National and Regional Implications of Conservation Compliance

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Abstract

Soil erosion as an on-site problem received much attention in the 1985 Food Security Act (FSA), which established programs for the Conservation Reserve and conservation compliance. The 1985 FSA explicitly linked farmers' resource use and conservation activities to benefits received from commodity programs. Much debate has ensued on erosion standards for compliance and farm income trade-offs. Farm-level uncertainties about meeting conservation compliance standards and about the trade-offs between limiting soil loss and maintaining farm income are evident. The objective of the analysis described herein was to provide information on national and regional implications of conservation compliance.

Alternative per acre soil loss restrictions were assessed using a national Agricultural Resource Interregional Modeling System (ARIMS). Two sets of erosion standards were evaluated. One group of scenarios set conservation compliance at annual levels 20, 10, and 5 tons of allowable soil loss per acre; levels of cropped land were allowed to shift among market regions without being confined by historical levels using flexibility constraints. For the second group, conservation compliance was set at 10 and 5 tons of allowable soil loss per acre. For this approach, erosion standards were evaluated while retaining the flexibility restrictions from the baseline.

The analyses indicated that a conservation compliance standard of 5 tons per acre would reduce cropland erosion in most regions by 30-60 percent from the baseline level. Major shifts to conservation tillage and other erosion-reducing cropping practices were required to achieve conservation compliance. These shifts lead to increases in production costs of 2-5 percent. Even a relatively modest mandatory restriction on soil loss of 20 or 10 tons per acre resulted in major reductions in erosion rates, with modest increases in total production costs. Thus, conservation compliance standards more stringent than those now used by the states would not significantly distort production or comparative regional advantages. Costs of conservation compliance to producers and consumers would be modest at best.

provided through the Soil Conservation Service (SCS), the Forestry Service, and the Cooperative Extension Service. To participate, a farmer files a request with the local ASCS office and works with its personnel to develop an acceptable soil and water conservation plan. When the farm conservation plan is approved and implemented, the farmer is eligible for cost-sharing programs. Generally, farm conservation programs eligible for technical aid and cost sharing include conservation cropping system practices, water diversion and containment, wildlife protection and enhancement, and forest-timber protection and maintenance. Participation in government commodity programs may be contingent on participation in soil and water resource conservation programs that encourage farmers to develop long-run conservation plans.

Conservation Reserve

The Conservation Reserve (CR), authorized by the Food Security Act of 1985, offers farmers the opportunity to convert highly erodible cropland to a permanent vegetative cover. The farmer may enter into a ten-year CR contract with the USDA and may receive annual rental payments on eligible acres of up to $50,000 per farm per year. The CR is administered through state and local ASCS offices. Cost sharing is available for the establishment of permanent vegetative cover on land placed in conservation reserve.

Highly erodible cropland is eligible for conservation reserve enrollment. Two criteria designate cropland as highly erodible: (1) an erodibility index equal to or greater than eight for wind or water erosion,

or (2) an erosion rate greater than that recommended by Soil Conservation Service field technical standards based on soil tolerance. The erodibility index is based on soil type, slope, rainfall and wind exposure, and soil tolerance. For eligibility, at least two-thirds of a field must be considered highly erodible and must have been used to produce an agricultural commodity between 1981 and 1985. If the producer elects to return CR land to production before the end of the contract period, all annual rental and established costs, plus interest, must be repaid to the Commodity Credit Corporation (USDA 1987).

Conservation Compliance

In addition to programs for complete removal of highly erodible croplands from production, the 1985 Food Security Act includes provisions for conservation compliance (CC). The CC discourages planting highly erodible cropland if the land is not adequately protected from erosion. Production on highly erodible cropland without an approved soil conservation plan may prevent the operator from receiving agricultural commodity program benefits. If highly erodible land (potential erosion relative to field tolerance) comprises more than one-third of the acreage in a field, the farm operator must develop an annual conservation cropping system plan based on ASCS and SCS technical guidelines specific for the soil region. This plan must be implemented by 1995. Failure to comply with the conservation compliance provision means risking eligibility for price and income supports, crop insurance, Farmers' Home Administration loans, CCC storage payments, farm storage loans, Conservation Reserve

payments, and other USDA commodity programs. The loss of USDA program benefits applies to all land on the farm (USDA 1987).

Technical Standards

Section III of the Soil Conservation Service technical guidelines for resource management stipulates that conservation planning must be directed toward implementation of a resource management system (RMS). This is a combination of conservation and management practices that is conditioned on the primary use of the land, and that will protect, restore, and improve the soil by meeting acceptable soil loss rates or water quality standards (USDA/SCS 1987). The SCS guidelines address basic categories of resource degradation problems, including erosion control, water disposal and management, animal waste, agricultural chemical management, and off-site issues. These resource problems do not necessarily apply equally in any given case. An RMS plan addresses only site-specific problems.

Resource management systems are determined acceptable for a specific land use by application of quality criteria guidelines. These guidelines outline minimum acceptable conditions for sustained use, protection, restoration, and improvement of soil and water resources. These evaluations--based on SCS conservation policy, technical guidelines, and the professional judgment of SCS agents--are used to determine when quality criteria are met.

Quality Criteria

Conservation treatments are designed to control the greater of the erosive forces (water or wind), so that estimated soil erosion does not exceed a designated tolerance level for the dominant farm soil. For example, for water erosion control on cropland, the estimated annual soil loss from sheet or rill erosion should not exceed the tolerance level for the dominant erosive soil within the conservation treatment unit. Estimates of soil-loss tolerance are developed using the Universal Soil Loss Equation (USLE). If wind is the primary erosive force, similar minimum quality criteria are imposed, developed using soil-loss tolerance levels specific to soil units and estimated using the Wind Erosion Equation (WEQ).

Compliance

Field Office Technical Guides at local SCS offices traditionally have included information for planning and applying resource management systems. However, what is new in the 1985 FSA is reference to conservation systems that address specifics of soil erosion control. Conservation systems are components of resource management systems and are the minimum standard for compliance with the 1985 FSA (cross-compliance) provision linking conservation to farm commodity program benefits.

Problem and Objectives

This analysis evaluates the implications of the conservation compliance (CC) provision of the 1985 FSA. The effects of alternative soil loss restrictions on land use are examined within the framework of a

national Agricultural Resource Interregional Modeling System (ARIMS) (English et al. 1987). There are several issues to be considered in determining standards. Policymakers and farmers are concerned with the impacts of erosion abatement levels for CC. What is fair to producers, given that alternative levels of erosion tolerance can be targeted in the SCS technical guidelines? The associated issues of equity among farmers and trade-offs of current resource degradation against future cost are difficult ones. What level of erosion is acceptable, given soil loss tolerance, for achieving conservation goals? On a regional basis, what level will not place an economic disadvantage on the producers of any given region?

State-level conservation authorities can customize the technical guidelines for resource, cultural, economic, and social conditions in an area, thus implying that standards for compliance could differ by state and region. The important national question is, how much should the standards be allowed to differ? One way of developing information for use in assessing CC impacts and different standards for compliance is to investigate the results of constant, or fixed, standards nationally. Such results can also provide information on cost of production/soil loss tradeoffs for alternative standards.

This report provides a framework for assessing the fairness of (1) state-specific standards for conservation compliance and (2) the overall regional and national trade-offs among soil loss, compliance standards, and farm production costs. Estimates of soil and water resource

use relative to land availability, production cost, and compliance standards are developed using ARIMS as calibrated for baseline projections (FAPRI 1988) of total commodity production.

Analytical Methods

The Agricultural Resource Interregional Modeling System (ARIMS) was developed at the Center for Agricultural and Rural Development (CARD), Iowa State University, for use in the second Resource Conservation Act (RCA) appraisal (English et al. 1987; Robertson et al. 1987). ARIMS subsequently has been modified and updated for use in analysis of current policy issues (AAEA 1988). It is a large-scale, national linear programming model with several supporting data sets and models. This set of models simulates economic activity in seven sectors of U.S. agriculture: crop production, livestock production, pasture/range production, irrigation requirements and costs, land availability, final and intermediate commodity transportation, and demand (Figure 1).

ARIMS utilizes three different regional definitions. The first and primary set of regions consists of 105 producing areas (Figure 2). Land availability and irrigation sectors are also defined at this level. The second set of regions serves jointly as the 31 market regions and 31 livestock producing areas (Figure 3), from which fertilizer inputs are purchased and livestock production is defined. In addition, these 31 regions serve as transportation hubs; transportation routes are defined from one market region to another. The third set of regions delineates 34 ecosystems, with range and pasture production activities defined for these

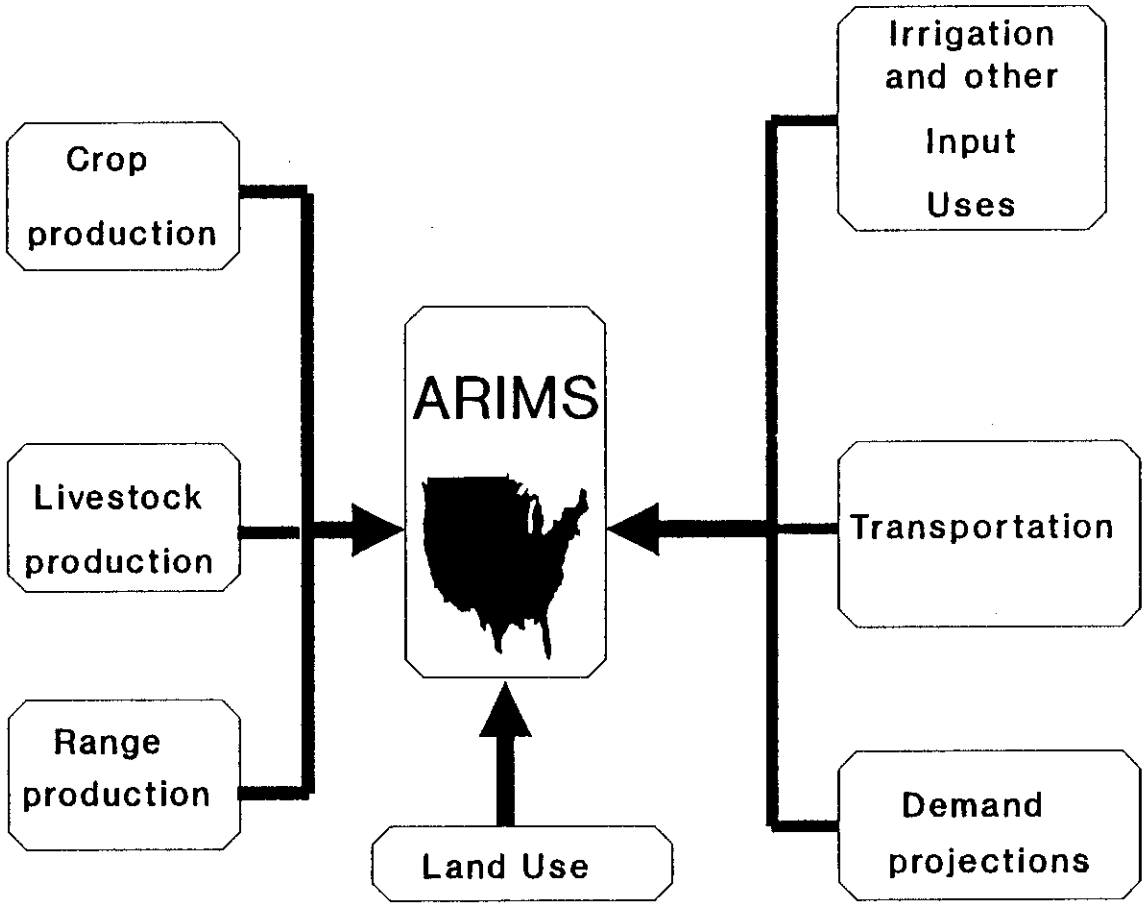


Figure 1. The National Agricultural Resource Interregional Modeling System Used in the Appraisal Required by the Resource Conservation Act

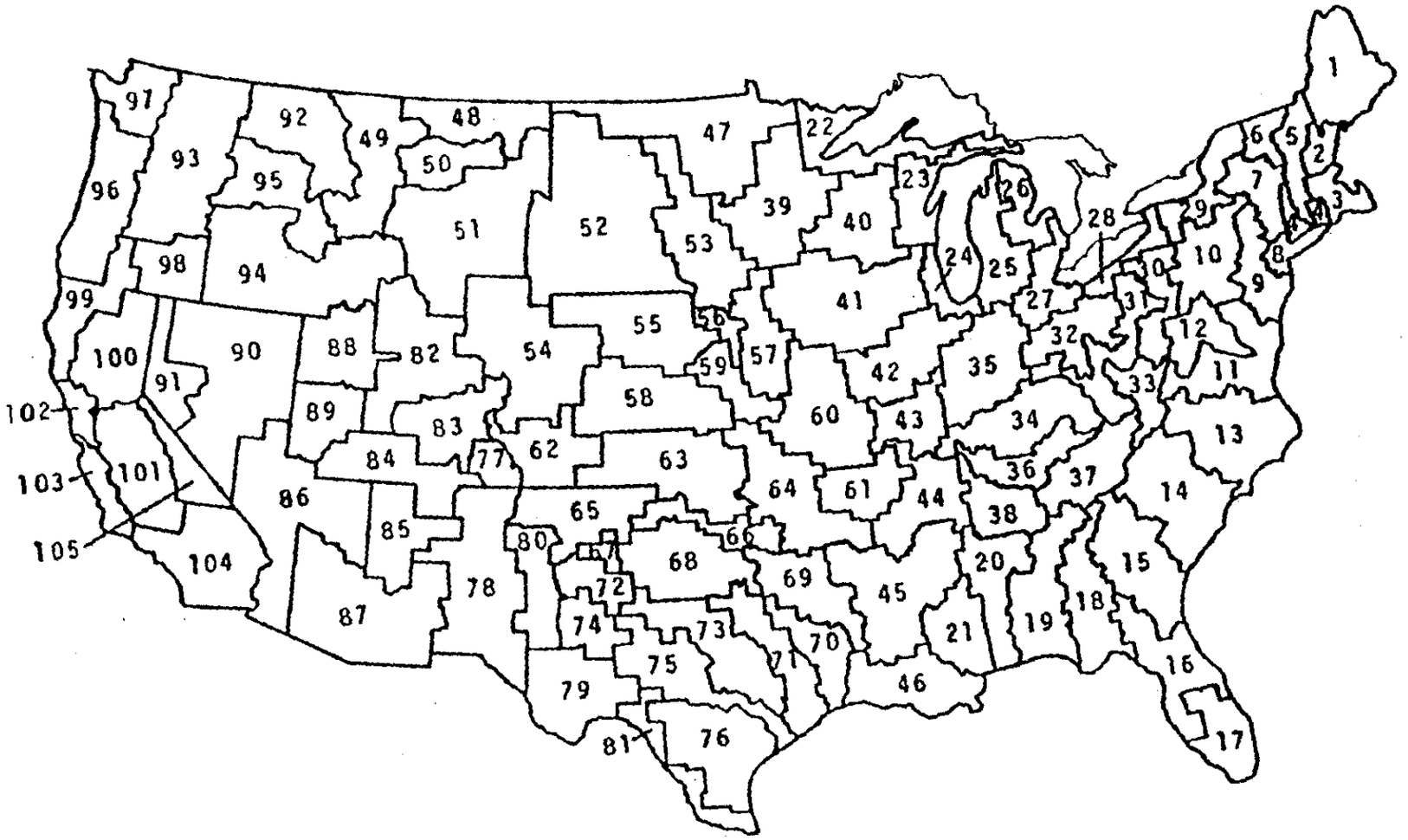


Figure 2. The 105 crop producing areas used in ARIMS.

Figure 3. The thirty-one market regions and livestock producing regions in ARIMS.

regions. In this report, results are aggregated and reported by USDA Crop Production Regions (Figure 4).

Crop production is delineated by activity, representing one- to six-year rotations and a combination of a tillage method and conservation practice by land group (Table 1). The crop production activities include barley, corn (grain and silage), cotton, hay (legume and nonlegume), oats, peanuts, sorghum (grain and silage), soybeans and summerfallow, sunflowers, and wheat. The water and fertilizer needs of other exogenous crops are specified exogenously. Tillage practices considered include conventional (with residue over winter and without), conservation, and zero tillage. Conservation practices considered to replace straight row tillage are contouring, strip cropping, and terracing. Tillage practices can be combined with conservation practices by land group. In addition, strip cropping is available in some production areas for wind erosion control. For purposes of definition, zero tillage practices leave more than 85 percent residue on the ground at the time of planting, while conservation tillage leaves between 30 and 85 percent of the residue. With conventional tillage, primary tillage occurs in the fall or the spring.

Livestock production components of ARIMS include beef (grain and roughage fed), pork, and dairy. Production is specified by market region. Total production levels for livestock and endogenous crops are specified externally by the Food and Agricultural Policy Research Institute (FAPRI 1988).

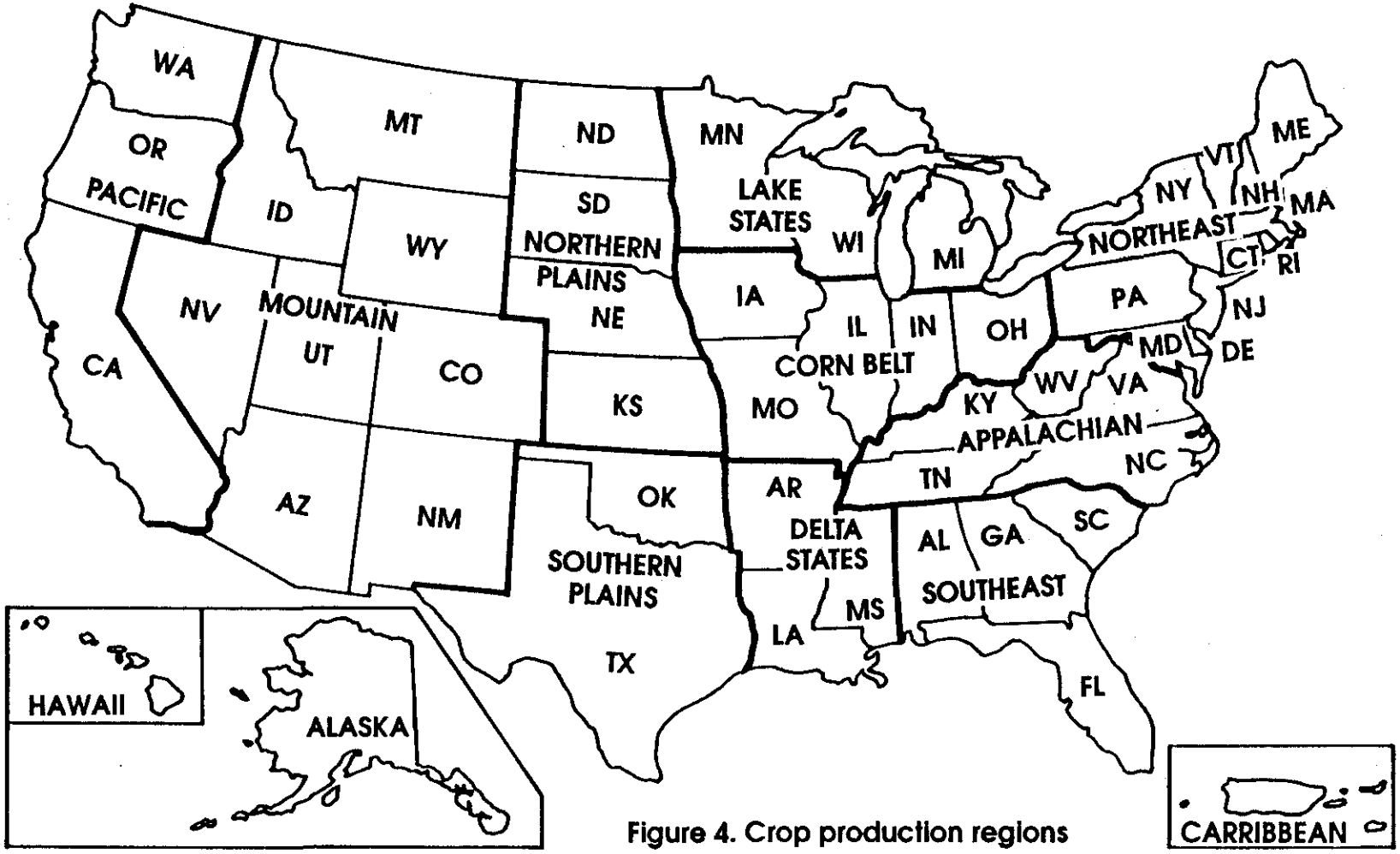


Figure 4. Crop production regions

Table 1. Definition of land quality groupings

Land Group[a]	USDA Land Capability Class/Subclass[b]
I	I, II_{wa}, III_{wa}
II	II_e
III	III_e
IV	IV_e
V	II_c, III_c, IV_c
VI	II_s, III_s, IV_s
VII	II_w, III_w, IV_w
VIII	V, VI, VII, VIII

[a]Land groupings defined for the 1985 Resource Conservation Appraisal.

[b]The subclass subscripts are standard USDA LCU subclass notation. The exception is wa, which indicates land classified as having a wetness problem that has been adequately treated.

The land base for ARIMS is determined from the 1982 Natural Resources Inventory (82NRI) compiled by the Soil Conservation Service, with all currently or recently cropped land designated as cropland (SCS 1987). In addition, uncropped land was assessed for potential conversion to cropland. Land with high or medium potential for conversion is included in the overall cropland resource base.

Excluded from the land base is land used for urban purposes, as well as other exogenous crops. The water requirements of exogenous crops and for all exogenous livestock also are removed from the resource base. ARIMS must designate endogenous cropping and feeding activities sufficient to satisfy the nutrient needs of total exogenous livestock production.

Technology and factor costs used in ARIMS are representative of 1980, while yields and acreage constraints have been updated to predicted levels for 1990 (FAPRI 1988). Data for erosion impacts on yields and input requirements derive from EPIC (Putman et al. 1988a, 1987b). Yield differences based on tillage types and land groups are also from EPIC; base yields are from county-level USDA survey data for the years 1986-1987.

Assumptions and Scenarios

Exogenous national and export demand projections for ARIMS derive from FAPRI (1988) commodity market models. Production costs and practices built into the model are representative of the early 1980s, with adjustments for predicted 1990s conditions; yields, available land for cropping, and demand (domestic and export) are also set at levels predicted for 1990. Choices of alternative crop rotations, tillage methods, conservation practices, and

livestock production practices are included in ARIMS by region and are determined endogenously in the solution process. It is assumed that land use conversions between dry and irrigated cropland and between potential and actual cropland may occur to a limited extent, and that range land can be utilized for forage production subject to dietary restrictions.

ARIMS finds the least-cost method of producing a specified set of demands. The "least-cost" criterion is justified under the long-term competitive equilibrium (Silberberg 1974; Robertson et al. 1987). The policy analysis involves comparing the long-run equilibria for different sets of conservation compliance policy conditions (Nicol et al. 1975). These are final, or equilibrium, outcomes. No attempt is made to describe the path from the current situation to the solution of the model given one of the alternative policies.

The baseline to which alternatives in the study are compared simulates current farm policy continued through 1990 (Figure 5). A 45-million-acre Conservation Reserve is taken out of the cropland base by 1990 for all the scenarios. Crop acreage change constraints, as well as upper bounds on adoption of conservation and zero tillage, are included in the baseline model, but not in all the scenarios. The crop acreage constraints reflect the distortions from the competitive least-cost solution that can be attributed chiefly to commodity programs (Miller 1972). These flexibility constraints are set to require no less than 80 percent of the 1985-86 average crop acres by producing region. Tillage constraints reflect the likely adoption rates by 1990. Without the tillage constraints, ARIMS solutions would imply more rapid adoption of conservation practices than

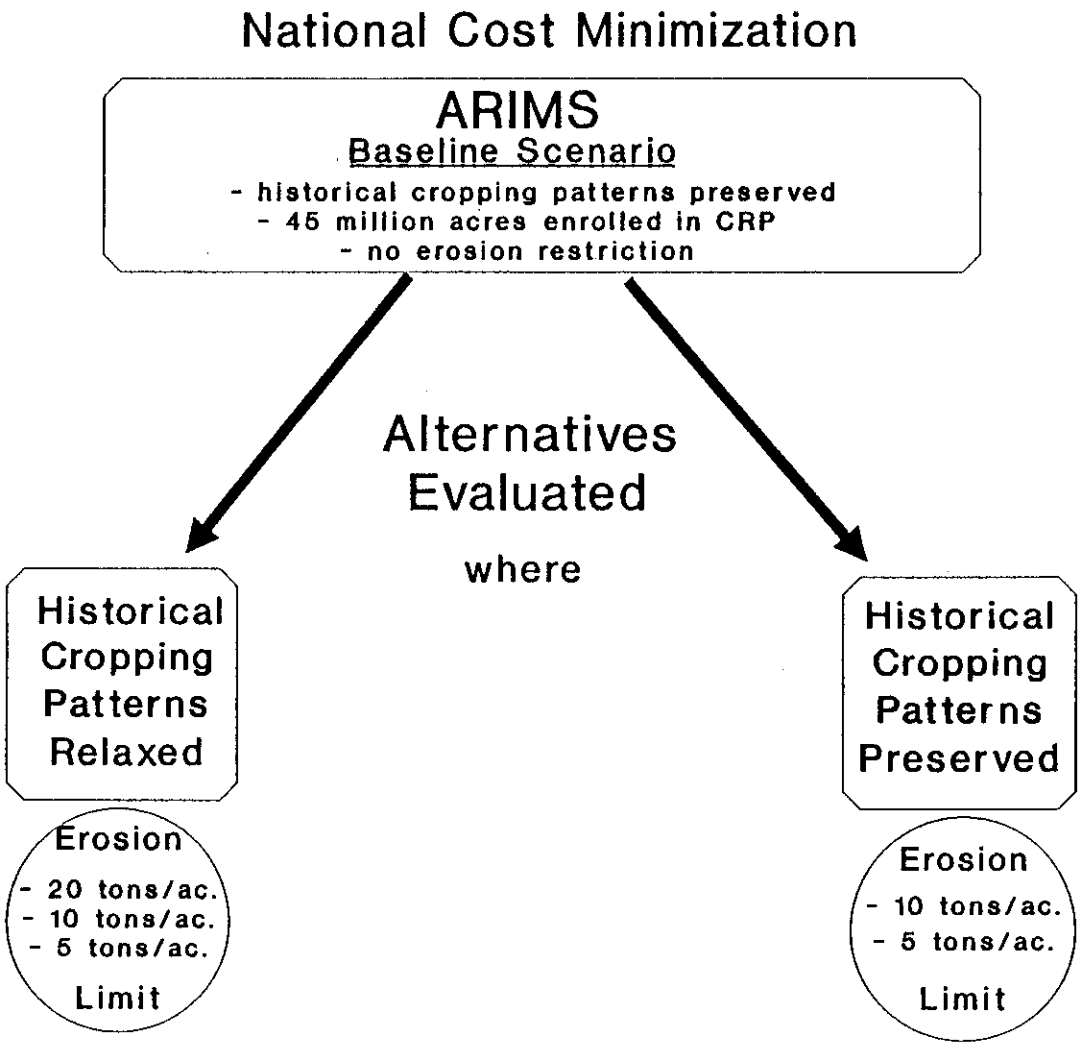


Figure 5. Conservation Compliance Scenarios Evaluated

farmers have achieved in the past. The restrictions are rationalized on the basis of institutional factors that affect the adoption decision.

For this study there are two sets of erosion restriction scenarios (Figure 5). The first set of scenarios allowed shifting of crop levels among market regions, thereby relaxing historical levels of regional crop acres. The objective was to evaluate the likely long-run changes in production patterns among production areas and market regions. This first set included three levels of conservation compliance, at 20, 10, and 5 tons of allowable soil loss per acre, per year. The second set of erosion restrictions was evaluated in an environment consistent with the baseline. Constraints on crop acreage change among market regions allowed no more than a 20-percent shift in acreage among regions. This second set of scenarios evaluated only 10- and 5-ton-per-acre annual soil loss restrictions.

These erosion restrictions reflect the conservation compliance rules of the 1985 Food Security Act. However, this study makes two assumptions: that the erosion restrictions are mandatory and, for the first set of restricted erosion scenarios, that distortive commodity subsidies have been eliminated. Hence, the model solution is for a competitive market in which the lowest cost of production is attained subject to alternative mandatory erosion restrictions. For the 20- and 10-ton-per-acre scenarios, the sum of wind and water erosion must be less than the limit on average by production area. For the 5-ton scenario, neither wind nor water erosion is allowed to exceed 5 tons. The issue of magnitude of incentives required for farmers to voluntarily adopt the erosion restrictions is not evaluated,

although orders of magnitude for these incentives can be estimated from the shadow prices.

Results When Cropping Patterns are Relaxed

Results of the first set of conservation compliance restrictions are compared here to the base scenario. Recall that the base scenario includes a 45-million-acre conservation reserve. No erosion restrictions were placed on the cropping activities in the base scenario. Crop acreage shifts among market regions were restricted so as not to deviate more than 20 percent from the historic regional pattern. These flexibility constraints were applied at the market region level. Restrictions in the base scenario placed upper bounds on conservation and zero tillage cropping at a 20-percent increase over 1985-86 levels by 1990.

Changes in ARIMS for the first set of conservation compliance evaluations limited erosion from cropland activities to 20-ton, 10-ton, and 5-ton levels. Also, the market region crop acreage flexibility constraints were eliminated, and only selected constraints on minimum crop acres and irrigation were maintained. By eliminating these constraints the model becomes a better approximation of a long-run, least-cost, competitive equilibrium.

Results are presented as percentage differences compared to the base scenario (Figure 6). Estimates for the impacts of conservation compliance on erosion, land use and commodity production, production cost, and production practices are presented in Figures 7-36.

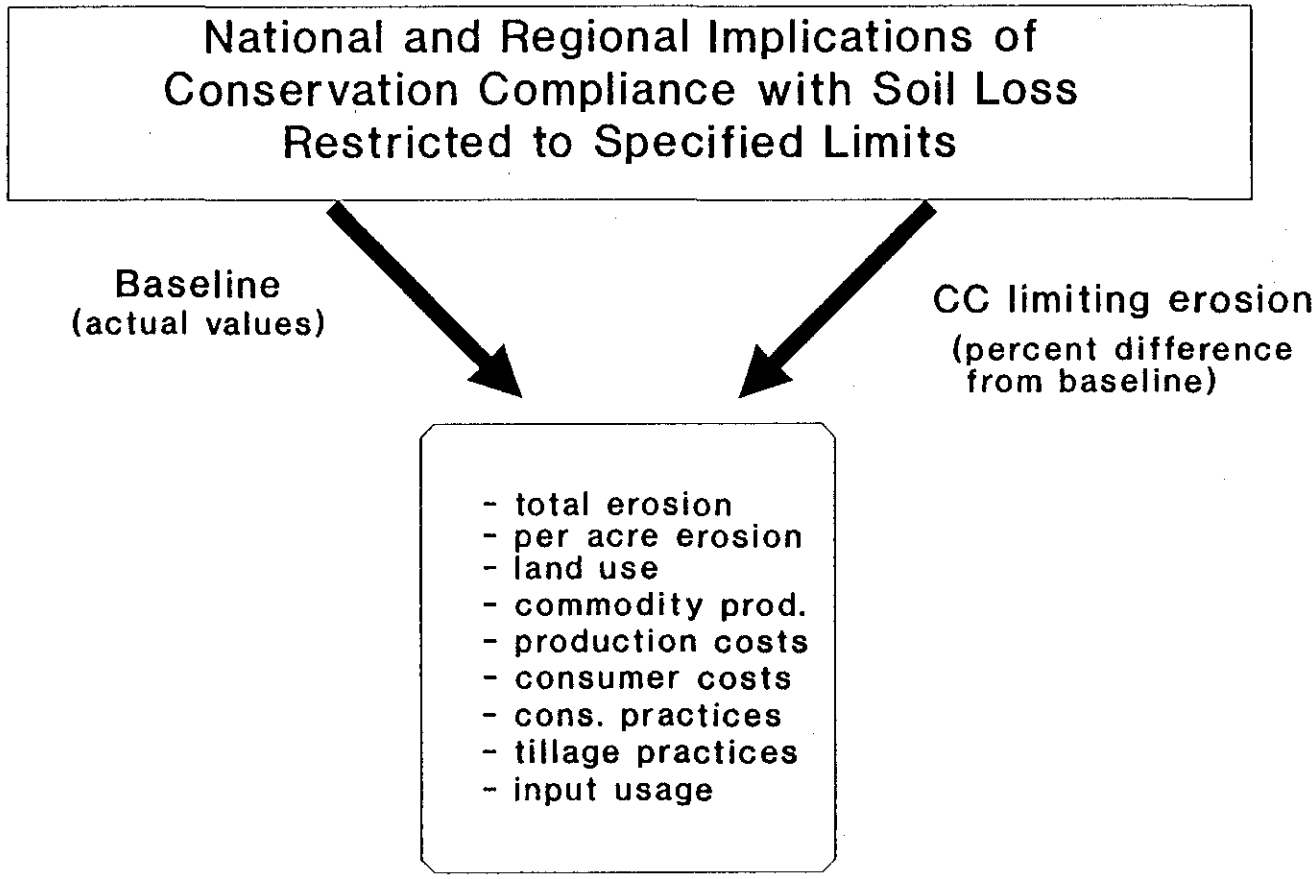


Figure 6. Results from the CARD Analysis

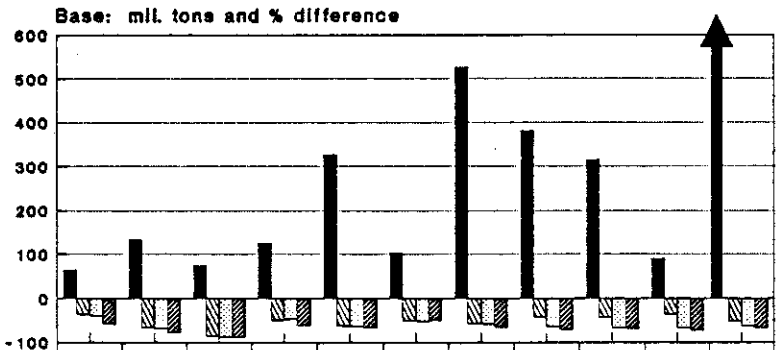
Erosion

Estimated national totals of soil erosion due to cropping decreased by 52.4, 62.2, and 67.5 percent, respectively, for the CC restrictions of 20, 10, and 5 tons per acre (Figure 7). Some of these reductions can be attributed to cropland use declines of 17.3, 15.8, and 15.4 percent, respectively, in the three scenarios and a significant regional redistribution of crops (see Appendix Table 2). Estimated average soil loss per acre was reduced by 41.0, 54.3, and 61.0 percent for the three levels of restrictions (Figure 8). Even though soil loss attributable to idle land more than doubled for all scenarios, the loss was smaller compared to the erosion on cropped land.

All regions experienced a decrease in erosion for all scenarios (Appendix Table 1). However, there was not as much difference among the scenarios as between all of them and the baseline. For example, moving from the 20-ton to the 10-ton restriction level gave a 10 percent reduction in erosion and a 0.5 percent increase in total production cost. Moving from the 10-ton to the 5-ton scenario gave a 5.3 percent decrease in erosion, with a 0.7 percent increase in total production cost. Total production cost includes crop and livestock production cost.

For all levels, the Southeast region had more than an 85 percent reduction in erosion. In contrast, the Lake States experienced only about a 50-percent reduction. Erosion reductions of 50-60 percent in the Corn Belt and Delta regions were particularly significant, since acreage reductions in these regions were low. The Corn Belt, Plains, and Mountain

Figure 7. National Soil Erosion Totals
Conservation Compliance Scenarios
Historical Cropping Patterns Relaxed



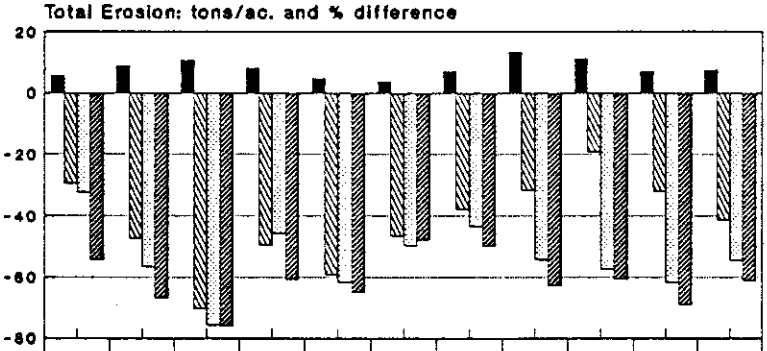
	NE	APPL.	SE	Delta	C.Belt	LS	N.Pln	S.Pln	Mtn.	Pcfc	Nat.
Base: mil. tons	64	133	74	125	327	104	527	381	315	90	2141
20-ton %	-36.6	-65.8	-85.6	-50	-62.8	-50.9	-58.6	-41.8	-43.1	-37.2	-52.4
10-ton %	-38.9	-69.1	-88.2	-46.4	-63.8	-53.1	-58.6	-64.9	-66.7	-67	-62.2
5-ton %	-68	-77.6	-87	-61.4	-65.2	-50.3	-65	-71.3	-69	-72.7	-67.5

USDA Production Regions

Base: mil. tons | 20-ton % | 10-ton % | 5-ton %

SCS/CARD: Iowa State University

Figure 8. Total Soil Loss Per Acre
Conservation Compliance Scenarios
Historical Cropping Patterns Relaxed



	NE	APPL.	SE	Delta	C.Belt	LS	N.Pln	S.Pln	Mtn.	Pcfc	Nat.
Base: tons/ac.	5.6	8.7	10.7	8	4.7	3.8	7.1	13.3	11.2	7	7.4
20-ton %	-29.6	-47.2	-70.2	-49.4	-59.2	-46.4	-37.5	-31.9	-19	-32	-41.3
10-ton %	-32.5	-56.5	-75.7	-45.7	-61.6	-49.6	-43.3	-54.2	-57.3	-61.7	-54.3
5-ton %	-54.1	-66.8	-75.9	-60.6	-64.9	-47.6	-49.8	-62.8	-60.6	-68.9	-61

USDA Production Regions

Base: tons/ac. | 20-ton % | 10-ton % | 5-ton %

SCS/CARD: Iowa State University

regions had the largest erosion totals in the base. Appendix Table 1 provides regional estimates for sheet and rill erosion and wind erosion.

Land Use and Commodity Production

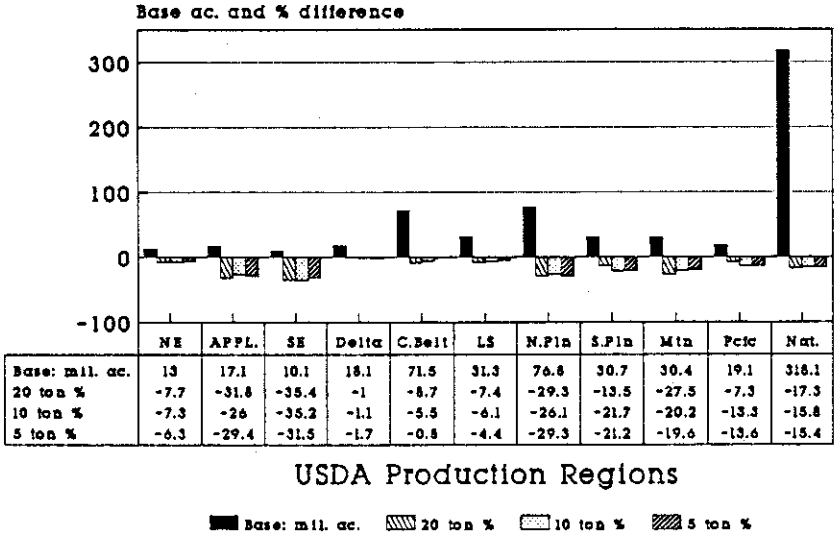
National cropland use estimates decreased by 17.3, 15.8, and 15.4 percent, respectively, for CC levels of 20, 10, and 5 tons (Figure 9). Apparently, as erosion controls were tightened, more land was required to meet national demand. This was due primarily to differences in yield for the cropping practices and land classes. The 45-million-acre reserve in the base was unchanged for the alternative levels. However, levels of idle and cropped land changed not only because of different practices but also because of differing amounts of land conversion (Figure 10). Double cropping increased by 125, 300, and 430 percent, respectively, for the 20-, 10-, and 5-ton levels.

The comparative advantage of the Corn Belt was shown particularly for the 5-ton scenario. This region had the smallest estimated reduction in cropped land, while the Appalachian, Southeast, Plains, Mountain, and Pacific regions had the largest reductions. Generally, regional shifts in the production patterns for specific commodities were large even for the Corn Belt (Appendix Table 3).

Nationally, total commodity production levels changed little after demands were fixed. For the commodities used as intermediate input for livestock production (eg., hay and feed grain), there was some change. Also, some commodities were overproduced in the scenarios because of their presence in rotations used to reduce erosion. Some corn production shifted

Figure 9. Comparison of Land Use Conservation Compliance Scenarios

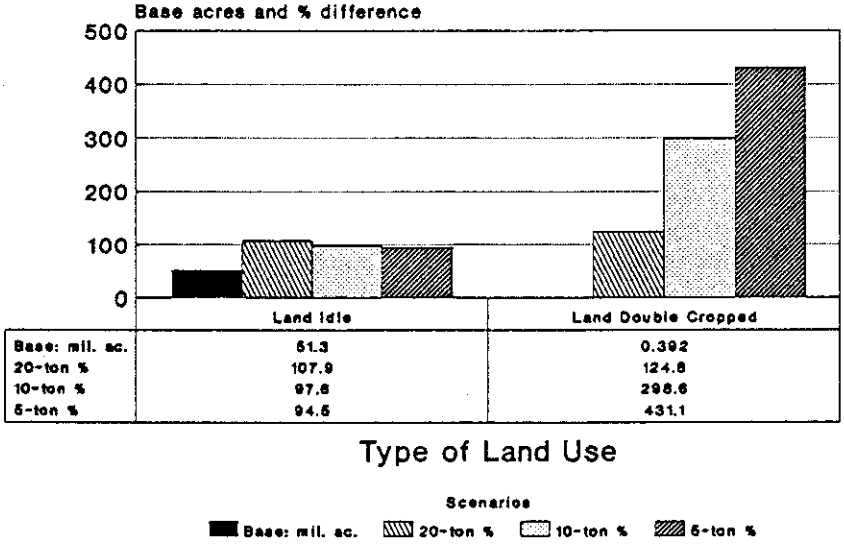
Historical Cropping Patterns Relaxed



SCS/CARD: Iowa State University

Figure 10. Idle Land & Double Cropping Conservation Compliance Scenarios

Historical Cropping Patterns Relaxed



SCS/CARD: Iowa State University

from the Corn Belt (20 percent), Southeast (25 percent), and Pacific (60 percent) regions (Figure 11). Hay production estimates for all regions fell, since livestock in the competitive scenarios received grains instead. Soybean production shifted to a significant degree from the Appalachian, Delta, and Southeast regions into the Plains, Lake, and Mountain regions (Figure 12). Wheat acreage increased dramatically in the Corn Belt and Lake regions (Figure 13). Although not reported, significant acreage shifts of other crops were also present. In general, shifts in regional production occurred more on the basis of relaxed constraints in flexibility than because of CC restrictions (Appendix Table 4).

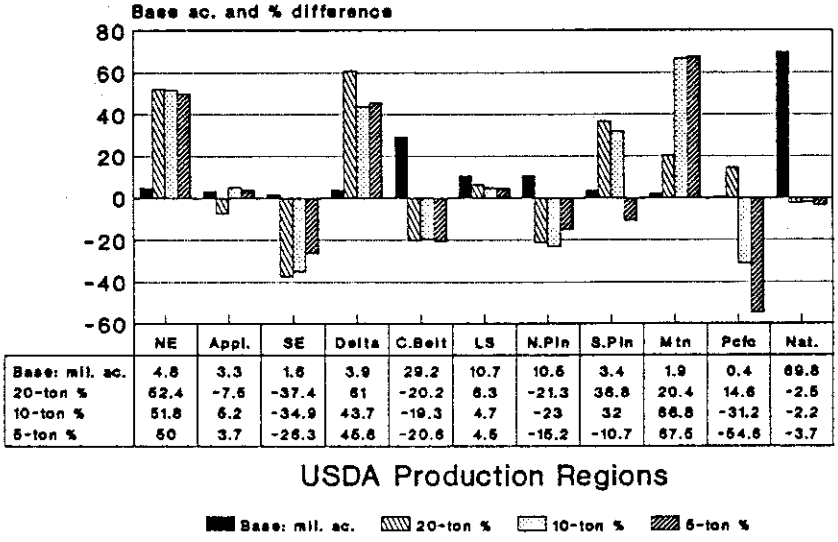
Production Costs and Consumer Prices

Total production costs were lower for all scenarios compared to the base, largely because of removal of the flexibility constraints (Figure 14). However, between the 20-ton and 10-ton levels there was a 10-percent erosion reduction, compared to an estimated 0.5 percent increase in total production cost. Most crop production costs were lower for the CC scenarios, while livestock production costs were about the same as in the base. Generally, transportation costs were reduced (Figure 15). In line with the erosion abatement goals of the scenarios, land improvement costs increased.

Domestic and foreign consumers would have paid higher commodity prices under the scenarios (Figure 16). Corn silage had the highest increase in imputed value, followed by hay, cotton, and small grains (Appendix Table 6). However, to satisfy erosion restrictions regionally, some hay

Figure 11. Production of Corn Conservation Compliance Scenarios

Historical Cropping Patterns Relaxed

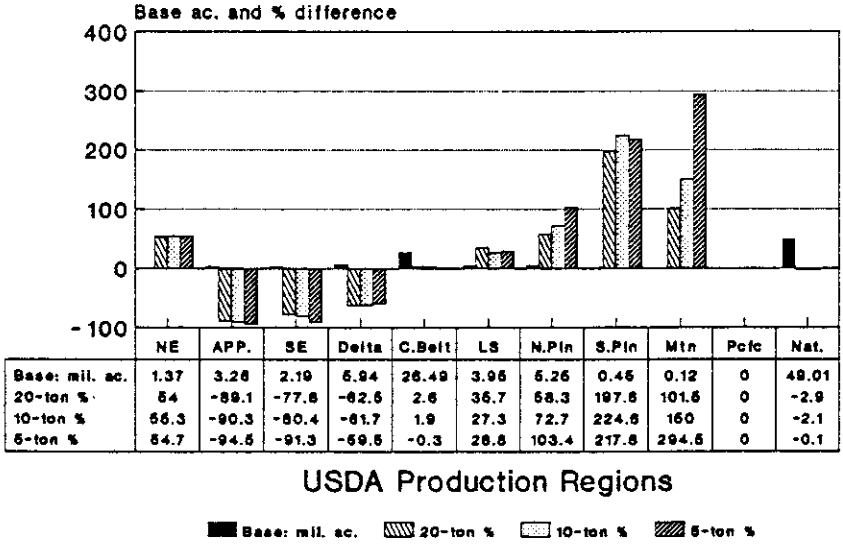


	NE	Appl.	SE	Delta	C.Belt	LS	N.Pln	S.Pln	Mtn	Pcfc	Nat.
Base: mil. ac.	4.8	3.3	1.6	3.9	29.2	10.7	10.6	3.4	1.9	0.4	69.8
20-ton %	52.4	-7.6	-37.4	61	-20.2	6.3	-21.3	36.8	20.4	14.6	-2.5
10-ton %	51.8	6.2	-34.9	43.7	-19.3	4.7	-23	32	66.8	-31.2	-2.2
5-ton %	50	3.7	-26.3	45.6	-20.6	4.5	-15.2	-10.7	67.5	-54.6	-3.7

SCS/CARD: Iowa State University

Figure 12. Production of Soybeans Conservation Compliance Scenarios

Historical Cropping Patterns Relaxed

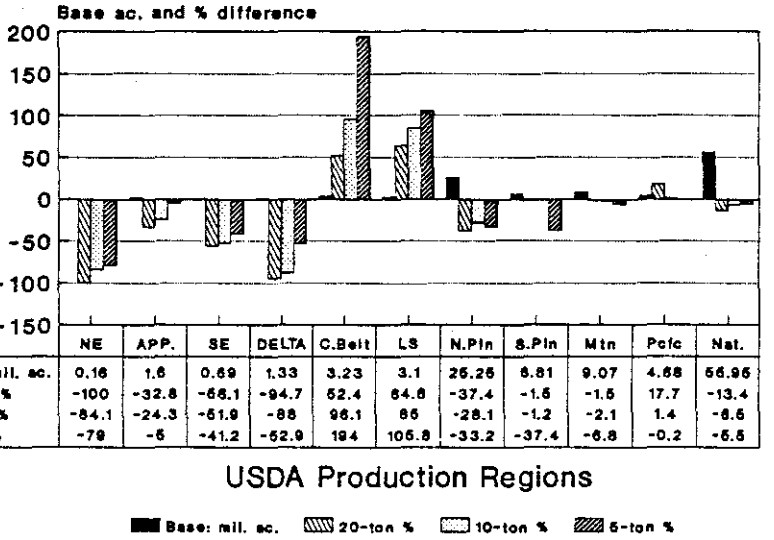


	NE	APP.	SE	Delta	C.Belt	LS	N.Pln	S.Pln	Mtn	Pcfc	Nat.
Base: mil. ac.	1.37	3.26	2.19	5.94	26.49	3.95	5.26	0.45	0.12	0	49.01
20-ton %	54	-89.1	-77.6	-62.5	2.6	35.7	58.3	197.6	101.6	0	-2.9
10-ton %	56.3	-90.3	-80.4	-61.7	1.9	27.3	72.7	224.6	160	0	-2.1
5-ton %	54.7	-94.6	-91.3	-59.5	-0.3	28.6	103.4	217.6	294.5	0	-0.1

SCS/CARD: Iowa State University

Figure 13. Production of Wheat Conservation Compliance Scenarios

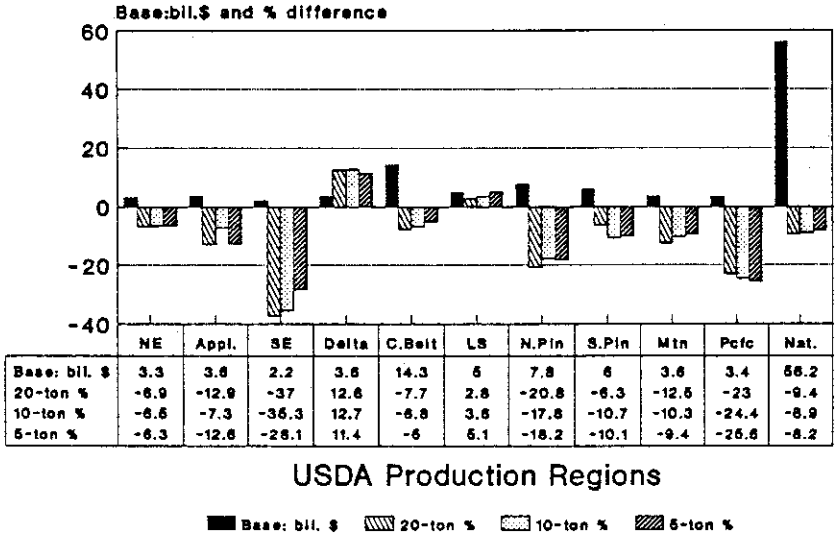
Historical Cropping Patterns Relaxed



	NE	APP.	SE	DELTA	C.Belt	LS	N.Pln	S.Pln	Mtn	Pcfc	Nat.
Base: mil. ac.	0.16	1.6	0.69	1.33	3.23	3.1	26.26	8.81	9.07	4.66	56.96
20-ton %	-100	-32.8	-66.1	-94.7	52.4	64.6	-37.4	-1.5	-1.5	17.7	-13.4
10-ton %	-84.1	-24.3	-51.9	-88	96.1	86	-28.1	-1.2	-2.1	1.4	-8.6
5-ton %	-79	-5	-41.2	-52.9	194	105.8	-33.2	-37.4	-6.8	-0.2	-5.5

SCS/CARD: Iowa State University

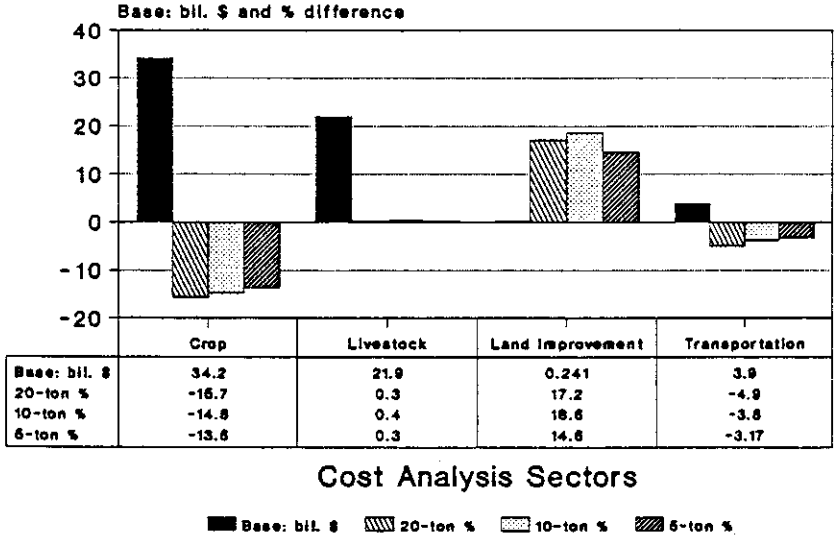
Figure 14. Comparison: Total Prod. Cost
Conservation Compliance Scenarios
Historical Cropping Patterns Relaxed



	NE	Appl.	SE	Delta	C.Belt	LS	N.Pln	S.Pln	Mtn	Pcfc	Nat.
Base: bil. $	3.3	3.6	2.2	3.6	14.3	6	7.8	6	3.6	3.4	56.2
20-ton %	-6.9	-12.9	-37	12.6	-7.7	2.8	-20.8	-6.3	-12.5	-23	-9.4
10-ton %	-6.6	-7.3	-36.3	12.7	-6.8	3.6	-17.8	-10.7	-10.3	-24.4	-8.9
5-ton %	-6.3	-12.6	-28.1	11.4	-6	5.1	-18.2	-10.1	-9.4	-26.6	-8.2

SCS/CARD: Iowa State University

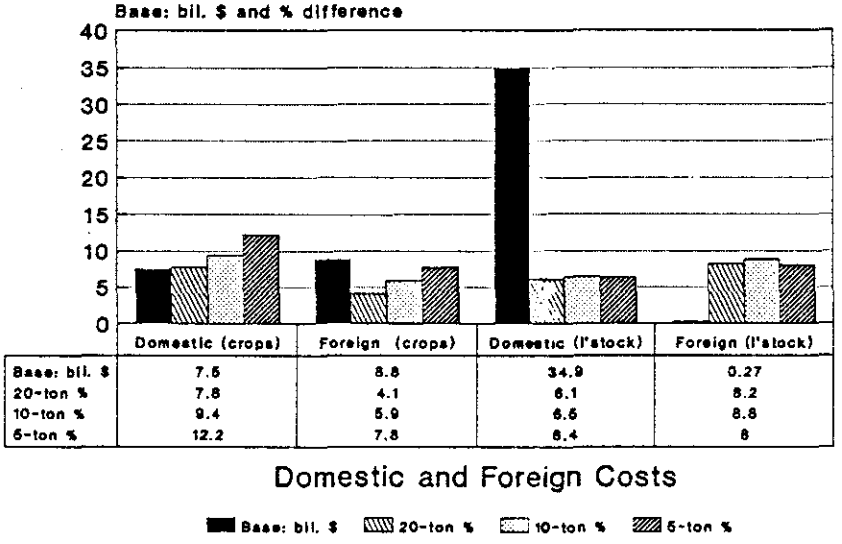
Figure 15. Comparison of Costs
Conservation Compliance Scenarios
Historical cropping Patterns Relaxed



	Crop	Livestock	Land Improvement	Transportation
Base: bil. $	34.2	21.9	0.241	3.9
20-ton %	-16.7	0.3	17.2	-4.9
10-ton %	-14.8	0.4	18.6	-3.8
5-ton %	-13.6	0.3	14.6	-3.17

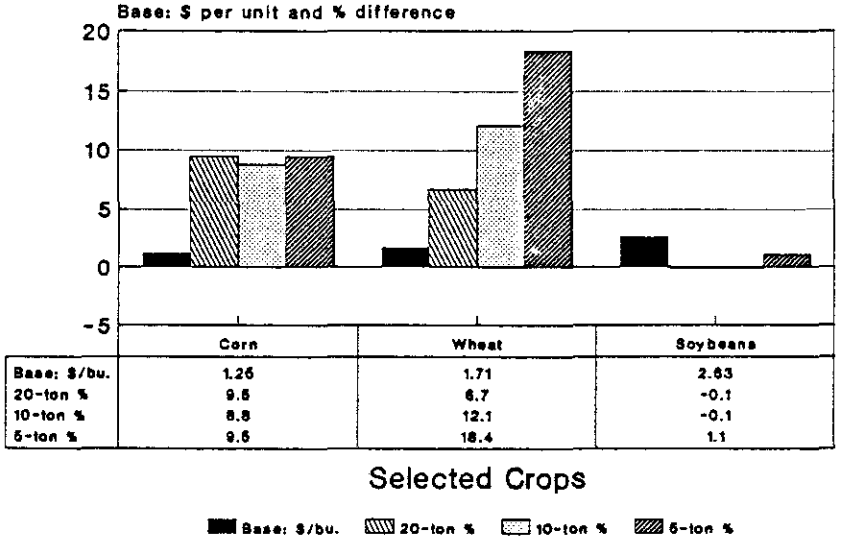
SCS/CARD: Iowa State University

Figure 16. Consumer Costs
Conservation Compliance Scenarios
Historical Cropping Patterns Relaxed



SCS/CARD: Iowa State University

Figure 17. Marginal Value (Cost) Est.
Conservation Compliance Scenarios
Historical Cropping Patterns Relaxed



SCS/CARD: Iowa State University

and small grains were apparently overproduced, and their estimated value fell to near zero. Peanuts, sorghum, and soybeans had lower imputed values at the national level under CC scenarios. Again, these changes from the base were due largely to the elimination of the flexibility constraints. The values in Figure 17 represent the estimated marginal costs of meeting the fixed demand levels. In a competitive equilibrium the values would be the prices of the commodities.

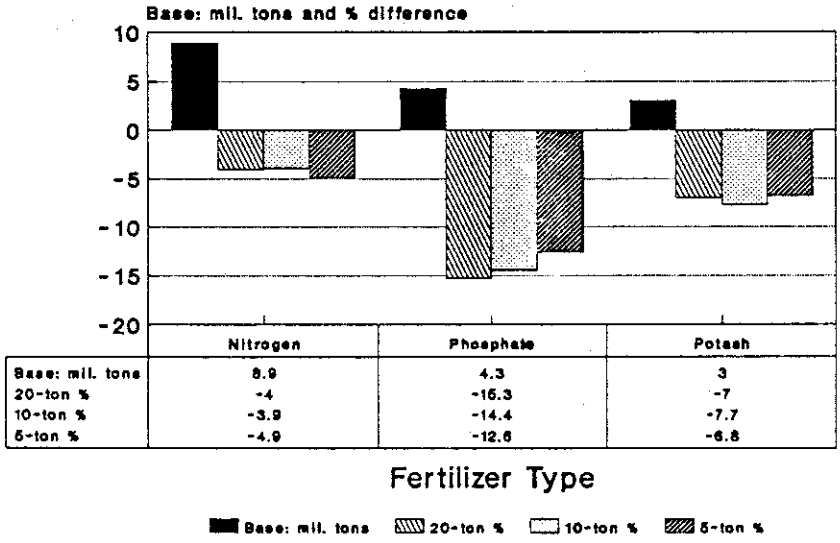
Imputed consumer prices increased more than production costs, indicating that conservative compliance would increase returns to agricultural resources. This improvement in producer welfare was in addition to that created by moving from the base to the competitive equilibrium least-cost solution. Changes in estimated marginal valuations for selected crops (Appendix Table 6) show how regional comparative advantage or specialization was influenced by alternative CC levels and the associated erosion abatement.

Chemical Inputs

Results show a decline in fertilizer use of all types for each scenario. This is in part a result of reduced land use (Figure 18). Nitrogen fertilizer use at the national level declined most (4.9 percent) in the 5-ton scenario. Estimates for pesticide expenditure increased by 13.6, 14.5, and 17.2 percent for the 20-, 10-, and 5-ton scenarios, respectively. The zero tillage practice employed to meet the erosion restrictions used more pesticides and less machinery and labor than did conventional tillage methods (Figure 19). Estimates of fertilizer and

Figure 18. Estimates of Fertilizer Use Conservation Compliance Scenarios

Historical Cropping Patterns Relaxed

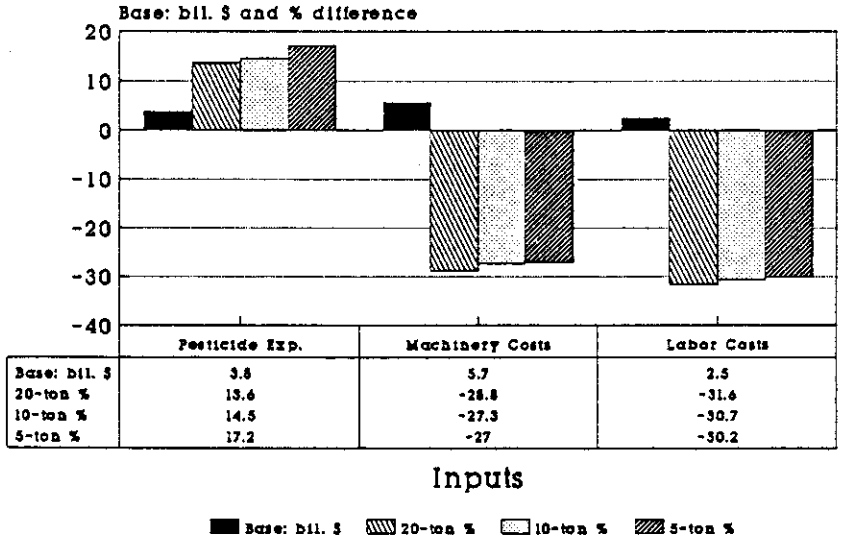


	Nitrogen	Phosphate	Potash
Base: mil. tons	8.9	4.3	3
20-ton %	-4	-15.3	-7
10-ton %	-3.9	-14.4	-7.7
5-ton %	-4.9	-12.6	-6.8

SCS/CARD: Iowa State University

Figure 19. Pest., Mach., and Labor Use Conservation Compliance Scenarios

Historical Cropping Patterns Relaxed



	Pesticide Exp.	Machinery Costs	Labor Costs
Base: bil. $	3.8	5.7	2.5
20-ton %	13.6	-28.8	-31.6
10-ton %	14.5	-27.3	-30.7
5-ton %	17.2	-27	-30.2

SCS/CARD: Iowa State University

pesticide use by region also are presented in Appendix Tables 7 and 8.

Tillage and Conservation Practices

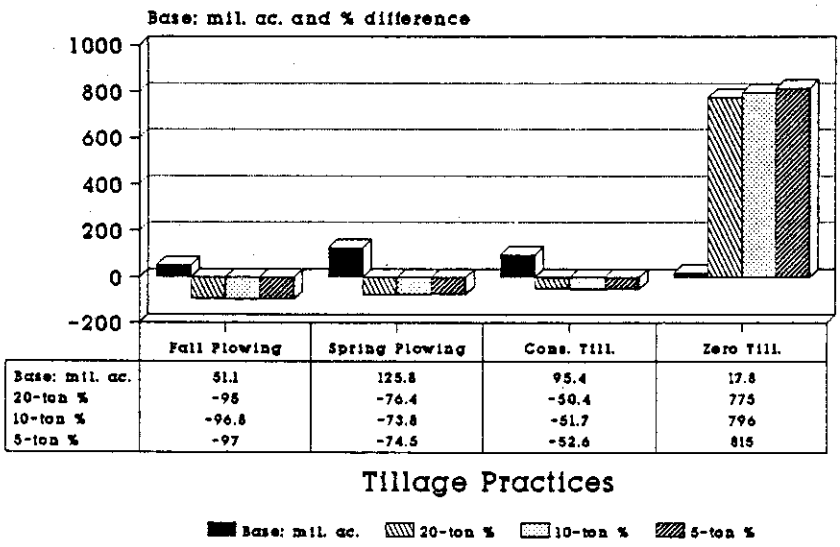
Increases in the use of zero tillage methods were on the order of seven- to eightfold and were the dominant predicted strategy for erosion control for all CC levels (Figure 20). Estimates for fall plowing tillage practices fell slightly more than those for spring plowing tillage practices. The solutions for the scenarios also used approximately 50 percent less conservation tillage, changing to zero tillage to satisfy the erosion restrictions. Strip cropping activities were lower for both 20- and 10-ton scenarios, but they increased thirteenfold under the 5-ton scenario (Figure 21). Estimates of the regional use of other conservation practices are shown in Appendix Table 10. Terracing activity levels changed little; generally they were not used even in the base, and those used typically were forced in the solution by artificial constraints. Contouring was employed in most regions for the 20-ton scenario; at the 10- and 5-ton levels, strip cropping became important as a practice to limit soil loss.

Results When Cropping Patterns are Preserved

The second set of conservation compliance scenarios included soil loss limits of 10 tons and 5 tons per acre. Estimates of the impacts of restricting erosion again were compared to the base. Recall that the model formulation used to evaluate these restrictions differed from that for the

Figure 20. Nat. Use of Tillage Practice Conservation Compliance Scenarios

Historical Cropping Patterns Relaxed

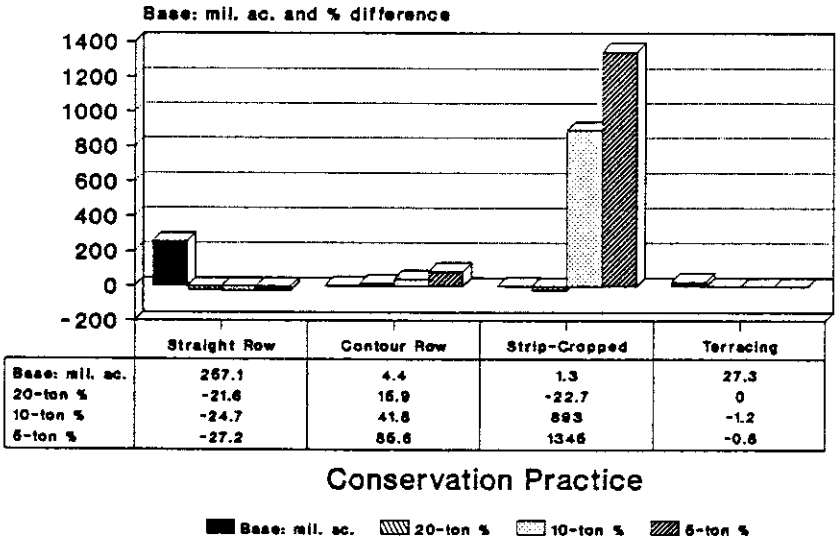


	Fall Plowing	Spring Plowing	Cons. Till.	Zero Till.
Base: mil. ac.	51.1	125.8	95.4	17.8
20-ton %	-95	-76.4	-50.4	775
10-ton %	-96.8	-73.8	-51.7	796
5-ton %	-97	-74.5	-52.6	815

SCS/CARD: Iowa State University

Figure 21. Nat. Use of Cons. Practices Conservation Compliance Scenarios

Historical Cropping Patterns Relaxed



	Straight Row	Contour Row	Strip-Cropped	Terracing
Base: mil. ac.	267.1	4.4	1.3	27.3
20-ton %	-21.6	16.9	-22.7	0
10-ton %	-24.7	41.8	893	-1.2
5-ton %	-27.2	86.6	1346	-0.6

SCS/CARD: Iowa State University

first set of analyses. In the second set, the basal restrictions on shifts in crop acreage among market regions remained in effect.

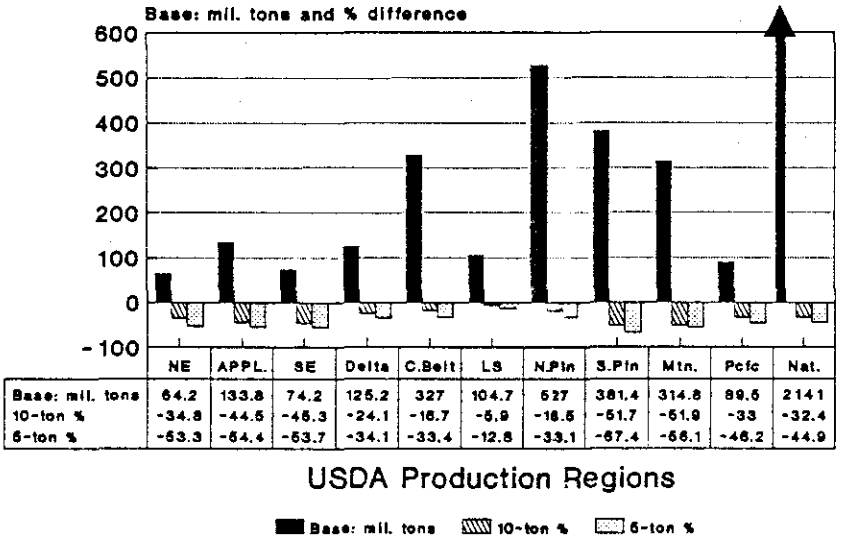
Erosion

Estimates of national total soil erosion for cropland use activities decreased 32.4 and 44.9 percent for the 10- and 5-ton restrictions, respectively (Figure 22). Estimates of per acre soil loss for wind erosion and sheet and rill erosion decreased 33.7 and 46.9 percent, respectively, for the two scenarios (Figure 23). Wind erosion abatement was slightly greater than sheet and rill erosion abatement, probably because of an absolute decline in cropped land in the Southern Plains, the only region with such a decline.

All regions had lower estimates of sheet and rill erosion (Appendix Table 11). Wind erosion, however, increased in the Northeast and Appalachian regions, although wind levels appeared insignificant in these regions. For other regions primarily outside the Northeast, wind erosion decreased consistent with crop land levels. The exception was in the Southeast, where total cropped land decreased and total erosion decreased proportionately more from the base.

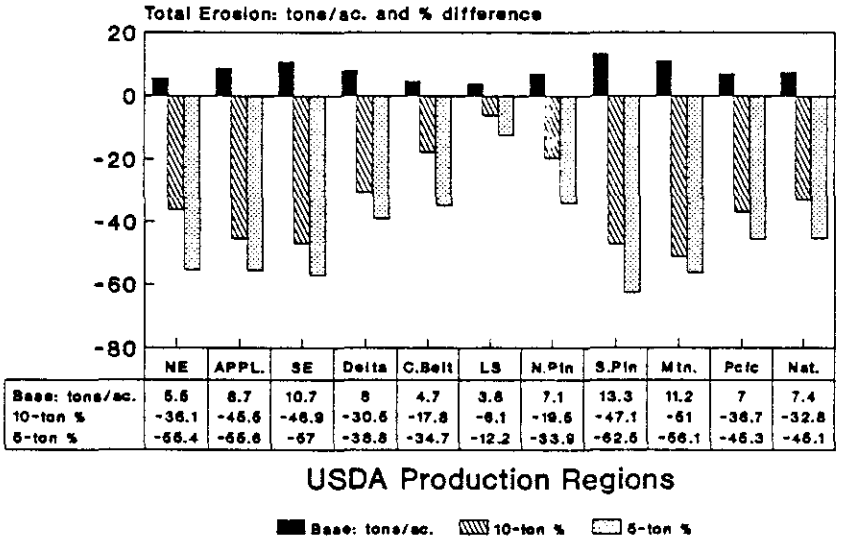
Total soil erosion declined for the two scenarios, but at a cost. There was 32.4 percent less total erosion than in the base for the 10-ton scenario, accompanied by an associated increase in production costs of 2.2 percent. Increasing the compliance level from 10 tons to 5 tons decreased total erosion by an additional 12.5 percent but increased cost by 1.7 percent. Regionally only Appalachia, the Southeast, and the Northern

Figure 22. National Soil Erosion Totals
Conservation Compliance Scenarios
Historical Cropping Patterns Preserved



SCS/CARD: Iowa State University

Figure 23. Total Soil Loss Per Acre
Conservation Compliance Scenarios
Historical Cropping Patterns Preserved



SCS/CARD: Iowa State University

Plains had higher cost estimates. Between the 10- and the 5-ton scenarios, all regions had higher estimated costs, primarily because of increases in cropped land and land improvements. Exceptions were for regions where cropped acres declined.

Land Use and Commodity Production

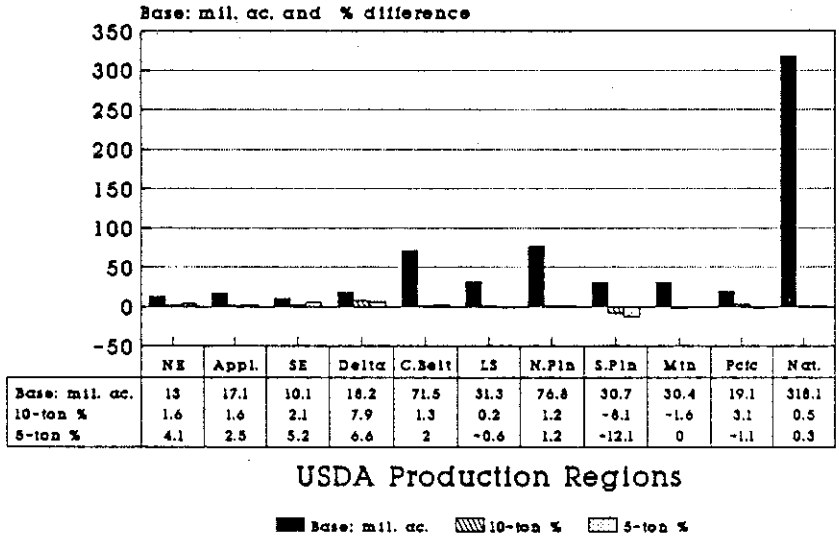
Total cropland use increased modestly by 0.5 and 0.3 percent for the two scenarios, respectively (Figure 24). A comparison of the two levels (Figure 25) reveals, however, that idle land was reduced relative to the baseline. More land was double cropped or converted with the 10-ton level. However, when the erosion restriction was tightened to the 5-ton-per-acre level, there was a considerable change in this pattern: a threefold increase in conversion of less erodible potential cropland, less idling of land, and lower use of double cropping compared to the 10-ton scenario.

Total commodity production changed little, since demand was fixed (Figures 26, 27, and 28). In moving from the 10- to the 5-ton level, total production of corn and wheat decreased and total production of soybeans increased. Total cotton production declined for both levels, influenced by a large decline of cotton acreage in the Southern Plains (Appendix Table 13).

Commodity production shifts among regions were mixed for the alternative compliance levels. At both levels, corn production increased in the Northeast, Appalachian, Corn Belt, and Northern Plains regions and decreased in the Southern Plains and Pacific regions. As the level was tightened, corn production shifted to the Northeast, Corn Belt, and Lake

Figure 24. Comparison of Land Use Conservation Compliance Scenarios

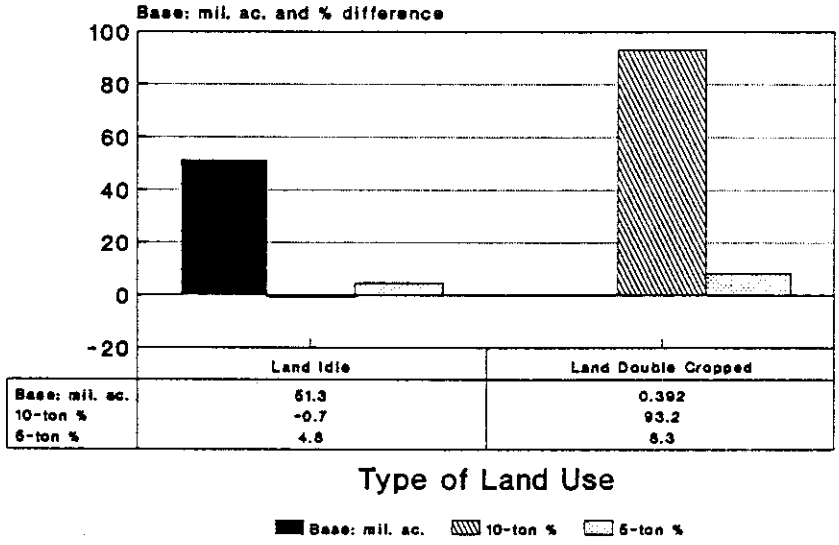
Historical Cropping Patterns Preserved



SCS/CARD: Iowa State University

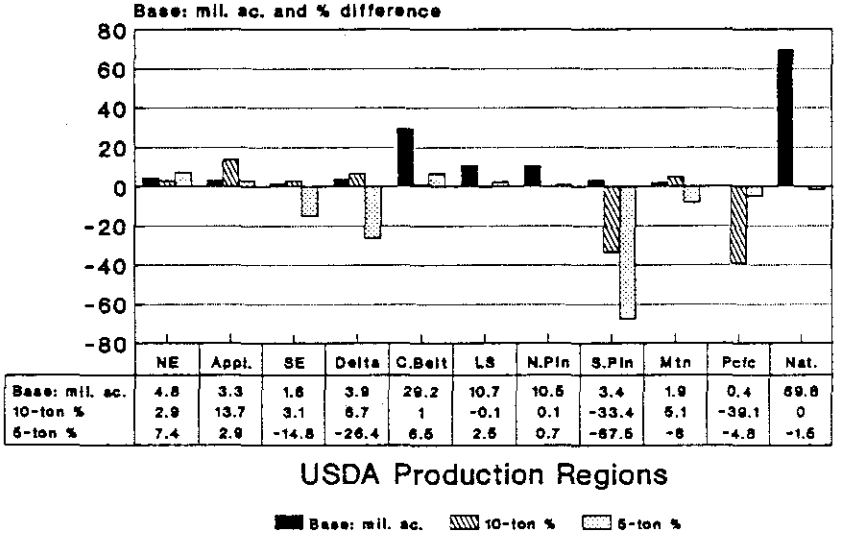
Figure 25. Idle Land & Double Cropping Conservation Compliance Scenarios

Historical Cropping Patterns Preserved



SCS/CARD: Iowa State University

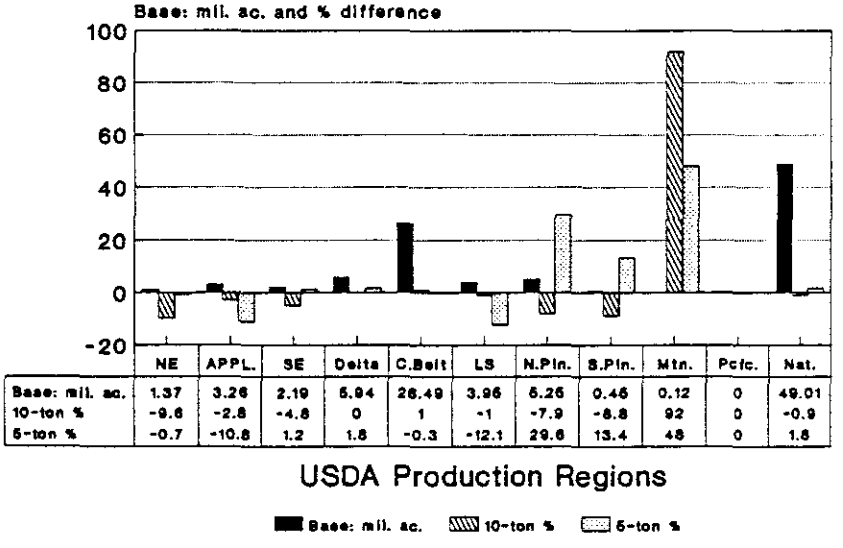
Figure 26. Production of Corn
Conservation Compliance Scenarios
Historical Cropping Patterns Preserved



	NE	Appl.	SE	Delta	C.Belt	LS	N.Pln	S.Pln	Mtn	Pcfc	Nat.
Base: mil. ac.	4.8	3.3	1.6	3.9	29.2	10.7	10.5	3.4	1.9	0.4	69.8
10-ton %	2.9	13.7	3.1	6.7	1	-0.1	0.1	-33.4	5.1	-39.1	0
5-ton %	7.4	2.9	-14.8	-26.4	6.5	2.5	0.7	-67.5	-8	-4.8	-1.6

SCS/CARD: Iowa State University

Figure 27. Production of Soybeans
Conservation Compliance Scenarios
Historical Cropping Patterns Preserved

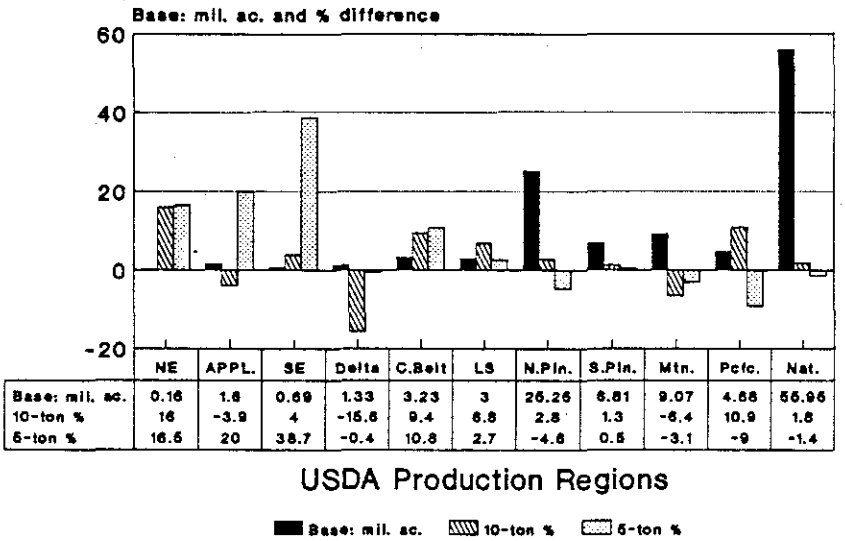


	NE	APPL.	SE	Delta	C.Belt	LS	N.Pln.	S.Pln.	Mtn.	Pcfc.	Nat.
Base: mil. ac.	1.37	3.26	2.19	5.94	26.49	3.96	5.26	0.46	0.12	0	49.01
10-ton %	-9.6	-2.8	-4.8	0	1	-1	-7.9	-6.8	92	0	-0.9
5-ton %	-0.7	-10.8	1.2	1.8	-0.3	-12.1	29.6	13.4	48	0	1.8

SCS/CARD: Iowa State University

Figure 28. Production of Wheat Conservation Compliance Scenarios

Historical Cropping Patterns Preserved



SCS/CARD: Iowa State University

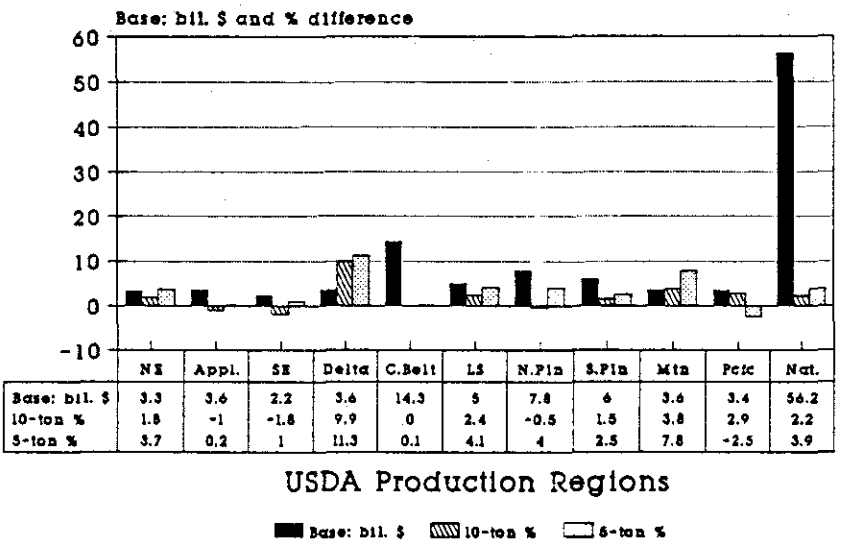
States (Figure 26). Wheat production had a similar shift to the Northeast, the Southeast, and the Corn Belt (Figure 28). Soybean production pattern shifts differed from those for the feed grains and wheat. The Mountain region experienced a significant increase in soybean acres, and acreage was reduced in Appalachia, the Lake States, and the Corn Belt (Figure 27). Cotton production shifted from the Southern Plains for both CC levels.

Crop Production Costs and Imputed Consumer Prices

Total production costs increased nationally, rising 2.2 percent above the baseline for the 10-ton CC scenario and another 1.7 percent for the 5-ton scenario (Figure 29). Crop production costs increased in all regions except the Southern Plains. These increases in total cost were due primarily to the increases in cropped acres. Between the 10-ton and the 5-ton levels, estimates for crop sector production costs increased 2.8 percent (Figure 30). There was essentially no change in livestock production costs nationally, and transportation costs also were similar between the base and the scenarios. Land improvement costs increased in the scenarios to meet erosion abatement goals. Commodity price estimates for domestic consumers averaged 5.7 percent higher between the base and the 10-ton scenario (Figure 31). This increase in consumer costs was greater than the increase in crop sector production costs, indicating some improvement in producer welfare. Imputed marginal values for selected commodities (Figure 32) indicate an increase for corn and wheat and a decrease for soybeans and hay compared to the base.

Figure 29. Comparison: Total Prod. Cost Conservation Compliance Scenarios

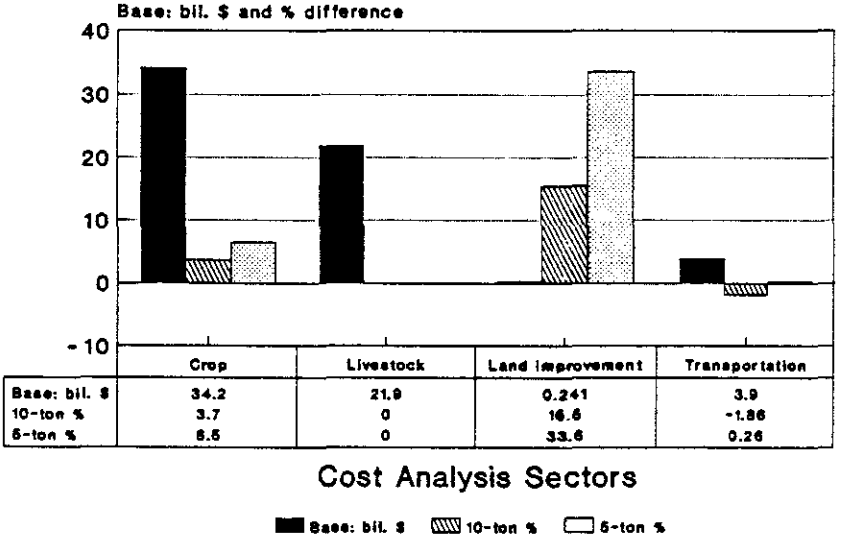
Historical Cropping Patterns Preserved



SCS/CARD: Iowa State University

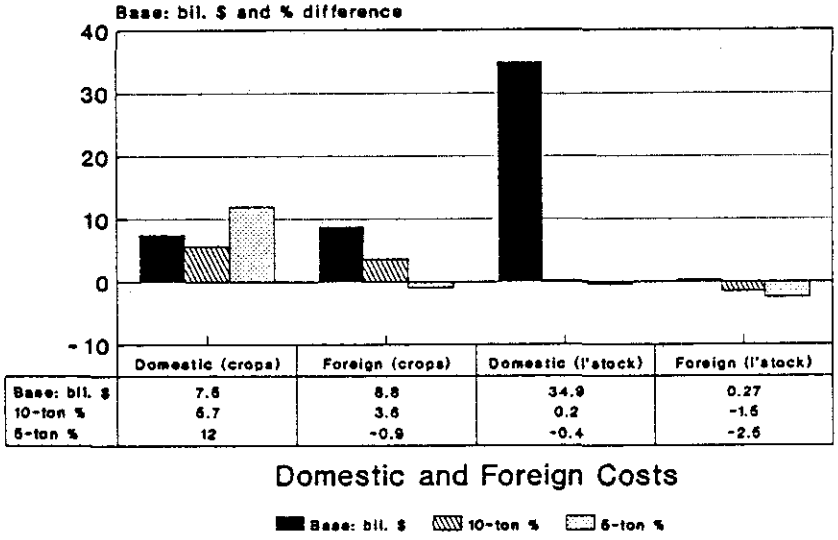
Figure 30. Comparison of Costs Conservation Compliance Scenarios

Historical Cropping Patterns Preserved



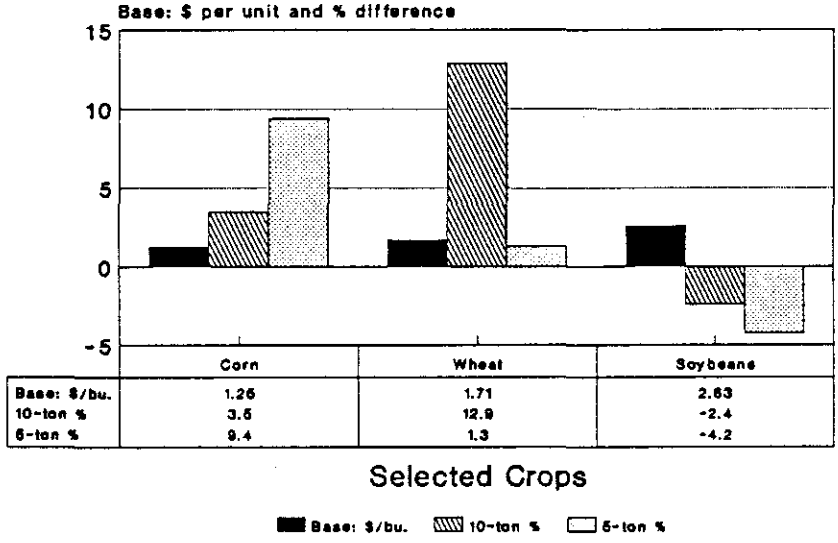
SCS/CARD: Iowa State University

Figure 31. Consumer Costs
Conservation Compliance Scenarios
Historical Cropping Patterns Preserved



SCS/CARD: Iowa State University

Figure 32. Marginal Value (cost) Est.
Conservation Compliance Scenarios
Historical Cropping Patterns Preserved



SCS/CARD: Iowa State University

Chemical Inputs

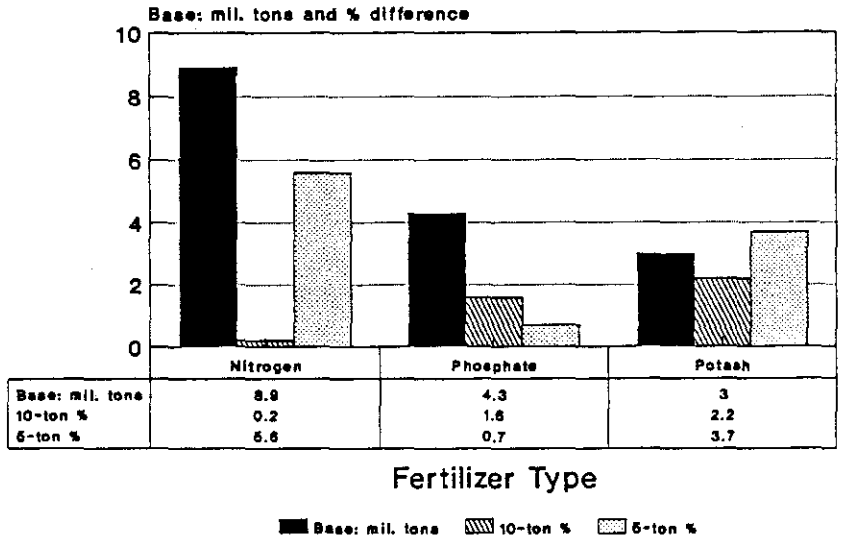
Nitrogen fertilizer use increased nationally for both scenarios (Figure 33). Nitrogen fertilizer estimates increased 5.6 percent for the 5-ton-per-acre scenario, and other fertilizer input use estimates increased similarly. Pesticide expenditures increased by 6.9 and 11.7 percent above the baseline for the 10- and 5-ton scenarios, respectively (Figure 34). Some of this estimated increase in pesticide use was due to expanded acreage; moreover, conservation tillage practices generally employ more pesticides per acre than do conventional cropping practices. The Delta region, for example, where cropped land estimates show a relatively large expansion in conservation tillage, also showed the largest increase in pesticide, machinery, and labor costs compared to the baseline (Appendix Table 18).

Tillage and Conservation Practices

Tillage practice estimates (Figure 35) indicate that straight row cropping methods declined as erosion restrictions were tightened. There were increases of 7.2 percent and 2.1 percent in the use of spring plowing and conservation cropping practices for the 10- and 5-ton scenarios, respectively. The impacts of 10-ton or 5-ton soil loss restrictions for conservation practices are shown in Figure 36. The use of straight row tillage decreased, while both contouring and strip cropping increased significantly as restrictions were tightened.

Figure 33. Estimates of Fertilizer Use Conservation Compliance Scenarios

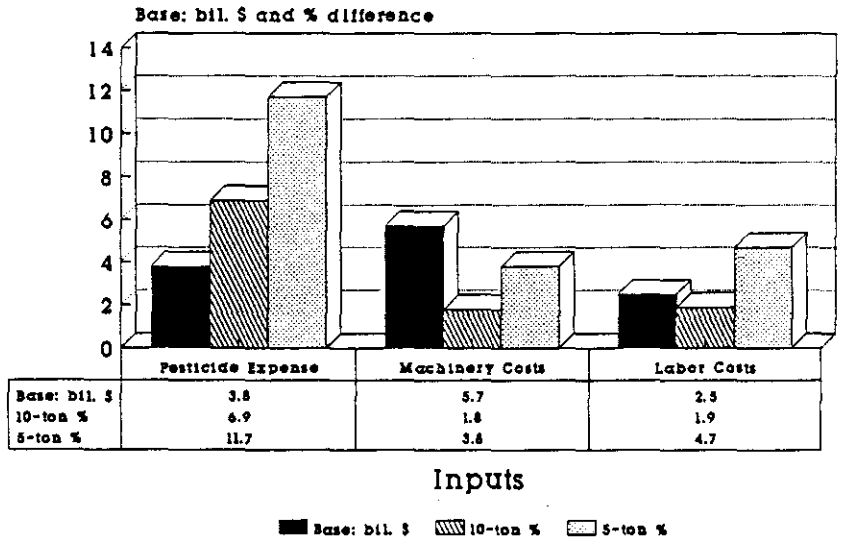
Historical Cropping Patterns Preserved



SCS/CARD: Iowa State University

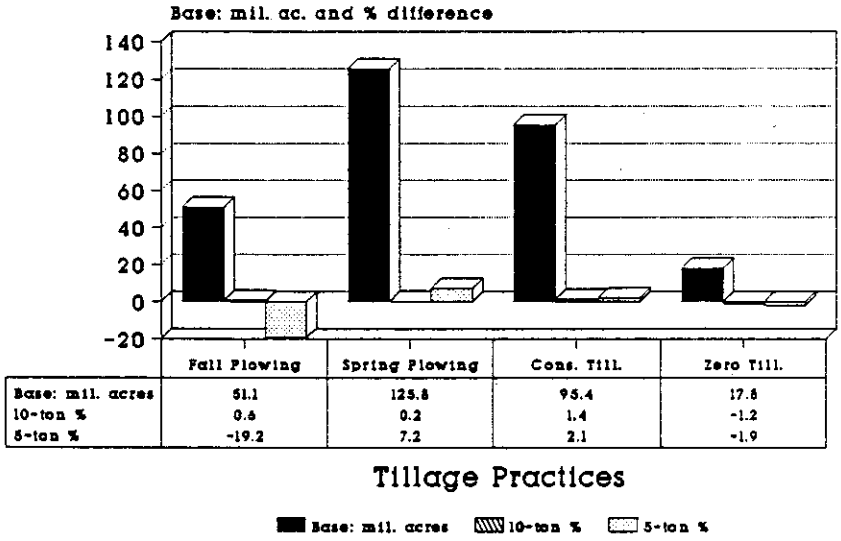
Figure 34. Pest., Mach., and Labor Use Conservation Compliance Scenarios

Historical Cropping Patterns Preserved



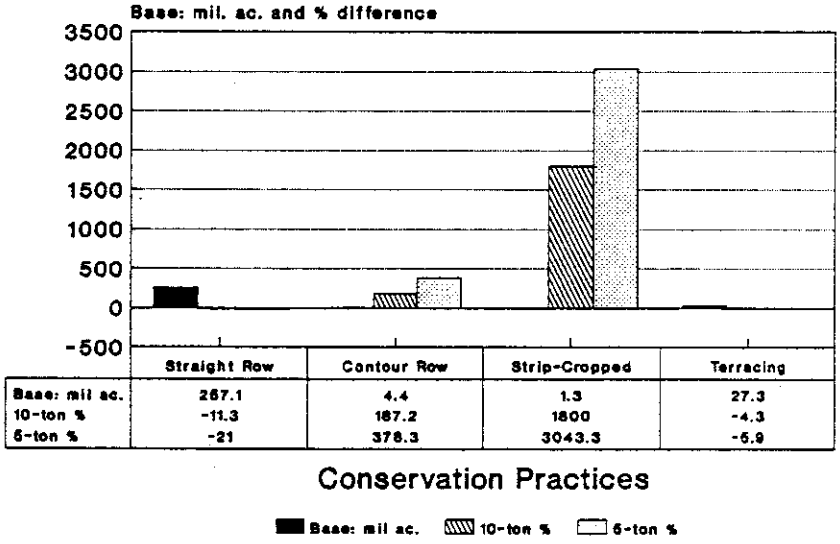
SCS/CARD: Iowa State University

Figure 35. Nat. Use / Tillage Practices
Conservation Compliance Scenarios
Historical Cropping Patterns Preserved



SCS/CARD: Iowa State University

Figure 36. Nat. Use / Cons. Practices
Conservation Compliance Scenarios
Historical Cropping Patterns Preserved



SCS/CARD: Iowa State University

Conclusions

Results of these analyses indicate that conservation compliance at the levels studied would reduce cropland erosion in most regions 30-60 percent from the baseline level. Major shifts to conservation tillage and other erosion-reducing cropping practices were required to achieve compliance, although such shifts lead to increases in the cost of production. Analysis shows that CC would not have the same impact on total erosion or total cost for all U.S. production regions. Differences in regional soil endowments and inherent erodibility, coupled with comparative regional advantages in commodity production, influenced acreage shifts, production costs, and total erosion levels.

For the first set of evaluations (20-, 10-, or 5-ton erosion limits), total costs of production were reduced 8-9 percent. This was, however, generally a result of the elimination of constraints on regional production. Regionally there were even greater changes in costs, largely the result of the shifts in cropped acreage. Zero tillage was the dominant strategy used to meet the erosion restrictions, along with shifts from straight row tillage to contour and strip cropping. As a result of these changes in tillage practice, pesticide expenditures were 13-17 percent higher, while machinery and labor costs were 27-30 percent lower. Imputed domestic consumer costs increased more than costs of production. However, elimination of the regional cropland allocation constraints simultaneous to implementation of conservation compliance made it difficult to evaluate the two factors separately. The comparisons most useful from this set of

evaluations are those between the alternative levels, not those between the CC levels and the baseline.

The second set of evaluations maintained the flexibility constraints from the base. Total erosion was significantly reduced 30-45 percent, with associated increases in production of 2-5 percent. The increase in total cost is related to crop production and transportation. Total land use increased 0.3-0.5 percent, and--for most regions--the erosive impact of greater land use was more than offset by shifts in cropping patterns and tillage practices that reduced per acre erosion. Land use increased most in the Delta region, which experienced 38 percent less total erosion. On the whole, commodity production changed little. Because final demands were fixed, the only possible changes were for intermediate inputs and (in a few cases) overproduction resulting from crop rotations that lessened erosion. Contour and strip cropping increased relative to the baseline, as did zero tillage. Conservation tillage practices required greater total expenditures for pesticides. Finally, imputed domestic consumer prices increased more than did production costs.

Appendix Tables

Table A1. Interregional comparison of per acre and total annual erosion estimated for baseline and conservation compliance scenarios (market region cropping patterns relaxed)

Variable/ Run	NE[d]	Appl.	SE	Delta	CnBlt	LS	N.Plns	S.Plns	Mntn	Pcfc	Natnl
Erosion/ ac.(tons)					(percent difference from base)						
Sheet and rill											
base (tons/ac.)[a]	5.2	7.9	9.6	6.9	3.9	2.2	2.4	2.7	1.5	3.5	3.5
20 tons[bc]	-31.2	-53.8	-78.6	-54.3	-72.1	-62.6	-52.1	-49.8	-33.0	-36.0	-56.5
10 tons	-34.3	-63.5	-84.7	-50.0	-74.1	-56.9	-59.3	-54.4	-46.4	-81.1	-62.4
5 tons	-57.2	-75.0	-85.1	-67.4	-76.8	-56.0	-60.4	-59.1	-47.2	-82.9	-68.7
Wind											
base (tons/ac.)	0.3	0.8	1.1	1.1	0.8	1.6	4.7	10.6	9.7	3.5	3.8
20 tons	2.3	22.1	1.4	-18.5	3.9	-38.1	-30.5	-27.4	-16.9	-28.0	-27.3
10 tons	2.2	16.2	1.4	-18.9	-1.2	-39.8	-35.3	-54.2	-59.0	-42.6	-46.9
5 tons	1.7	18.2	2.6	18.1	-6.7	-36.2	-44.5	-63.8	-62.6	-55.1	-53.9
Per acre total											
base (tons/ac.)	5.5	8.7	10.7	8.0	4.7	3.8	7.1	13.3	11.2	7.0	7.4
20 tons	-29.6	-47.2	-70.2	-49.4	-59.2	-46.4	-37.8	-31.9	-19.0	-32.0	-41.3
10 tons	-32.4	-56.5	-75.7	-45.7	-61.6	-49.6	-43.3	-54.2	-57.3	-61.7	-54.3
5 tons	-54.1	-66.8	-75.9	-60.6	-64.9	-47.6	-49.8	-62.8	-60.6	-68.9	-61.0
Regional total											
base (mil. tons)	64.2	133.8	74.2	125.2	327.0	104.7	527.0	381.4	314.8	89.5	2141.9
20 tons	-36.6	-65.8	-85.6	-50.0	-62.8	-50.9	-56.6	-41.8	-43.1	-37.2	-52.4
10 tons	-38.9	-69.1	-88.2	-46.4	-63.8	-53.1	-58.6	-64.9	-66.7	-67.0	-62.2
5 tons	-58.0	-77.6	-87.0	-61.4	-65.2	-50.3	-65.0	-71.3	69.0	-72.7	-67.5

SOURCE: Agricultural Resources Interregional Modeling System (ARIMS).

[a]Base refers to ARIMS projected 1990 scenario with a 45-million-acre CRP enrollment (baseline) and no limits on allowable soil loss.

[b]20, 10, and 5 refer to ARIMS projected 1990 baseline scenario and limits on per acre soil loss for conservation compliance.

[c]Market region cropland flexibility constraints were made unrestrictive across regions.

[d]USDA Production Regions:

NE = Northeast
Appl. = Appalachian
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Pcfc = Pacific
Natnl = National

Table A2. Interregional comparison of land use estimates for baseline and conservation compliance scenarios (market region cropping patterns relaxed)

Variable/ Run	NE[d]	Appl.	SE	Delta	CnBlt	LS	N.Plns	S.Plns	Mntn	Pcfc	Natnl
	(percent difference from base)										
Cropped land											
base (mil. ac.)[a]	13.0	17.1	10.1	18.2	71.5	31.3	76.8	30.7	30.4	19.1	318.1
20 tons[bc]	-7.7	-31.8	-35.4	-1.0	-8.7	-7.4	-29.3	-13.5	-27.5	-7.3	-17.3
10 tons	-7.3	-26.0	-35.2	-1.1	-5.5	-6.1	-26.1	-21.7	-20.2	-13.3	-15.8
5 tons	-6.3	-29.4	-31.5	-1.7	-0.8	-4.4	-29.3	-21.2	-19.6	-13.6	-15.4
Pot. land conv.											
base (1000 ac.)	19.0	0.0	0.0	566.0	537.0	57.0	67.0	1880.0	379.0	682.0	4186.0
20 tons	854.8	0.0	0.0	2.5	45.2	0.0	-100.0	17.5	-98.5	-16.2	4.6
10 tons	854.8	0.0	0.0	3.0	45.2	0.0	-100.0	-11.1	-98.5	-16.7	-8.2
5 tons	854.8	0.0	0.0	3.0	45.2	0.0	-100.0	-11.1	-100.0	-16.7	-8.3
Green cover											
base (mil. ac.)	2.9	2.4	5.7	2.1	13.1	8.6	5.3	7.4	2.9	1.0	51.3
20 tons	39.6	226.0	62.5	13.6	49.3	26.8	436.3	54.7	273.5	123.5	107.9
10 tons	37.9	184.6	62.2	15.1	31.8	22.2	391.5	84.8	186.1	236.5	97.6
5 tons	33.3	206.3	55.6	24.0	5.7	16.0	434.1	81.8	188.3	245.8	94.5
Double crop											
base (1000 ac.)	323.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.0	42.0	392.0
20 tons	-100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100.0	2016.1	124.8
10 tons	-100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100.0	3652.0	298.6
5 tons	-100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100.0	4900.3	431.2

SOURCE: Agricultural Resources Interregional Modeling System (ARIMS).
[a]Base refers to ARIMS projected 1990 scenario with a 45-million-acre CRP enrollment (baseline) and no limits on allowable soil loss.
[b]20, 10, and 5 refer to ARIMS projected 1990 baseline scenario and limits on per acre soil loss for conservation compliance.
[c]Market region cropland flexibility constraints were made unrestrictive across regions.
[d]USDA Production Regions:

NE = Northeast	CnBlt = Corn Belt	Mntn = Mountain
Appl. = Appalachian	LS = Lake States	Pcfc = Pacific
SE = Southeast	N.Plns = Northern Plains	Natnl = National
Delta = Delta	S.Plns = Southern Plains	

Table A3. Interregional comparison of estimated acres of selected crops in the baseline and conservation compliance scenarios (market region cropping patterns relaxed)

Variable/ Run	NE[d]	Appl.	SE	Delta	CnBlt	LS	N.Plns	S.Plns	Mntn	Pcfc	Natnl
	(percent difference from base)										
Corn prod.											
base (mil. ac.)[a]	4.79	3.30	1.61	3.86	29.23	10.72	10.54	3.41	1.92	0.40	69.79
20 tons[bc]	52.40	-7.50	-37.40	61.00	-20.20	6.30	-21.30	36.80	20.40	14.60	-2.50
tons	51.80	5.20	-34.90	43.70	-19.30	4.70	-22.90	31.90	66.80	-31.20	-2.20
5 tons	50.00	3.70	-26.30	45.60	-20.60	4.50	-15.20	-10.70	67.50	-54.60	-3.70
Wheat Prod.											
base (mil. ac.)	0.16	1.60	0.69	1.33	3.23	3.10	25.25	6.81	9.07	4.68	55.95
20 tons	-100.00	-32.80	-56.10	-94.70	52.40	64.60	-37.40	-1.50	-1.50	17.70	-13.40
10 tons	-84.10	-24.30	-51.90	-88.00	96.10	85.00	-28.10	-1.20	-2.10	1.40	-6.50
5 tons	-79.00	0.50	-41.20	-52.90	194.00	105.80	-33.20	-37.40	-6.80	-0.20	-5.50
Soybeans Prod.											
base (mil. ac.)	1.37	3.26	2.19	5.94	26.49	3.95	5.25	0.45	0.12	0.00	49.01
20 tons	54.00	-89.10	-77.60	-62.50	2.60	35.70	58.30	197.60	101.50	0.00	-2.90
10 tons	55.30	-90.30	-80.40	-61.70	1.90	27.30	72.70	224.60	150.00	0.00	-2.10
5 tons	54.70	-94.50	-91.30	-59.50	-0.30	28.80	103.40	217.80	294.50	0.00	-0.10
Cotton Prod.											
base (mil. ac.)	0.00	1.56	0.33	1.73	0.20	0.00	0.00	6.88	0.23	0.80	11.71
20 tons	0.00	45.50	-83.50	67.10	-9.80	0.00	0.00	-34.20	-100.00	-100.00	-15.40
10 tons	0.00	55.60	-83.50	108.70	17.20	0.00	0.00	-45.60	-100.00	-100.00	-14.10
5 tons	0.00	47.20	30.90	74.50	7.00	0.00	0.00	-34.30	-100.00	-100.00	-10.70

SOURCE: Agricultural Resources Interregional Modeling System (ARIMS).

[a]Base refers to ARIMS projected 1990 scenario with a 45-million-acre CRP enrollment (baseline) and no limits on allowable soil loss.

[b]20, 10, and 5 refer to ARIMS projected 1990 baseline scenario and limits on per acre soil loss for conservation compliance.

[c]Market region cropland flexibility constraints were made unrestrictive across regions.

[d]USDA Production Regions:

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Table A4. Interregional comparison of selected production costs in the baseline and conservation compliance scenarios (market region cropping patterns relaxed)

Variable/ Run	NE[d]	Appl.	SE	Delta	CnBlt	LS	N.Plns	S.Plns	Mntn	Pcfc	Natnl
					(percent difference from base)						
Production costs											
base (mil. $)[a]	3272.5	3567.1	2242.5	3634.2	14324.0	4953.1	7761.8	5969.1	3557.5	3448.9	56228.0
20 tons[bc]	-6.9	-12.9	-37.0	12.6	-7.7	2.8	-20.8	-6.3	-12.5	-23.0	-9.4
10 tons	-6.5	-7.3	-35.3	12.7	-6.8	3.6	-17.8	-10.7	-10.3	-24.4	-8.9
5 tons	-6.3	-12.6	-28.1	11.4	-5.0	5.1	-18.2	-10.1	-9.4	-25.6	-8.2
Crop costs											
base (mil. $)	1382.8	1997.6	1057.7	2105.5	9339.5	3175.3	5800.5	3114.1	2120.8	1472.6	34267.0
20 tons	-8.8	-19.7	-47.7	13.0	-16.2	-4.4	-25.6	-15.8	-24.0	-21.7	-15.7
10 tons	-8.5	-12.7	-47.9	15.5	-13.2	-4.0	-22.4	-23.4	-21.5	-27.7	-14.8
5 tons	-7.4	-17.4	-35.0	10.3	-10.0	-2.7	-24.2	-21.0	-20.4	-27.4	-13.6
Livestock costs											
base (mil. $)	1890.0	1578.5	1184.8	1528.7	4984.3	1777.8	1961.4	2855.1	1436.6	1976.3	21960.6
20 tons	-5.5	-4.5	-27.4	12.1	8.2	15.6	-6.5	4.0	4.4	-24.0	0.3
10 tons	-5.1	-0.4	-24.3	8.8	5.1	17.1	-4.2	3.3	6.1	-22.0	0.4
5 tons	-5.4	-6.5	-22.0	12.9	4.5	19.0	-0.6	1.7	6.9	-24.3	0.3
Land improvement											
base (mil. $)	318.7	6666.1	8723.1	9433.5	33917.3	1909.2	99835.3	54047.7	19547.1	7238.2	241634.0
20 tons	0.9	-5.1	-10.8	7.3	-0.3	-0.5	15.8	34.4	48.1	-47.1	17.2
10 tons	0.9	-3.9	9.5	9.3	0.0	1.9	12.5	53.1	28.9	-45.6	18.6
5 tons	0.9	-0.5	10.7	62.7	3.5	1.3	12.9	20.4	32.3	-42.0	14.6
Transportation											
base (mil. $)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3871.79
20 tons	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-4.86
10 tons	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3.76
5 tons	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3.17

SOURCE: Agricultural Resources Interregional Modeling System (ARIMS).

[a]Base refers to ARIMS projected 1990 scenario with a 45-million-acre CRP enrollment (baseline) and no limits on allowable soil loss.

[b]20, 10, and 5 refer to ARIMS projected 1990 baseline scenario and limits on per acre soil loss for conservation compliance.

[c]Market region cropland flexibility constraints were made unrestrictive across regions.

[d]USDA Production Regions:

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Table A5. National estimates of domestic and foreign consumer cost of commodities from the crop and livestock sectors (market region cropping patterns relaxed)

Variable	Base	20 tons[ab]	10 tons	5 tons
		(percent difference from base)		
Domestic consumer cost: crops (mil. $)	7512.873	7.8	9.4	12.2
Domestic consumer cost: livestock (mil. $)	34871.579	6.1	6.5	6.4
Total	0	6.4	7.1	7.4
Foreign consumer cost: crop (mil. $)	8825.118	4.1	5.9	7.8
Foreign consumer cost: livestock (mil. $)	270.217	8.2	8.8	8
Total	0	4.3	6	7.8

[a]Refers to the assumption of unrestricted market region cropped acreage change.
[b]20, 10, 5 refer to ARIMS projected 1990 baseline scenario and limits on per acre soil loss for conservation compliance.

Table A6. Interregional comparison of marginal value (cost) estimates for selected crops in the baseline and conservation compliance scenarios (market region cropping patterns relaxed)

Variable/ Run	NE[d]	Appl.	SE	Delta	CnBlt	LS	N.Plns	S.Plns	Mntn	Pcfc	Natnl
	(percent difference from base)										
Corn											
base ($)[a]	1.45	1.46	1.56	1.45	1.20	1.18	1.14	1.49	1.36	1.91	1.25
20 tons[bc]	-0.80	5.10	10.80	5.60	7.80	8.10	15.70	4.50	11.70	10.70	9.50
10 tons	-0.80	3.90	10.90	5.70	7.60	7.90	14.80	4.50	8.90	9.20	8.80
5 tons	0.00	6.00	12.30	7.80	8.40	8.30	15.70	7.60	8.20	8.60	9.50
Wheat											
base ($)	1.95	2.00	2.05	1.90	1.79	1.67	1.57	1.77	1.65	2.12	1.71
20 tons	-100.00	8.60	6.00	13.00	5.50	-3.20	4.90	7.50	7.20	5.70	6.70
10 tons	14.30	11.40	10.00	17.40	8.90	0.20	9.70	11.90	16.60	10.40	12.10
5 tons	15.40	11.70	14.10	21.80	13.40	5.40	16.70	18.00	24.70	15.60	18.40
Soybeans											
base ($)	2.81	2.80	2.95	2.81	2.58	2.57	2.56	2.75	2.67	0.00	2.63
20 tons	1.70	3.30	-1.50	0.80	0.60	0.20	2.90	-2.70	0.40	0.00	-0.10
10 tons	1.70	3.10	-1.60	0.40	0.60	0.30	2.80	-2.60	-0.60	0.00	-0.10
5 tons	2.40	3.70	0.00	1.70	1.90	1.10	3.90	-1.10	0.50	0.00	1.10
Cotton											
base ($)	0.00	169.34	169.34	169.34	169.34	0.00	0.00	169.34	169.34	169.34	169.34
20 tons	0.00	11.80	11.80	11.80	11.80	0.00	0.00	11.80	-100.00	-100.00	11.80
10 tons	0.00	15.20	15.20	15.20	15.20	0.00	0.00	15.20	-100.00	-100.00	15.20
5 tons	0.00	19.60	19.60	19.60	19.60	0.00	0.00	19.60	-100.00	-100.00	19.60
Hay											
base ($)	2.35	7.57	3.50	11.94	4.00	1.63	2.18	7.26	3.67	9.74	3.73
20 tons	-94.10	84.20	105.10	-100.00	-100.00	-100.00	-100.00	132.10	92.50	45.00	107.40
10 tons	-94.00	89.50	111.80	-100.00	-100.00	-100.00	-100.00	136.90	111.90	61.90	240.00
5 tons	-100.00	-100.00	96.10	-100.00	-100.00	-100.00	-100.00	99.20	197.40	43.90	233.50

SOURCE: Agricultural Resources Interregional Modeling System (ARIMS).

[a]Base refers to ARIMS projected 1990 scenario with a 45-million-acre CRP enrollment (baseline) and no limits on allowable soil loss.

[b]20, 10, and 5 refer to ARIMS projected 1990 baseline scenario and limits on per acre soil loss for conservation compliance.

[c]Market region cropland flexibility constraints were made unrestrictive across regions.

[d]USDA Production Regions:

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Table A7. Interregional comparison of estimates for fertilizer cost and use in the baseline and conservation compliance scenarios (market region cropping patterns relaxed)

Variable/ Run	NE[d]	Appl.	SE	Delta	CnBlt	LS	N.Plns	S.Plns	Mntn	Pcfc	Natnl
					(percent difference from base)						
Fertilizer cost											
base (mil. $)[a]	290.3	377.6	173.7	438.1	1840.5	527.0	867.1	458.0	266.4	152.4	5391.1
20 tons[bc]	-1.0	-22.4	-48.5	39.7	-20.3	-4.4	-26.1	1.2	10.2	23.3	-10.3
10 tons	-0.6	-18.5	-50.5	30.3	-15.7	-2.1	-27.4	1.3	-2.7	25.4	-9.7
5 tons	0.6	-17.5	-42.2	29.4	-10.5	-0.6	-27.6	-20.0	-3.0	32.5	9.2
Total nitrogen used											
base (1000 tons)	266.4	443.5	324.3	693.5	2023.1	744.7	1955.7	1174.1	642.6	605.5	8873.0
20 tons	34.3	-15.8	-14.5	58.4	-26.2	5.0	-23.3	4.0	9.5	17.3	-4.0
10 tons	34.6	-9.9	-14.9	45.6	-20.1	8.1	-25.1	6.1	-1.9	18.6	-3.9
5 tons	32.8	-7.0	-8.7	51.2	-13.8	10.2	-28.5	-14.9	-2.3	21.7	-4.9
Total phos. used											
base (1000 tons)	366.3	410.9	201.0	394.6	1939.1	476.0	279.0	119.7	60.4	85.3	4332.0
20 tons	-17.7	-28.0	-50.8	27.3	-14.5	-11.6	-30.6	-26.0	0.0	-44.6	-15.3
10 tons	-17.4	-23.7	-52.9	19.7	-11.9	-9.9	-27.6	-31.1	-6.5	-43.0	-14.4
5 tons	-15.4	-26.9	-47.9	19.2	-10.0	-9.4	-15.5	-30.5	-4.3	-46.3	-12.6
Total potash used											
base (1000 tons)	123.8	170.0	107.0	228.7	982.0	269.3	577.7	212.2	231.3	103.3	3005.0
20 tons	6.2	-27.1	-38.3	21.1	-7.1	10.3	-18.5	6.5	-0.3	-42.7	-7.0
10 tons	6.6	-21.0	-40.0	13.3	-3.3	11.8	-19.7	0.1	-15.1	-41.5	-7.7
5 tons	8.1	-25.7	-34.0	15.6	3.0	12.4	-18.3	20.3	-16.5	-43.7	-6.8

SOURCE: Agricultural Resources Interregional Modeling System (ARIMS).
[a]Base refers to ARIMS projected 1990 scenario with a 45-million-acre CRP enrollment (baseline) and no limits on allowable soil loss.
[b]20, 10, and 5 refer to ARIMS projected 1990 baseline scenario and limits on per acre soil loss for conservation compliance.
[c]Market region cropland flexibility constraints were made unrestrictive across regions.
[d]USDA Production Regions:

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Table A8. Interregional comparison of pesticide, machinery, and labor cost estimates for the baseline and conservation compliance scenarios (market region cropping patterns relaxed)

Variable/ Run	NE[d]	Appl.	SE	Delta	CnBlt	LS	N.Plns	S.Plns	Mntn	Pcfc	Natnl
	(percent difference from base)										
Pesticide cost											
base (mil. $)[a]	141.1	310.2	194.6	287.3	1210.0	396.1	490.9	398.2	171.1	170.5	3769.9
20 tons[bc]	30.1	3.6	-24.3	29.8	9.1	33.0	19.8	35.5	-18.8	-14.7	13.6
10 tons	31.1	11.7	-25.6	41.1	11.0	31.7	25.9	11.4	-10.9	-8.2	14.5
5 tons	33.1	2.9	-9.5	32.5	10.4	31.8	32.1	28.8	-5.6	2.3	17.2
Machinery cost											
base (mil. $)	212.9	350.5	172.7	367.1	1534.7	552.8	1097.3	621.2	461.8	299.0	5669.8
20 tons	-28.9	-25.9	-61.9	4.4	-25.0	-17.6	-41.2	-34.2	-34.3	-29.8	-28.8
10 tons	-28.7	-18.5	-60.8	11.5	-22.9	-18.0	-38.0	-39.0	-29.6	-37.5	-27.3
5 tons	-28.2	-25.5	-45.2	1.4	-20.7	-17.0	-41.0	-31.9	-28.4	-39.3	-27.0
Labor cost											
base (mil. $)	109.0	153.3	83.0	164.1	653.2	236.2	466.6	279.3	163.2	136.6	2444.5
20 tons	-37.7	-27.1	-62.5	4.6	-29.2	-22.3	-41.8	-40.2	-31.7	-32.5	-31.6
10 tons	-37.5	-20.4	-60.7	7.1	-26.9	-22.5	-38.1	-44.3	-30.2	-44.3	-30.7
5 tons	-36.0	-26.3	-46.8	-0.3	-24.2	-21.2	-42.0	-36.5	-29.0	-48.0	-30.2
Water cost											
base (mil. $)	0.6	2.7	15.5	111.5	23.6	1.6	592.5	589.2	666.4	697.3	2701.0
20 tons	0.0	-62.4	2.6	4.4	-3.0	0.6	25.1	-4.6	-11.0	-32.0	-6.4
10 tons	0.0	-61.2	-1.8	8.3	-0.6	0.6	12.9	-9.1	-18.6	-27.6	-10.6
5 tons	0.0	-62.0	-2.7	19.2	22.8	0.6	17.0	-2.2	-16.1	-24.5	-6.2

SOURCE: Agricultural Resources Interregional Modeling System (ARIMS).

[a]Base refers to ARIMS projected 1990 scenario with a 45-million-acre CRP enrollment (baseline) and no limits on allowable soil loss.

[b]20, 10, and 5 refer to ARIMS projected 1990 baseline scenario and limits on per acre soil loss for conservation compliance.

[c]Market region cropland flexibility constraints were made unrestrictive across regions.

[d]USDA Production Regions:

NE = Northeast
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Table A9. Interregional comparison of tillage practices used for cropping in the baseline and conservation compliance scenarios (market region cropping patterns relaxed)

Variable/ Run	NE[d]	Appl.	SE	Delta	CnBlt	LS	N.Plns	S.Plns	Mntn	Pcfc	Natnl
Till. practice	(percent difference from base)										
Fall plowing											
base (1000 ac.)[a]	695.0	1208.0	330.0	1877.0	9369.0	7454.0	11228.0	3436.0	9978.0	5492.0	51068.0
20 tons[bc]	-100.0	-100.0	-100.0	-100.0	-100.0	-99.7	-98.1	-78.2	-88.3	-92.4	-95.0
10 tons	-100.0	-100.0	-100.0	-100.0	-100.0	-99.7	-98.0	-100.0	-90.3	-92.4	-96.8
5 tons	-100.0	-100.0	-100.0	-100.0	-100.0	-99.8	-98.6	-100.0	-90.4	-92.5	-97.0
Spring plowing											
base (1000 ac.)	7146.0	10119.0	5753.0	11701.0	20444.0	10082.0	32813.0	16322.0	6608.0	4803.0	125791.0
20 tons	-99.9	-48.4	-97.6	-3.4	-66.4	-80.7	-98.3	-93.7	-84.4	-68.1	-76.4
10 tons	-99.9	-44.3	-95.6	8.0	-65.7	-80.3	-97.8	89.5	-83.6	-60.5	-73.8
5 tons	-100.0	-48.7	-82.2	-13.9	-62.4	-78.5	-98.1	-85.7	-84.9	-59.7	-74.5
Cons. tillage											
base (1000 ac.)	2103.0	1850.0	286.0	1522.0	33328.0	8972.0	27575.0	7422.0	10124.0	2299.0	95436.0
20 tons	288.5	-35.6	-100.0	-100.0	-84.6	-36.8	-69.3	-17.1	-14.7	74.7	-50.4
10 tons	283.6	-43.4	-100.0	-100.0	-86.1	-47.9	-77.1	-10.8	20.8	9.7	-51.7
5 tons	261.3	-43.4	-100.0	-99.5	-86.1	-50.3	-77.4	-18.0	25.3	6.2	-52.6
0-tillage											
base (1000 ac.)	1572.0	2234.0	549.0	510.0	6219.0	998.0	2674.0	1397.0	1382.0	200.0	17735.0
20 tons	48.7	59.6	483.4	709.0	722.1	1657.8	1490.9	1080.8	545.2	2612.7	775.6
10 tons	58.4	91.3	467.5	443.7	764.8	1791.4	1656.2	870.9	454.7	2611.2	796.1
5 tons	96.9	85.6	395.2	923.8	808.1	1848.6	1572.8	877.8	442.2	2599.8	815.7

SOURCE: Agricultural Resources Interregional Modeling System (ARIMS).

[a]Base refers to ARIMS projected 1990 scenario with a 45-million-acre CRP enrollment (baseline) and no limits on allowable soil loss.

[b]20, 10, and 5 refer to ARIMS projected 1990 baseline scenario and limits on per acre soil loss for conservation compliance.

[c]Market region cropland flexibility constraints were made unrestrictive across regions.

[d]USDA Production Regions:

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Table A10. Interregional comparison of conservation practices used for cropping in the baseline and conservation compliance scenarios (market region cropping patterns relaxed)

Variable/ Run	NE[d]	Appl.	SE	Delta	CnBlt	LS	N.Plns	S.Plns	Mntn	Pcfc	Natnl
Cons. Practice	(percent difference from base)										
Straight row											
base (1000 ac.)[a]	11253.0	14064.0	5304.0	15340.0	65034.0	27270.0	63760.0	19951.0	23757.0	11350.0	257084.0
20 tons[bc]	-16.7	-45.0	-66.5	-2.8	-9.7	-8.5	-34.8	-22.6	-31.3	-5.6	-21.6
10 tons	-16.8	-39.9	-65.7	-3.8	-6.8	-7.4	-33.7	-35.1	-63.4	-17.9	-24.7
5 tons	-31.4	-51.5	-58.4	-5.0	-2.1	-5.4	-37.1	-55.8	-66.2	-17.6	-27.2
Contour row											
base (1000 ac.)	245.0	812.0	48.0	64.0	161.0	0.0	0.0	40.0	2247.0	823.0	4439.0
20 tons	356.8	98.0	15.8	249.2	42.4	+++	+++	1161.6	-53.9	-58.4	15.9
10 tons	341.3	143.2	34.0	464.2	291.7	+++	+++	680.4	-48.2	-29.7	41.8
5 tons	1034.3	266.8	-33.2	55.7	319.6	+++	+++	643.0	64.0	-42.5	85.6
Strip cropping											
base (1000 ac.)	0.0	0.0	0.0	5.0	7.0	0.0	101.0	37.0	780.0	373.0	1304.0
20 tons	0.0	0.0	0.0	-100.0	-100.0	0.0	-100.0	-24.8	-1.7	-75.0	-22.7
10 tons	+++	0.0	0.0	-100.0	-100.0	0.0	1172.2	1304.0	1299.0	66.0	893.4
5 tons	+++	+++	0.0	-100.0	3839.7	0.0	1155.3	13066.0	1440.8	-67.6	1345.6
Terracing											
base (1000 ac.)	18.0	536.0	1567.0	200.0	4158.0	192.0	10428.0	8550.0	1307.0	248.0	27303.0
20 tons	0.0	-4.3	-3.8	41.0	0.4	-0.6	-2.2	-1.1	24.4	-3.1	0.0
10 tons	0.0	-0.4	-5.1	41.6	0.4	0.0	2.2	-5.2	-10.3	-3.1	-1.2
5 tons	0.0	-3.6	-4.0	217.1	0.5	-0.6	-0.1	-5.7	-2.0	0.0	-0.6

SOURCE: Agricultural Resources Interregional Modeling System (ARIMS).

[a]Base refers to ARIMS projected 1990 scenario with a 45-million-acre CRP enrollment (baseline) and no limits on allowable soil loss.

[b]20, 10, and 5 refer to ARIMS projected 1990 baseline scenario and limits on per acre soil loss for conservation compliance.

[c]Market region cropland flexibility constraints were made unrestrictive across regions.

[d]USDA Production Regions:

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Table A11. Interregional comparison of per acre and total annual erosion estimates for baseline and conservation compliance scenarios (market region cropping patterns preserved)

Variable/ Run	NE[d]	Appl.	SE	Delta	CnBlt	LS	N.Plns	S.Plns	Mntn	Pcfc	Natnl
Erosion/ ac.(tons)					(percent difference from base)						
Sheet and rill											
base (tons/ac.)[a]	5.2	7.9	9.6	6.9	3.9	2.2	2.4	2.7	1.5	3.5	3.5
10 tons[bc]	-38.1	-50.4	-52.2	-34.5	-21.1	-9.0	-25.6	-40.0	-33.5	-55.6	-31.9
5 tons	-58.6	-61.4	-63.8	-43.4	-40.0	-17.0	-32.2	-55.0	-35.4	-57.0	-43.9
Wind											
base (tons/ac.)	0.3	0.8	1.1	1.1	0.8	1.6	4.7	10.6	9.7	3.5	3.8
10 tons	0.4	5.9	-1.6	-5.5	1.7	-2.1	-16.5	-48.9	-53.6	-18.0	-33.7
5 tons	3.6	3.9	0.5	-9.7	-9.2	-5.8	-34.8	-64.4	-59.2	-33.8	-46.2
Per acre total											
base (tons/ac.)	5.5	8.7	10.7	8.0	4.7	3.8	7.1	13.3	11.2	7.0	7.4
10 tons	-36.1	-45.5	-46.9	-30.5	-17.8	-6.1	-19.5	-47.1	-51.0	-36.7	-32.8
5 tons	-55.4	-55.6	-57.0	-38.8	-34.7	-12.2	-33.9	-62.5	-56.1	-45.3	-45.1
Regional total											
base (mil. tons)	64.2	133.8	74.2	125.2	327.0	104.7	527.0	381.4	314.8	89.5	2141.9
10 tons	-34.8	-44.5	-45.3	-24.1	-16.7	-5.9	-18.5	-51.7	-51.9	-33.0	-32.4
5 tons	-53.3	-54.4	-53.7	-34.1	-33.4	-12.8	-33.1	-67.4	-56.1	-46.2	-44.9

SOURCE: Agricultural Resources Interregional Modeling System (ARIMS).
[a]Base refers to ARIMS projected 1990 scenario with a 45-million-acre CRP enrollment (baseline) and no limits on allowable soil loss.
[b]10 and 5 refer to ARIMS projected 1990 baseline scenario and limits on per acre soil loss for conservation compliance.
[c]Market region cropland flexibility constraints restricted shift among regions consistent with baseline specification.
[d]USDA Production Regions:

NE = Northeast	CnBlt = Corn Belt	Mntn = Mountain
Appl. = Appalachian	LS = Lake States	Pcfc = Pacific
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Table A12. Interregional comparison of land use estimates for baseline and conservation compliance scenarios (market region cropping patterns preserved)

Variable/ Run	NE[d]	Appl.	SE	Delta	CnBlt	LS	N.Plns	S.Plns	Mntn	Pcfc	Natnl
					(percent difference from base)						
Cropped land											
base (mil. ac.)[a]	13.0	17.1	10.1	18.2	71.5	31.3	76.8	30.7	30.4	19.1	318.1
10 tons[bc]	1.6	1.6	2.1	7.9	1.3	0.2	1.2	-8.1	-1.6	3.1	0.5
5 tons	4.1	2.5	5.2	6.6	2.0	-0.6	1.2	-12.1	0.0	-1.1	0.3
Pot. land conv.											
base (1000 ac.)	19.0	0.0	0.0	566.0	537.0	57.0	67.0	1880.0	379.0	682.0	4186.0
10 tons	0.0	0.0	0.0	-0.9	19.5	0.0	180.3	-11.1	289.7	31.1	31.5
5 tons	-19.3	0.0	0.0	-4.9	18.1	16.6	1776.7	-27.8	533.7	91.8	81.1
Green cover											
base (1000 ac.)	2864.0	2388.0	5687.0	2117.0	13110.0	8573.0	5250.0	7379.0	2934.0	1007.0	51309.0
10 tons	-7.2	-18.3	-3.8	-59.0	-6.8	-0.6	-8.1	30.0	41.7	-32.0	-0.7
5 tons	-19.1	-17.6	-9.6	-47.3	-9.1	1.6	16.8	34.3	59.0	90.2	4.8
Double crop											
base (1000 ac.)	323.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28.0	42.0	392.0
10 tons	16.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	746.0	93.2
5 tons	-0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	85.2	8.3

SOURCE: Agricultural Resources Interregional Modeling System (ARIMS).

[a]Base refers to ARIMS projected 1990 scenario with a 45-million-acre CRP enrollment (baseline) and no limits on allowable soil loss.

[b]10 and 5 refer to ARIMS projected 1990 baseline scenario and limits on per acre soil loss for conservation compliance.

[c]Market region cropland flexibility constraints restricted shift among regions consistent with baseline specification.

[d]USDA Production Regions:

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Table A13. Interregional comparison of estimated acres of selected crops in the baseline and conservation compliance scenarios (market region cropping patterns preserved)

Variable/ Run	NE[d]	Appl.	SE	Delta	CnBlt	LS	N.Plns	S.Plns	Mntn	Pcfc	Natnl
	(percent difference from base)										
Corn prod.											
base (mil. ac.)[a]	4.79	3.30	1.61	3.86	29.23	10.72	10.54	3.41	1.92	0.40	69.79
10 tons[bc]	2.90	13.70	3.10	6.70	1.00	-0.10	0.10	-33.40	5.10	-39.10	0.00
5 tons	7.40	2.90	-14.80	-26.40	6.50	2.50	0.70	-67.50	-8.00	-4.80	-1.50
Wheat Prod.											
base (mil. ac.)	0.16	1.60	0.69	1.33	3.23	3.10	25.25	6.81	9.07	4.68	55.95
10 tons	16.00	-3.90	4.00	-15.60	9.40	6.80	2.80	1.30	-6.40	10.90	1.80
5 tons	16.50	20.00	38.70	-0.40	10.80	2.70	-4.60	0.50	-3.10	-9.00	-1.40
Soybeans Prod.											
base (mil. ac.)	1.37	3.26	2.19	5.94	26.49	3.95	5.25	0.45	0.12	0.00	49.01
10 tons	-9.60	-2.80	-4.80	0.00	1.00	-1.00	-7.90	-8.80	92.00	0.00	-0.90
5 tons	-0.70	-10.80	1.20	1.80	-0.30	-12.10	29.60	13.40	48.00	0.00	1.80
Cotton Prod.											
base (mil. ac.)	0.00	1.56	0.33	1.73	0.20	0.00	0.00	6.88	0.23	0.80	11.71
10 tons	0.00	3.40	21.00	81.10	85.10	0.00	0.00	-31.60	4.50	0.00	-4.00
5 tons	0.00	33.00	121.90	132.90	53.40	0.00	0.00	-60.40	2.40	0.00	-7.20

SOURCE: Agricultural Resources Interregional Modeling System (ARIMS).
[a]Base refers to ARIMS projected 1990 scenario with a 45-million-acre CRP enrollment (baseline) and no limits on allowable soil loss.
[b]10 and 5 refer to ARIMS projected 1990 baseline scenario and limits on per acre soil loss for conservation compliance.
[c]Market region cropland flexibility constraints restricted shift among regions consistent with baseline specification.
[d]USDA Production Regions:

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Table A14. Interregional comparison of selected production costs in the baseline and conservation compliance scenarios (market region cropping patterns preserved)

Variable/ Run	NE[d]	Appl.	SE	Delta	CnBlt	LS	N.Plns	S.Plns	Mntn	Pcfc	Natnl
						(percent difference from base)					
Production costs											
base (mil. $)[a]	3272.5	3567.1	2242.5	3634.2	14323.8	4953.1	7761.8	5969.1	3557.5	3448.9	56227.9
10 tons[bc]	1.8	-1.0	-1.8	9.9	0.0	2.4	-0.5	1.5	3.8	2.9	2.2
5 tons	3.7	0.2	1.0	11.3	0.1	4.1	4.0	2.5	7.8	-2.5	3.9
Crop costs											
base (mil. $)	1382.8	1997.6	1057.7	2105.5	9339.5	3175.3	5800.5	3114.1	2120.8	1472.6	34267.0
10 tons	3.1	2.7	3.5	17.7	2.0	0.1	1.1	-4.8	3.6	4.0	3.7
5 tons	6.2	6.5	13.1	21.5	3.9	-0.6	6.5	-7.8	7.5	-1.6	6.5
Livestock costs											
base (mil. $)	1890.0	1578.5	1184.8	1528.7	4984.3	1777.8	1961.4	2855.1	1436.6	1976.3	21960.6
10 tons	0.8	-5.8	-6.5	-0.9	-3.7	6.5	-5.3	8.4	4.0	2.0	0.0
5 tons	2.0	-7.8	-9.9	-2.8	-7.1	12.4	-3.4	13.7	8.1	-3.1	0.0
Land improvement											
base (mil. $)	318.7	6666.1	8723.1	9433.5	33917.3	1909.2	99835.3	54047.7	19547.1	7238.2	241634.0
10 tons	0.0	13.1	9.2	32.1	6.6	-0.4	8.5	25.9	28.0	33.9	15.5
5 tons	6.4	-12.9	1.4	59.0	8.1	6.7	27.1	52.7	79.2	35.5	33.6
Transportation											
base (mil $)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3871.79
10 tons	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-1.86
5 tons	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.26

SOURCE: Agricultural Resources Interregional Modeling System (ARIMS).

[a]Base refers to ARIMS projected 1990 scenario with a 45-million-acre CRP enrollment (baseline) and no limits on allowable soil loss.

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[c]Market region cropland flexibility constraints restricted shift among regions consistent with baseline specification.

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Table A15. National domestic and foreign consumer cost of commoditites from the crop and livestock sectors (market cropping patterns preserved)

Variable	Base	10-ton CC[ab]	5-ton CC
	(percent difference from base)		
Domestic consumer cost: crops (mil. $)	7512.873	5.7	12.0
Domestic consumer cost: livestock (mil. $)	34871.579	0.2	-0.4
Total	42384.452	1.2	1.8
Foreign consumer cost: crop (mil. $)	8825.118	3.6	-0.9
Foreign consumer cost: livestock (mil. $)	270.217	-1.5	-2.5
Total	9095.335	3.4	-1.0

SOURCE: Agricultural Resources Interregional Modeling System (ARIMS).
[a]Market region cropland flexibility constraints restricted shift among regions consistent with baseline specification.
[b]10 and 5 refer to ARIMS projected 1990 baseline scenario and limits on per acre soil loss for conservation compliance.

Table A16. Interregional comparison of marginal value (cost) estimates for selected crops in the baseline and conservation compliance scenarios (market region cropping patterns preserved)

Variable/ Run	NE[d]	Appl.	SE	Delta	CnBlt	LS	N.Plns	S.Plns	Mntn	Pcfc	Natnl
	(percent difference from base)										
Corn											
base ($)[a]	1.45	1.46	1.56	1.45	1.20	1.18	1.14	1.49	1.36	1.91	1.25
10 tons[bc]	1.20	3.20	2.70	4.00	3.90	4.10	4.90	3.50	2.80	1.30	3.50
5 tons	2.80	6.80	9.30	10.20	11.50	11.00	12.50	7.20	10.60	6.50	9.40
Wheat											
base ($)	1.95	2.00	2.05	1.90	1.79	1.67	1.57	1.77	1.65	2.12	1.71
10 tons	8.80	8.30	9.90	11.60	9.40	8.00	13.10	12.30	15.70	10.10	12.90
5 tons	0.60	-1.00	1.50	-2.00	-0.30	-0.70	1.50	0.80	3.40	0.50	1.30
Soybeans											
base ($)	2.81	2.80	2.95	2.81	2.58	2.57	2.56	2.75	2.67	0.00	2.63
10 tons	-0.70	-1.60	-2.60	-2.80	-2.70	-0.90	-1.90	-3.00	-2.50	0.00	-2.40
5 tons	-2.10	-3.20	-4.20	-4.60	-4.50	-1.30	-3.60	-5.70	-5.90	0.00	-4.20
Cotton											
base ($)	0.00	169.34	169.34	169.34	169.34	0.00	0.00	169.34	169.34	169.34	169.34
10 tons	0.00	8.60	8.60	8.60	8.60	0.00	0.00	8.60	8.60	8.60	8.60
5 tons	0.00	26.70	26.70	26.70	26.70	0.00	0.00	26.70	26.70	26.70	26.70
Hay											
base ($)	2.35	7.57	3.50	11.94	4.00	1.63	2.18	7.26	3.67	9.74	3.73
10 tons	13.60	-0.50	-25.40	-8.80	11.50	29.80	-18.30	-16.10	-25.60	-6.00	-5.90
5 tons	36.20	-0.60	-54.80	-12.30	2.70	100.50	-42.50	-24.60	-38.10	-7.60	-8.30

SOURCE: Agricultural Resources Interregional Modeling System (ARIMS).

[a]Base refers to ARIMS projected 1990 scenario with a 45-million-acre CRP enrollment (baseline) and no limits on allowable soil loss.

[b]10 and 5 refer to ARIMS projected 1990 baseline scenario and limits on per acre soil loss for conservation compliance.

[c]Market region cropland flexibility constraints restricted shift among regions consistent with baseline specification.

[d]USDA Production Regions:

NE = Northeast
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Table A17. Interregional comparison of estimates for fertilizer cost and use in the baseline and conservation compliance scenarios (market region cropping patterns preserved)

Variable/ Run	NE[d]	Appl.	SE	Delta	CnBlt	LS	N.Plns	S.Plns	Mntn	Pcfc	Natnl
					(percent difference from base)						
Fertilizer cost											
base (mil. $)[a]	290.3	377.6	173.7	438.1	1840.5	527.0	867.1	458.0	266.4	152.4	5391.1
10 tons[bc]	3.6	4.6	1.0	11.7	2.5	0.1	-0.5	-9.7	-0.8	11.1	1.7
5 tons	3.4	3.3	3.4	0.1	7.8	1.4	11.5	-4.8	2.1	-5.5	4.7
Total nitrogen used											
base (1000 tons)	266.4	443.5	324.3	693.5	2023.1	744.7	1955.7	1174.1	642.6	605.5	8873.0
10 tons	3.6	8.0	1.2	14.1	1.1	-0.1	-0.3	-11.9	-5.2	3.9	0.2
5 tons	7.2	7.3	3.8	2.1	10.1	3.7	15.6	-6.4	-2.3	-4.1	5.6
Total phos. used											
base (1000 tons)	366.3	410.9	201.0	394.6	1939.1	476.0	279.0	119.7	60.4	85.3	4332.0
10 tons	2.9	0.3	-1.8	5.8	1.7	1.5	-2.6	-6.1	7.2	8.5	1.6
5 tons	3.2	-1.2	-3.1	-3.3	3.2	2.0	-6.9	-11.5	14.1	-3.6	0.7
Total potash used											
base (1000 tons)	123.8	170.0	107.0	228.7	982.0	269.3	577.7	212.2	231.3	103.3	3005.0
10 tons	2.5	1.1	1.0	5.8	1.5	1.0	-1.1	10.8	2.9	5.7	2.2
5 tons	3.2	0.4	-0.7	-1.6	2.5	-1.4	6.1	18.8	7.6	-1.9	3.7

SOURCE: Agricultural Resources Interregional Modeling System (ARIMS).
[a]Base refers to ARIMS projected 1990 scenario with a 45-million-acre CRP enrollment (baseline) and no limits on allowable soil loss.
[b]10 and 5 refer to ARIMS projected 1990 baseline scenario and limits on per acre soil loss for conservation compliance.
[c]Market region cropland flexibility constraints restricted shift among regions consistent with baseline specification.
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Table A18. Interregional comparison of pesticide, machinery, and labor cost estimates for the baseline and conservation compliance scenarios (market region cropping patterns preserved)

Variable/ Run	NE[d]	Appl.	SE	Delta	CnBlt	LS	N.Plns	S.Plns	Mntn	Pcfc	Natnl
	(percent difference from base)										
Pesticide cost											
base (mil. $)[a]	141.1	310.2	194.6	287.3	1210.0	396.1	490.9	398.2	171.1	170.5	3769.9
10 tons[bc]	2.5	4.8	3.5	37.9	1.9	0.0	-0.3	19.0	9.0	7.3	6.9
5 tons	11.4	14.5	20.7	62.7	4.1	-0.4	14.7	6.1	14.4	-4.3	11.7
Machinery cost											
base (mil. $)	212.9	350.5	172.7	367.1	1534.7	552.8	1097.3	621.2	461.8	299.0	5669.8
10 tons	2.8	0.7	5.0	19.3	1.8	0.0	1.3	-9.0	4.0	2.5	1.8
5 tons	6.6	4.6	16.8	28.4	3.0	-0.9	4.0	-10.2	7.8	-1.0	3.8
Labor cost											
base (mil. $)	109.0	153.3	83.0	164.1	653.2	236.2	466.6	279.3	163.2	136.6	2444.5
10 tons	3.3	1.0	5.6	10.8	1.9	0.3	3.1	-7.0	6.3	0.2	1.9
5 tons	7.5	4.4	12.8	15.2	3.5	-0.2	8.8	-6.4	12.9	-1.0	4.7
Water cost											
base (mil. $)	0.6	2.7	15.5	111.5	23.6	1.6	592.5	589.2	666.4	697.3	2701.0
10 tons	0.0	-63.6	1.8	20.1	23.1	0.3	-4.0	80.9	3.6	2.8	19.4
5 tons	15.4	-68.4	9.3	16.5	78.9	-68.9	11.0	106.6	10.3	-0.6	29.4

SOURCE: Agricultural Resources Interregional Modeling System (ARIMS).

[a]Base refers to ARIMS projected 1990 scenario with a 45-million-acre CRP enrollment (baseline) and no limits on allowable soil loss.

[b]10 and 5 refer to ARIMS projected 1990 baseline scenario and limits on per acre soil loss for conservation compliance.

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Table A19. Interregional comparison of tillage practices used for cropping in the baseline and conservation compliance scenarios (market region cropping patterns preserved)

Variable/ Run	NE[d]	Appl.	SE	Delta	CnBlt	LS	N.Plns	S.Plns	Mntn	Pcfc	Natnl
Till. Practice	(percent difference from base)										
Fall plowing											
base (1000 ac.)[a]	695.0	1208.0	330.0	1877.0	9369.0	7454.0	11228.0	3436.0	9978.0	5492.0	51068.0
10 tons[bc]	15.9	-25.6	-63.7	-34.0	-1.3	-11.4	21.3	-27.3	13.6	-8.5	0.6
5 tons	0.5	-68.5	-21.1	-65.0	-61.9	-48.1	24.7	-30.7	5.8	-10.9	-19.2
Spring plowing											
base (1000 ac.)	7146.0	10119.0	5753.0	11701.0	20444.0	10082.0	32813.0	16322.0	6608.0	4803.0	125791.0
10 tons	0.5	-0.7	6.8	16.1	5.4	8.0	-5.7	-12.3	-13.6	18.5	0.2
5 tons	5.2	11.8	5.9	14.3	34.8	30.0	-3.7	-22.3	0.9	2.8	7.2
Cons. tillage											
base (1000 ac.)	2103.0	1850.0	286.0	1522.0	33328.0	8927.0	27575.0	7422.0	10124.0	2299.0	95436.0
10 tons	3.8	27.4	-6.0	8.9	0.4	1.1	1.6	7.2	-7.1	5.3	1.4
5 tons	8.1	-3.7	76.0	45.5	0.7	4.2	-1.7	12.5	-2.6	8.5	2.1
0-tillage											
base (1000 ac.)	1572.0	2234.0	549.0	510.0	6219.0	998.0	2674.0	1397.0	1382.0	200.0	17735.0
10 tons	-1.2	6.7	8.8	10.8	-2.5	0.8	-0.5	-5.6	-17.5	18.5	-1.2
5 tons	-0.5	5.7	7.0	9.9	-2.2	0.3	-5.0	2.7	-26.2	25.1	-1.9

SOURCE: Agricultural Resources Interregional Modeling System (ARIMS).

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[b]10 and 5 refer to ARIMS projected 1990 baseline scenario and limits on per acre soil loss for conservation compliance.

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Table A20. Interregional comparison of conservation practices used for cropping in the baseline and conservation compliance scenarios (market region cropping patterns preserved)

Variable/ Run	NE[d]	Appl.	SE	Delta	CnBlt	LS	N.Plns	S.Plns	Mntn	Pcfc	Natnl
Cons. Practice	(percent difference from base)										
Straight row											
base (1000 ac.)[a]	11253.0	14064.0	5304.0	15340.0	65034.0	27270.0	63760.0	19951.0	23757.0	11350.0	257084.0
10 tons[bc]	-1.3	-8.7	1.2	5.1	-2.5	-1.5	-9.2	-38.6	-52.2	-3.6	-11.3
5 tons	-19.4	-20.6	-2.2	-1.1	-8.8	-1.8	-19.4	-63.6	-63.6	-19.1	-21.0
Contour row											
base (1000 ac.)	245.0	812.0	48.0	64.0	161.0	0.0	0.0	40.0	2247.0	823.0	4439.0
10 tons	48.4	166.9	432.1	982.4	1627.0	+++	+++	4233.2	-7.8	-4.8	187.2
5 tons	1005.9	384.4	1000.0	1217.9	3628.4	+++	+++	1689.7	-42.5	106.4	378.3
Strip cropping											
base (1000 ac.)	0.0	0.0	0.0	5.0	7.0	0.0	101.0	37.0	780.0	373.0	1304.0
10 tons	+++	+++	+++	394.0	453.1	+++	5176.0	12695.5	1548.5	277.4	1800.0
5 tons	+++	+++	+++	1591.9	15435.2	+++	10344.4	28661.6	1990.5	288.4	3043.3
Terracing											
base (1000 ac.)	18.0	536.0	1567.0	200.0	4158.0	192.0	10428.0	8550.0	1307.0	248.0	27303.0
10 tons	0.0	11.7	-4.0	2.3	-2.4	-3.4	1.4	-14.1	-0.7	0.0	-4.3
5 tons	1.1	-15.4	0.0	248.7	3.6	-1.6	-3.3	-27.7	40.6	0.0	-5.9

SOURCE: Agricultural Resources Interregional Modeling System (ARIMS).

[a]Base refers to ARIMS projected 1990 scenario with a 45-million-acre CRP enrollment (baseline) and no limits on allowable soil loss.

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