the substitution of FCI for disaster payments probably reduced the incentives to plant some erosion-encouraging crops with the exception of soybeans. Where participation in FCI programs is low, neither program will have a significant impact on erosion.

FARMERS HOME ADMINISTRATION LOANS 17/

Farmers Home Administration (FmHA) provides credit to farmers who cannot obtain it elsewhere and dispenses farm ownership, operating, soil and water, and emergency disaster loans. Some of the loan programs may encourage farmers to bring more land into production, thereby encouraging erosion problems. But FmHA requires all borrowers of ownership and soil and water loans to agree to implement soil conservation plans; that provision may offset erosion-inducing provisions of such loans.

Farmers can obtain ownership loans to purchase or improve real estate, soil and water loans to develop and conserve such resources,

17/ This section draws heavily on (3, 28, 29, 30).

and shorter term operating loans to cover operating expenses. To qualify for FmHA loans, farmers must be unable to obtain sufficient credit elsewhere at reasonable rates and terms, operate a family-sized farm, and meet other eligibility requirements. The loans provide more favorable repayment terms and interest rates than those from commercial sources.

FmHA can make emergency disaster loans in counties designated as disaster areas. These loans can supplement crop insurance and disaster payments in sharing production risk. The loans become available when the President declares a major disaster or emergency. The FmHA Administrator can designate counties for physical loss loans only. To qualify for production loss loans, farmers in designated counties must show a 30-percent production loss on combinations of similar crop types or a single enterprise and meet other eligibility requirements. Farmers unable to obtain suitable credit elsewhere qualify for a subsidized loan offering between 5 and 8 percent interest, while other farmers can obtain such loans at the prevailing market rate. These loans are limited to 80 percent of actual loss to property or production and can be used to replace damaged property and pay the disaster year's production costs, debt installments, and living expenses.

Farm ownership, soil and water, operating, and emergency disaster loans all have features that could encourage farmers to bring more land into production. Farmers might convert land in hay, pasture, or timber to cash crop production, thereby inducing more erosion on land brought into production. In addition, some of the new land brought into production could be more naturally erosive than that already in production. The requirement that applicants for ownership and soil and water loans implement conservation plans could offset the erosive impacts of these two programs, but not of operating or emergency loans. The impact that these programs have on the extent and severity of erosion problems and on soil conservation will be related to the number of farmers who actually receive such loans.

Both farm ownership loans and soil and water loans subsidize investments that could bring more land into production and encourage more erosion than would be the case without these programs. Both types of loans can be used to develop water supplies, develop and improve farmland, clear, level, and drain land, carry out basic land treatment practices and make other improvements, all of which could bring more land into production. Soil and water loans can also subsidize practices that conserve soil.

The impact of FmHA ownership and soil and water loans on erosion problems may be relatively unimportant. Since 1974, less than 6 percent of farm real estate debt has been held by FmHA (19). Not all this debt is used to bring land into production, so these loans

might encourage increased erosion on only a small acreage. Soil and water loans account for less than 0.02 percent of farm real estate credit, so only a small portion of farm acreage may be receiving soil conservation treatment under this program (19).

The requirements for applicants to implement conservation plans could offset increased erosion caused by this program and concentrate practices where they are needed. However, this requirement may be quite limited in the acreage that it affects. First, soil conservation under this program is restricted to those who qualify for the loans. Second, new ownership and soil and water loans typically account for less than 1.5 percent of farm real estate debt. So it could take many years before conservation plans would become widespread under this program.

Low-interest operating loans could increase returns for some farmers by reducing annual production costs. These loans could, therefore, encourage some farmers receiving them to plant acres otherwise unprofitable. The result could be increased soil loss on the additional acres planted, possibly at rates that reduce soil productivity. Operating loans account for a substantial share of non-real estate farm credit varying between 4.5 and 5.9 percent from 1974-81 (19). However, it is not clear how many additional acres these loans bring into production.

Emergency disaster loans could induce further erosion in areas prone to natural disaster. Emergency disaster loans reduce the risks of production loss due to natural disaster by subsidizing interest rates for those who qualify; such loans may encourage farming in high-risk enterprises and locations (5). Thus, the programs could encourage more production and erosion than otherwise. Alternatively, the loans can be used to repair damaged conservation pratices or maintain payments on debts for structures installed. However, the disaster loans probably do little to encourage new practices because farmers do not know when the credit will be available. Before 1976, these loans accounted for less than 0.5 percent of non-real estate farm credit and probably had little impact on decisions affecting soil loss. However, the impact of these loans now may be more substantial since their share of non-real estate farm credit increased from 1.9 percent in 1976 to 9.4 percent in 1983 (19).

RESEARCH NEEDS

By influencing crop prices, supplementing income, or reducing the risk of financial loss, farm programs create incentives for farmers to raise crops that encourage erosion and, on some sites, productivity losses. Export programs, price supports, target prices, production adjustments, and Federal crop insurance encourage farmers to plant wheat, feed grains, cotton, rice, or soybeans instead of grass,

hay, or pasture (table 6). FmHA programs, by providing credit, may encourage farmers to bring more land into production and increase erosion. By increasing farm profits and reducing their variability, farm programs may give farmers more money to invest in conservation and increase conservation incentives. But the price and income effects of farm programs seem to create greater incentives for erosion than than conservation. Some provisions of farm programs do encourage soil conservation: acreage reduction programs, the acreage conservation reserve, and the requirement that recipients of FmHA ownership and soil and water loans implement soil conservation plans. Quantitative research is needed to examine the significance of these incentives with three research objectives.

Objective 1: Examine whether there are significant differences in erosion between farms that participate in programs and those that do not. This objective would be best pursued by statistical comparisons of erosion rates between participating and nonparticipating farms. Such a study was pursued concurrently with this one (15).

Objective 2: Examine the significance of program incentives for soil erosion and soil conservation. Studies should more specifically examine:

- Incentives to produce various crops and to bring more land into crop production.
- The significance of program incentives for the application of conservation practices.

It would be desirable to conduct statistical tests on the following questions to pursue objective 2:

a. Do export, price support, dairy, or acreage reduction programs significantly increase the prices of or acreage planted to wheat, feed grains, cotton, rice, or soybeans?

b. Do target price programs significantly increase the acreage planted to wheat, feed grains, cotton, or rice?

c. Do crop insurance or FmHA loans significantly increase the acreage planted to erosive crops?

d. If various programs increase the acreage under crop production, are erosion rates significantly higher than average on land brought into production?

A dynamic modeling study of impacts of the income-supplementing, credit providing, and risk-sharing aspects of farm programs on incentives for soil conservation over time would be appropriate. Such a study could help demonstrate whether or not farm policies create

Table 6--Crops eligible for farm programs, by erosion class

Erosion class and crop	Price support		Target Price	Production adjustment	Federal crop insurance	Export 1/	FmHA loans 2/
	Nonrecourse loan	FOR					
Most erosive:							
Cotton	X	*	X	X	X	X	X
Soybeans	X	*	*	*	X	X	X
Moderately erosive:							
Corn	X	X	X	X	X	X	X
Grain Sorghum	X	X	X	X	X	X	X
Less erosive:							
Barley	X	X	X	X	X	X	X
Oats	X	X	X	X	X	X	X
Rice	X	*	X	X	X	X	X
Wheat	X	X	X	X	X	X	X
Least erosive:							
Grassland	*	*	*	*	L	*	X
Hayland	*	*	*	*	L	*	X
Well-managed pasture or range	*	*	*	*	L	*	X

* = Not eligible.
X = Eligible.
L = Very small program for forage and forage seeding.
1/ = Export policies are not crop specific but wheat, feed grains, cotton, rice, and soybeans are major export crops.
2/ = FmHA programs are not crop specific so they apply to any crop.

incentives that encourage soil conservation. The study would need to account for erosion-caused yield losses, discounting, and alternative farm management strategies.

Objective 3: Estimate the aggregate impacts of program incentives on the acres of various crops planted and erosion at the farm, regional, or national level.

A series of static, farm management modeling studies to simulate management and erosion with and without various farm program provisions are also appropriate for the third objective. The models should specifically account for risk implications and thus be quadratic programs, linear programming models accounting for risk, or other models that account for risk. The studies should be conducted for a variety of "typical" field crop and dairy farm operations in different geographical areas and should estimate soil loss. The Erosion Productivity Impact Calculator (EPIC) model could then be used to estimate productivity losses associated with farm program incentives.

Studies that address the aggregate impacts of farm policies on prices, production of crops, and erosion on a national and regional level are also desirable for pursuing objective 3. Ultimately, such studies ought to estimate the acres where productivity would be lost due to farm program incentives and the value of lost productivity. Mathematical programming models to account for price-supporting, income-supplementing, and risk-sharing aspects of farm programs, as well as variation in productivity and erosion potential on crop production at the national and regional levels would be appropriate but could be cumbersome and expensive. Other approaches combining an econometric simulation model of commodity markets with a model of crop production and erosion would also be appropriate and could be more feasible. Models like FAPSIM and HYBRID could be useful for these studies.

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