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A Study of Costs of Compliance Related to Non-Point Pollution: Rules for Wisconsin Crop Producers

By

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Developed for the Wisconsin Corn Promotion Board

By

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Introduction

The non-point pollution rules proposed by the Wisconsin Department of Natural Resources (DNR) have generated questions regarding the costs of compliance for Wisconsin agriculture. It is clear that some agricultural practices will have to change if the proposed rules are enacted, but the costs of these changes are less clear. The DNR proposals include cost sharing for the introduction of best management practices, but constrain the cost share program to essentially out of-pocket expenses. In general, there is no compensation for costs associated with additional management time, or lost revenue. The purpose of this project is to generate a set of estimates relating to net costs of compliance for Wisconsin crop producers. The intent is to develop a baseline for discussion of rule adoption and the share of total costs paid by producers.

The numbers discussed below are estimates based on the best available data at the time the project was conducted. It is currently not clear exactly how many acres will be affected by required changes in management practices. As the total production area affected becomes clearer, total statewide cost of compliance estimates can be refined.

Impacts on Crop Production

Background

For agriculture, the new nonpoint pollution rules will impose performance standards related to crop land soil erosion, soil erosion on stream banks and shorelines, manure runoff from barnyards and feedlots, and manure runoff from crop land where manure is applied.

The new nonpoint pollution rules as related to crop production involve several levels of change. The first will be changes in tillage systems. These include relatively low cost changes (for example, changing to a contour plowing system from a system of straight rows) where cost share compensation is small with the bulk of costs coming in the form of altered management focus. In other cases, however, the cropping system changes may be quite dramatic. Some riparian and highly erodable areas currently under cultivation will require permanent cover crops to comply with new soil loss regulations. In these cases, cost share compensation may be considerable, but non-covered costs, such as forgone revenue opportunities, will also be considerable.

Because of differences in the estimates of acres out of compliance with the new rules, this study attempts to measure producer costs three ways. First, using estimates of acreage data from the National Resources Conservation Service (NRCS), USDA, total Wisconsin acres out of compliance relative to the new regulations are estimated. Next, non-complying acres are estimated based on the Wisconsin 1999 Transect Survey County Summary Reports, published by the Wisconsin Department of Agriculture, Trade, and Consumer Protection (DATCP). Per acre costs associated with converting non-complying acres to management practices consistent with achieving the nonpoint pollution targets are then estimated for both sets of acreage data. However, it is likely

that the costs will vary greatly across individual operations. To account for this, the third procedure identifies a couple of sample farms from critical parts of the state, and examines the costs of bringing these farms into compliance. This will allow individual producers to examine their operations relative to the sample farms, and estimate their individual compliance costs.

General Requirements

The primary obligations faced by crop farmers are outlined in NR 151, proposed by the Wisconsin Natural Resources Board. These obligations include:

1) achieve a soil erosion rate less than or equal to t, where t is the maximum amount of soil loss that can be sustained without reducing productivity,

2) establish grass vegetation in cropping areas where concentrated water flow has significant potential for sediment delivery to navigable waters,

3) establish a water quality corridor of permanent cover at least 35 feet from the high water mark of established waterways in established water quality management areas,

4) develop a nutrient management plan for the application of manure, sludge, nitrogen, and phosphorus. This includes a soil test at least once every four years to determine nutrient levels.

For each target, best management practices as defined by the (NRCS) of USDA are to be employed. Descriptions of these are provided in the Wisconsin Technical Guide available from NRCS-USDA in Madison.

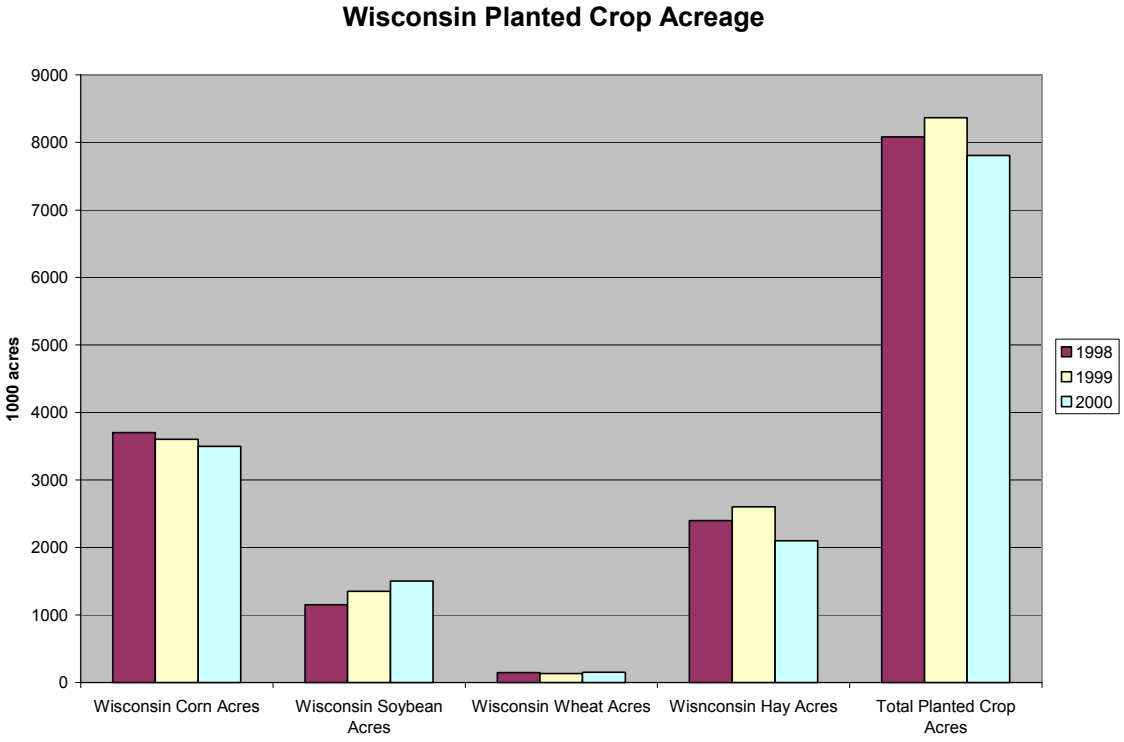
In order to estimate the costs to crop producers of complying with the proposed erosion regulations, budgets are estimated which compare producers' total costs of various management practices relative to the costs of traditional tillage crop production.[1] This is done only for grain and soybean producers, and does not directly account for costs that may be encountered by producers of other crops, such as cranberries or potatoes.

Estimating Wisconsin Non-complying Crop Acreage – NRCS Data

Figure 1 illustrates the Wisconsin acres devoted to corn, soybeans, wheat and hay, as well as total cropped acres, over the last three years. In 2000, Wisconsin cropped 7.8 million acres. This was down about one million acres from 1997, when 8.8 million acres were cropped.

Using data from 1997, NRCS estimated that 25 percent of Wisconsin crop land experienced sheet and rill erosion levels in excess of t. This is almost the exact percentage reported for 1992.[2] If we assume the percentage has remained constant the last couple of years (mirroring the trend from 1992 to 1997) then 1.95 million acres of

Wisconsin crop land would have been out of compliance with the erosion provision of the new proposed nonpoint pollution rules in 2000.



In addition, in both 1992 and 1997, there were 2 million and 1.9 million acres of non-cultivated cropland (i.e., land set fallow under a strip cropping or some other system), respectively. In both years this represented about 22 percent of the cultivated cropland. In 1992, the percentage of non-cultivated crop land experiencing a sheet and rill erosion rate in excess of t was about 4 percent, but by 1997 that percentage was over 7 percent. If the 1997 percentage is assumed to hold in 2000, then there was about 1.7 million acres lying fallow, with 119 thousand of these acres experiencing soil loss in excess of t.

There was an additional 175 thousand acres in 1997 in which wind erosion exceeded t. This was 2 percent of cultivated cropland (USDA estimated no non-cultivated crop land experienced a wind erosion rate in excess of t in 1997). Again, assuming the percentage in 2000 relative to total cropland is similar to 1997, it is estimated there were 156 thousand Wisconsin acres in 2000 where wind erosion exceeded t. Combining the various estimates above yields a total of just over 2.2 million Wisconsin acres that likely experienced erosion losses in excess of t in 2000.

Using the relative percentage of corn and soybean plantings to total corn and soybean acres (70 and 30 percent, respectively) for 2000, and assuming that the acres eroding in excess of t are allocated between the two crops in similar proportion, it is estimated that

1.46 million acres of corn last year were out of compliance with the proposed erosion guidelines, and 625 thousand soybean acres.

Estimating Wisconsin Non-complying Crop Acreage – DATCP Data

According to the 1999 Wisconsin Transect Survey, Wisconsin has 1.6 million acres of crop ground eroding in excess of t.[3] This is smaller than the estimate from the NRCS data. The DATCP estimate matches the estimate used by DNR in estimating non-point pollution program costs.

Using the 1999 data directly, it is estimated that there are 982 thousand Wisconsin crop acres eroding at a rate between t and 2t, 305 thousand between 2t and 3t, and 324 thousand eroding in excess of 3t.[4] The DATCP data is calculated on a county-by-county basis, so determining the percentage of non-complying acres in each area of the state is straightforward.

Assigning 70 percent of the non-complying acres to corn yields 1.1 million corn acres out of compliance. Non-complying soybean acres total 480 thousand.

Estimated Compliance Costs

The first step in estimating producer compliance costs for meeting soil erosion guidelines is to establish a baseline against which the costs associated with changes in management practices can be compared. A base budget for corn and soybean production was estimated.[5] Costs associated with employing practices assumed necessary to meet DNR guidelines are also estimated, and per acre cost comparisons made.[6] Based on per acre cost differences, total costs of bringing acres experiencing excessive erosion into compliance with objective 1 are estimated.

Appendix 1 provides average estimated budgets for corn production for four regions of Wisconsin, and Appendix 2 provides budgets for soybeans across three regions of the State. The regional budgets for each crop are identical except for average yield, price received, and land rent. Yield estimates for the base budgets are calculated from county estimates for 2000 reported by the National Agricultural Statistics Service, USDA.[7] Yield estimates for reduced tillage systems result from adjusting base yields by percent yield reductions experienced from University of Wisconsin field trial experiments over the last several years.[8]

Prices are average annual prices reported by DATCP, except in cases where market price was below a crop's loan rate. In that case, the national average loan rate was used. Regional land rents were calculated based on a land rent survey conducted by University of Wisconsin Extension in 2000. Rents at county levels were submitted by county agents, and then averaged across various regions.

DNR has estimated that bringing Wisconsin crop acres into compliance with the t standard will cost between $10 and $16 per acre. These represent the costs of changing

from one production system to another, and not any measure of foregone revenue possibilities implied by the new system. However, there will be wide variation in producer costs based on individual changes in production systems. For example, DNR has indicated a cost share rate of $9.00 per acre for switching to a contour cropping system. Employing the 70/30 cost share between the state government and individual producers, producers' per acre cost will be $2.70 per acre. Converting to a high residue cropping system has a cost share rate of $18.50 per acre, with producers' share coming to $5.55. In most cases, the cost share provisions run 3 to 4 years, and then producers are responsible for 100 percent of costs.[9] However, it is likely that the cost of adopting the new practice will be primarily encountered in the first few years. The DNR cost estimates are adopted for this study, and producer costs of converting to a new management system consist of multiplying the producers' share of costs times affected acres.

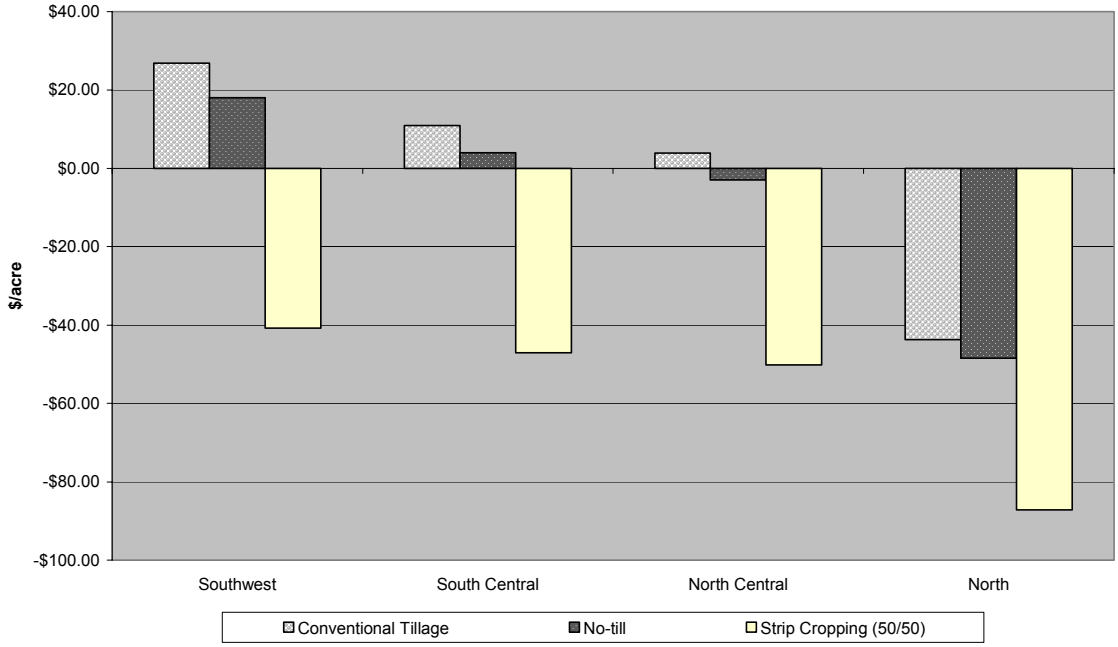
In addition to the cost of changing management practices, producers face foregone revenue associated with the new cropping systems. From Appendix 1, note that switching from a conventional tillage system to a no-till system results in a per acre reduction in net revenue of $8.76 in the Southwest, $7.24 in the Southeast, $6.85 in the North Central, and $5.18 in the North.[10] It is likely all producers will not have to make such radical switches in tillage. Producers in some areas can switch to a mulch till system, retaining at least 30 percent residue cover on cropped acres. However, all high residue systems have the same DNR cost share rate. Further, University of Wisconsin field trials show similar yield responses across all conservation tillage systems. In addition, budgets prepared by the University of Illinois for Northern Illinois actually show costs in mulch till systems exceed no-till costs by about 3 percent. As a result, using the no-till budget to approximate producer costs of complying with erosion provisions likely understates actual costs. Switching to a mulch till system may involve slightly higher costs than those used here, with a similar yield impact.

Switching from conventional to strip cropping results in revenue losses of $67.55 per acre in the Southwest, $57.98 per acre in the Southeast, $54.00 per acre in the North Central, and $43.46 per acre in the North.

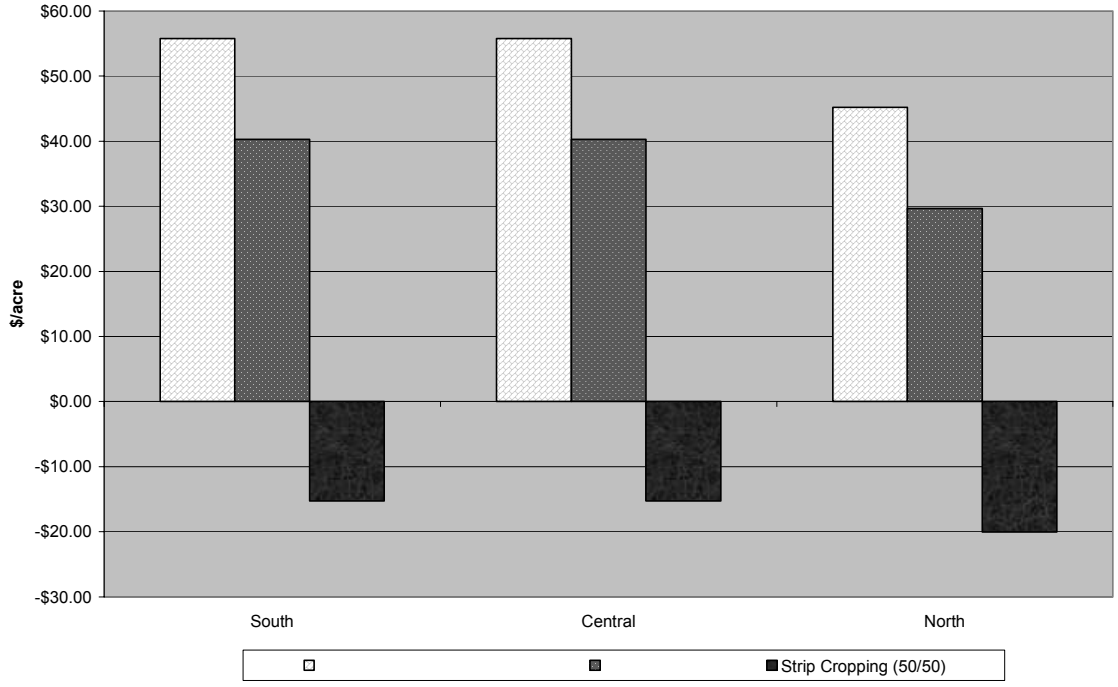
From Appendix 2, note that switching from a conventional tillage system to a no-till system in soybeans in 2000 would have resulted in a per acre reduction in net revenue of $15.52 in the South, $15.52 in the Central region, and $15.52 in the North. As with corn, it is assumed all producers have to make this switch. Producers in some areas can switch to mulch till systems, retaining at least 30 percent residue cover on cropped acres, but economic impacts are likely captured using the no-till budgets.

Switching soybean acres from conventional to strip cropping results in revenue losses of $71.30 per acre in the South, $71.03 per acre in the Central region, $65.70 per acre in the North. Soybean yields do not vary across regions as much as corn, thus foregone revenues are more similar.

Net Revenue minus Operating Costs
Wisconsin Corn Production



Revenue minus Operating Costs
Wisconsin Soybean Production



Corn – NRCS Data

It is estimated based on the NRCS data that 866 thousand Wisconsin corn acres were eroding at a rate between t and 2t in 2000. It is assumed that 33 percent of these acres are in the Southwest, 17 percent are in the Southeast, and the balances are evenly split between the North Central and North.[11] This results in 286 thousand acres eroding between t and 2t in the Southwest, 147 thousand in the Southeast, and 216 thousand in the North Central and North, respectively.

It is assumed that the non-complying acres between t and 2t can be brought into compliance by switching from conventional to a no-till system.[12] It is likely substantial acres (at least outside the Southwest region) can go to a mulch till system, but as noted above the economic impacts of such a change are captured in the no-till costs.

For all land eroding between 2t and 3t, it is assumed that a strip crop system must be adopted. Lands eroding in excess of 3t are taken out of production, and a permanent cover crop is planted.

The cost to producers for converting to a high residue crop system (mulch till or no-till) has a cost share rate established by DNR at $18.50 per acre per year. High residue systems can be cost shared for up to 4 years. The producer's share (30 percent) would be $5.55 per acre per year. Applying this rate to all acres with erosion rates between t and 2t, total adjustment costs to producers is $4.8 million. In addition, producers would incur foregone revenues of $6 million. Thus, total costs to producers of meeting compliance standards are estimated to be $10.8 million per year. This is just about $12.47 per acre.

For acreage eroding at a rate between 2t and 3t, it is assumed that a contour, strip system with a cover crop in non-cultivated strips will be necessary. Total corn acreage in this category is estimated at 290 thousand. This will cost producers $4.05 per acre to develop, plus foregone revenue. Producer costs of adopting the new production system are $1.2 million.

It is estimated that 113 thousand of these acres are in the Southwest, 49 thousand in the Southeast, and 64 thousand each in the North Central and North. Multiplying these acres by the forgone revenue of a strip system compared to the base in each region yields a total cost estimate of $17.7 million.

Land eroding in excess of 3t likely needs to be taken out of crop production to meet erosion requirements. This involves 306 thousand acres, with 135 thousand being in the Southwest, 27 thousand in the Southeast, and 72 thousand in both the Northeast and North.

The cost of putting in a cover crop is estimated at $12.70 per acre, with the producers' share being $3.81 per acre. Totaling producer costs across all for regions results in a total cost of $1.2 million. In addition, since it is not reasonable to assume that yields on these highly eroding lands match with expected average yields, foregone revenue is measured

by the estimated rental rate (i.e., once a cover crop is established, a producer cannot earn the rental rate on that piece of ground). Multiplying the rental rates in each region by the number of acres taken out of production results in a cost of $12.5 million in the Southwest, $2.5 million in the Southeast, $4.2 million in the North Central, and $2.2 million in the North. The total of all costs for land eroding in excess of 3t is thus $22.6 million.

Summing across all lands estimated to be eroding in excess of t results in a cost to producers of $53.5 million dollars.[13] This represents the upper bound of costs since it uses estimates of non-complying acres that are at the high end of the publicly available data. However, should more intensive changes in management practices be required than those assumed here, costs would increase.

Corn – DATCP Data

If we employ the same assumptions above relative to required changes in management systems, but allocate those changes based on the DATCP estimate of Wisconsin crop acres eroding in excess of t, we get lower cost estimates.[14] The Wisconsin 1999 Transect Survey not only has a lower total non-complying acreage estimate relative to the NRCS data, but also has a larger percentage in the t to 2t range, and less in the higher erosion rate categories.

According to DATCP, there were a total of 1.6 million Wisconsin crop acres eroding in excess of t. If we again allocate those acres to corn and soybeans (70 percent corn and 30 percent soybeans), then there were a total of 1.1 million acres of corn ground eroding in excess of t in Wisconsin.[15] The DATCP survey reported 982 thousand non-complying acres were eroding between 1 and 2t, 305 thousand between 2t and 3t, and 324 thousand in excess of 3t. Applying 70 percent of these totals to corn production yields an acreage estimate of 687 thousand non-complying acres eroding at a rate between t and 2t, 214 thousand eroding between 2t and 3t, and 227 with an erosion rate in excess of 3t.

Breaking down by region, the Southwest has 226 thousand acres between t and 2t, 83 thousand acres between 2t and 3t, and 99 thousand eroding at a rate in excess of 3t. The Southeast has 117 thousand, 35 thousand, and 20 thousand in each category, respectively. The North Central and North each have 172 thousand eroding between t and 2t, 47 thousands between 2t and 3t, and 53 thousand eroding in excess of 3t.

Converting all acres eroding at a rate between t and 2t to a high residue will cost producers $3.8 million. In addition, the producers will experience forgone revenue of $4.8 million. Total costs for bringing acres currently eroding between t and 2t into compliance are thus $8.6 million, or about $12.52 per acre.

Adopting a strip tillage system for acres eroding between 2t and 3t results in an adoption cost to producers of $0.9 million (214 thousand acres times producers' share of adoption costs of $4.05 per acre). In addition, forgone revenue in the Southwest will be $5.6 million, in the Southeast $2 million, in the North Central $3.4 million, and in the North

$2 million. The total costs of bringing these acres into compliance are $13.9 million. The majority of costs represent foregone revenue opportunities.

For acres eroding in excess of 3t a cover crop is planted and production ceases. This costs $12.70 per acre, of which the producer would pay $3.81. This results in a charge to producers of $0.9 million. Foregone revenue opportunities are measured in terms of the land rental rate, and total $17.7 million. Total costs are $18.6 million.

Summing across all costs and erosion levels yields an expected producer cost of $41.1 million. This compares to $53.5 million using the NRCS data.

Soybeans – NRCS Data

Total expected soybean acres eroding in excess of t are estimated at 624 thousand. Using this estimate, 368 thousand are eroding between t and 2t, 125 thousand between 2t and 3t, and 131 thousand in excess of 3t. In the soybean analysis, only three regions are considered, with the Southwest and Southeast being combined.[16] Based on the percentage distribution of lands eroding in excess of t in the DATCP survey, it is estimated that 184 soybean acres in the South are eroding at a rate between t and 2t, and 92 thousand in both the Central and North regions. Acres eroding between 2t and 3t total 70 thousand in the South, and 28 thousand each in the Central and North. Soybean acres eroding in excess of 3t total 69 thousand in the South, and 31 thousand in the Central and North regions, each.

As with corn, acres eroding at a rate between t and 2t switch to no-till to satisfy soil erosion requirements. Converting acres between t and 2t to a high residue system costs producers $2 million. Forgone revenues resulting from the switch total $5.7 million. Total costs of bringing soybean ground eroding between t and 2t into compliance are estimated at $7.7 million.

All land eroding between 2t and 3t must go to a strip crop system in this analysis. The costs of converting to a strip crop system across all three regions is estimated at $0.5, and foregone revenue totals $5 million in the South, $2 in the Central, and $1.5 in the North. Thus, total costs of bringing these lands into compliance are $9 million.

Bringing land into compliance that is currently eroding at a rate in excess of 3t requires planting a cover crop and taking the ground out of soybean production. Based on the 131 thousand soybean acres currently estimated to be in this category, total establishment costs to producers are $0.5 million. Foregone revenue is calculated based on regional rental rates, since it is difficult to establish an expected yield for these acres. Using this method, forgone revenue in the South is $6.4 million, in the Central $1.8 million, and in the North $0.9 million. Total costs of bringing these acres into compliance are $9.6 million.

The total cost of bringing all soybean land into compliance comes to $26.8 million. As with corn, this should be viewed as the upper bound since it uses the higher non-complying acreage estimate.

Soybeans – DATCP Data

Total soybean acres eroding in excess of t using the DATCP survey data are estimated to be 480 thousand. This includes 295 thousand with an erosion rate between t and 2t, 92 thousand eroding between 2t and 3t, and 97 thousand eroding in excess of 3t. In the Southern region, this suggests 148 thousand between t and 2t, 52 thousand between 2t and 3t, and 51 thousand in excess of 3t. The North and Central regions each have 74 thousand between t and 2t, 21 thousand between 2t and 3t, and 23 thousand in excess of 3t based on this estimate.

Bringing the first category, lands between t and 2t, into compliance will cost $1.6 million, with associated foregone revenues $4.5 million. Thus, total costs are $6.1 million.

Bringing the lands between 2t and 3t into compliance requires moving to a strip crop system, at a producer cost of $0.4 to change management practices, and foregone revenue of $3.4 million in the South, $1.5 million in the Central, and $1.4 million in the North. Total costs come to $6.8 million.

Bringing acres eroding in excess of 3t into compliance would cost $0.4 million for the management change, with foregone revenue reflected in the rental rate. For the South, this would be $4.7 million, in the Central $1.4 million, and in the North $0.7 million. This results in a total cost for acres in excess of 3t of $7.5 million.

Total costs of bringing soybean acres into compliance using DATCP estimated acres are $20.4 million.

Total Costs of Bringing Crop Acres into Compliance

Based on the estimates above, we have a range of expected impacts on Wisconsin crop producers associated with complying with the proposed soil erosion provisions. If we use the NRCS acreage estimates (adjusted for 2000 crop acres), total costs to crop producers are estimated to be $80.8 million dollars in the first year. This represents both the producer's share of the costs of converting to a best management practice assumed to achieve the erosion goal, and the revenue costs associated with new practice relative to conventional production technology.

If the more conservative acreage estimates from DATCP are used, total producer costs in the first year are $61.4 million. In both cases, a large percentage of producer costs is derived from lost revenue. In addition, because the change in tillage practice is so drastic for those areas eroding between 2t and 3t, the greatest costs associated with lost revenue show up here, despite the fact that they represent substantially smaller acres relative to acres eroding between t and 2t.

DNR has estimated total annual costs of attaining the erosion guidelines between $16.5 and $21.3 million.[17] These are the costs of converting to best management practices, not assessments of any foregone revenue opportunities. The share paid by producers (30 percent of estimated costs) is between $5 million and $7.7 million. Based on the estimates in this study, the cost of converting the NRCS estimated acres to complying best management practices is $10.7 million, and the cost of converting non-complying acres using the DATCP acreage estimates is $8 million.

Table 1. Estimated Producer Costs of Erosion Guideline Compliance Based on Various Acreage Estimates

Estimates Using NRCS Data	Acres	Conversion Cost Producer Share	Lost Revenue After Conversion	Total Cost
	(thousands)	(millions)	(millions)	
Non-cultivated acres (cover crop)	119	$0.50		$0.50
Acres eroding between t and 2t				
Corn	866	$4.80	$6.00	$10.80
Soybeans	368	$2.00	$5.70	$7.70
Acres eroding between 2t and 3t				
Corn	290	$1.20	$17.70	$18.90
Soybeans	125	$0.50	$9.00	$9.50
Acres eroding in excess of 3t				
Corn	306	$1.20	$22.60	$23.80
Soybeans	131	$0.50	$9.10	$9.60
Totals	2205	$10.70	$70.10	$80.80

Estimates Using DATCP Data	Acres	Conversion Cost Producer Share	Lost Revenue After Conversion	Total Cost
	(thousands)	(millions)	(millions)	
Acres eroding between t and 2t				
Corn	687	$3.80	$4.80	$8.60
Soybeans	295	$1.60	$4.50	$6.10
Acres eroding between 2t and 3t				
Corn	214	$0.90	$13.00	$13.90
Soybeans	92	$0.40	$6.30	$6.70
Acres eroding in excess of 3t				
Corn	227	$0.90	$17.70	$18.60
Soybeans	97	$0.40	$7.10	$7.50
Totals	1612	$8.00	$53.40	$61.40

Other Costs

In addition to costs associated with controlling excessive erosion, producers need to develop a nutrient management plan. DNR has estimated that this will cost $6 per acre to develop, and that there are 10 million acres for which nutrient management plans need developing. In addition, producers will receive a $4 per acre incentive payment to update and maintain the practice, not to exceed a total of 3 years cost share. The state has estimated the total annual costs to be between $14 million and $26 million per year. Based on the 70/30 state/producer cost share, the producers' total costs would be between $4.2 million and $7.8 million per year.

DNR has estimated that there are 100,000 acres of riparian fields that require buffer strips to protect adjacent waterways. The estimated costs of developing those strips are between $14 and $21.3 million per year. Assuming this represents total costs, the producers' share would be between $4.2 million and $6.4 million per year.

Sample Farm Analysis

In this section the potential costs faced by individual producers on sample farms are considered. The first is a sample farm in Grant County. The farm is constructed based on county average data (i.e., prices and yields). This farm is assumed to have 500 tillable acres, evenly divided between corn and soybeans.

According to DATCP, in 1999, 74 percent of Grant county corn production used a tillage system that left less than 30 percent residue in the field. However, 72 percent of the soybean acres used conservation tillage (the majority being no-till). Therefore, it is assumed that the 250 soybean acres were in compliance but the corn acres were not.

DATCP has estimated that 14 percent of Grant County crop land experiences erosion rates between t ands 2t. Another 6 percent erodes between 2t and 3t, and 4 percent in excess of 3t. If we assume that this farm matches the county averages, then 70 acres of corn (14 percent of the total 500 acres of crop ground) need to be switched from conventional tillage to no-till, 30 acres need to be strip cropped, and 20 acres need to be taken out of production and placed into a cover crop.

The cost of converting the 70 acres to no-till will be $389. Foregone revenue on these acres will total $613. This is based on an initial yield of 149 bushels per acre, and a no-till yield of 139 bushels per acre.

For the 30 acres eroding between 2t and 3t, the costs of changing practices are $122, and revenue forgone as a result of the new practice is $2405. For 20 acres taken out of production as a result of an erosion rate in excess of 3t, the cost of planting a cover crop is $76, and foregone revenue totals $2400 (land rent times acres).

The total first year costs on this farm of complying with the erosion guidelines are $6005. In addition, the producer will face nutrient planning and updating costs of $750 (DNR

expects the cost to average $5 per year in the first three years. The 30 percent of the producer's share would be $1.50 per acre times 500 acres). Thus, total first year costs are $6755, and assumes no significant change in manure management if manure is used as a nutrient input.

CASH CORN	Grant County			
	Conventional	No-till	Strip Cropping	Permanent Cover
YIELD	149	139	62.55	0
seed	$34.00	$34.00	$17.00	$10.50
fertilizer	$61.00	$61.00	$30.50	$0.00
chemical	$30.00	$44.00	$15.00	$0.00
Misc.	$11.43	$11.00	$5.72	$0.00
Custom Work	$6.50	$6.50	$3.25	$0.00
Drying	$20.00	$18.60	$10.00	$0.00
Interest	$7.00	$7.00	$3.50	$0.00
Equipment - Variable	$19.00	$11.44	$19.00	$0.52
Equipment - Fixed	$23.50	$14.15	$23.50	$0.58
Labor - Hired	$4.31	$3.23	$4.31	$0.00
Labor - Operator	$18.10	$13.58	$18.10	$1.10
Land	$120.00	$120.00	$120.00	$120.00
Cost Per Acre	$354.84	$344.50	$269.88	$132.70
Average Price (98-00)	$1.91	$1.91	$1.91	$1.91
Revenue per Acre	$284.59	$265.49	$119.47	$0.00
Revenue minus Oper. Cost	$49.75	$40.99	-$30.40	-$12.70
Net Revenue per Acre	-$70.25	-$79.01	-$150.40	-$132.70
Return per bushel	-$0.47	-$0.57	-$2.40	

The second farm scenario considered is in Trempealeau County (this is one of the 12 counties that did not participate in the 1999 DATCP Transect Survey). This is an area where manure management is likely to be a significant issue. Rather than specify a specific sample farm for this area, results from a 1997 UW-Extension report are summarized.[18] The study examined 17 farms, including various livestock enterprises, and looked at compliance issues related to developing and implementing nutrient management plans. Individual farm plans were analyzed, and operations were rated based on the likelihood of successfully implementing the plan. The basic requirements for assuming successful implementation were that the plan adheres to sound agronomic principles, is practical from the producer's point of view, and results in manure being spread on less than 45 percent of tillable acres and no established hay. Based on DNR cost estimates, the cost to all producers of developing a plan would be about $1.50 per acre (DNR has estimated an average cost of $5 per acre, with producers paying 30 percent).

The study found that 24 percent of general livestock farms, and 36 percent of dairy farms had developed plans which met the above criteria. The primary problems faced by other producers included inadequate land for waste application, spreading over more than 50-percent of tillable land, or a need to incorporate manure to remain within P guidelines

(this would be incompatible with a no-till system of crop production which might be necessary to met erosion requirements).

The study estimated 5 of the farms would need to build manure storage facilities for winter storage. This results from a lack of non-highly erodable land (the slope exceeds 12 percent, thus winter application is not allowed), fields that are inaccessible in winter, or spreadable land that is too far from buildings. Based on DNR cost estimates for constructing storage facilities, the producers' share of costs on these five farms would be $10,500 (based on a DNR total estimated cost of $35,000 per facility).[19]

DNR has estimated that there are between 3350 and 5000 farms in Wisconsin that will require manure storage. Using the 70/30 cost share rate, total costs are between $35 million and $53 million for Wisconsin livestock producers.

The Trempealeau study looked at the costs associated with 4 of the sample farms building liquid manure storage systems, and having the manure custom applied. Facility costs were substantially higher than the DNR cost estimate, ranging from $45,000 to $96,000 per facility. The study found that 2 of the 4 farms, if facing a 30 percent cost share rate, would actually improve their cash flow position (assuming a 9.5 percent interest rate and a 20 year loan on the producer's share). This results from a reduction in costs of chemical fertilizers that are replaced by the liquid manure. The net benefit was between $3 thousand and $4 thousand per year. However, on the other two farms the producers still faced a net cost of between $4 and $6 thousand per year. Clearly, the implications of developing and implementing a nutrient plan will vary significantly across operations.

Conclusions

Crop producers will face significant challenges in meeting the proposed non-point pollution guidelines. A significant part of the costs associated with meeting erosion guidelines will come in the form of foregone revenue. However, these costs will vary widely across individual operations based on tillage systems currently in place, and percent of tillable land out of compliance.

Meeting nutrient management guidelines will also be a significant challenge in parts of the state. Total costs of manure storage based on DNR estimates may understate actual costs. For example, the site-specific systems for liquid manure storage examined in the Trempealeau County study suggest significantly higher costs of developing storage systems than the average costs for storage facilities assumed by DNR. Again, this suggests that there will be significant variations in costs faced by individual producers.

The intent of this study is to provide some guidelines for crop producers relative to costs of compliance for the proposed non-point pollution rules. It does not make inferences relative to the social cost/benefit ratio associated with rule adoption, nor any judgments about the environmental impacts that might result from rule adoption.

Appendix 1.

Estimated Regional Corn Budgets

CASH CORN	Southwest			
	Conventional	No-till	Strip Cropping	Permanent Cover
YIELD	137	127	57.15	0
seed	$34.00	$34.00	$17.00	$10.50
fertilizer	$61.00	$61.00	$30.50	$0.00
chemical	$30.00	$44.00	$15.00	$0.00
Misc.	$11.43	$11.00	$5.72	$0.00
Custom Work	$6.50	$6.50	$3.25	$0.00
Drying	$20.00	$18.60	$10.00	$0.00
Interest	$7.00	$7.00	$3.50	$0.00
Equipment - Variable	$19.00	$11.44	$19.00	$0.52
Equipment - Fixed	$23.50	$14.15	$23.50	$0.58
Labor - Hired	$4.31	$3.23	$4.31	$0.00
Labor - Operator	$18.10	$13.58	$18.10	$1.10
Land	$92.50	$92.50	$92.50	$92.50
Cost Per Acre	$327.34	$317.00	$242.38	$105.20
Average Price (98-00)	$1.91	$1.91	$1.91	$1.91
Revenue per Acre	$261.67	$242.57	$109.16	$0.00
Revenue minus Oper. Cost	$26.83	$18.07	-$40.72	-$12.70
Net Revenue per Acre	-$65.67	-$74.43	-$133.22	-$105.20
Return per bushel	-$0.48	-$0.59	-$2.33	

CASH CORN	Southwest			
	Conventional	No-till	Strip Cropping	Permanent Cover
YIELD	137	127	57.15	0
seed	$34.00	$34.00	$17.00	$10.50
fertilizer	$61.00	$61.00	$30.50	$0.00
chemical	$30.00	$44.00	$15.00	$0.00
Misc.	$11.43	$11.00	$5.72	$0.00
Custom Work	$6.50	$6.50	$3.25	$0.00
Drying	$20.00	$18.60	$10.00	$0.00
Interest	$7.00	$7.00	$3.50	$0.00
Equipment - Variable	$19.00	$11.44	$19.00	$0.52
Equipment - Fixed	$23.50	$14.15	$23.50	$0.58
Labor - Hired	$4.31	$3.23	$4.31	$0.00
Labor - Operator	$18.10	$13.58	$18.10	$1.10
Land	$92.50	$92.50	$92.50	$92.50
Cost Per Acre	$327.34	$317.00	$242.38	$105.20
Average Price (98-00)	$1.91	$1.91	$1.91	$1.91
Revenue per Acre	$261.67	$242.57	$109.16	$0.00
Revenue minus Oper. Cost	$26.83	$18.07	-$40.72	-$12.70
Net Revenue per Acre	-$65.67	-$74.43	-$133.22	-$105.20

CASH CORN	Southeast			
	Conventional	No-till	Strip Cropping	Permanent Cover
YIELD	128	119	53.55	0
seed	$34.00	$34.00	$17.00	$10.50
fertilizer	$61.00	$61.00	$30.50	$0.00
chemical	$30.00	$44.00	$15.00	$0.00
Misc.	$11.43	$11.00	$5.72	$0.00
Custom Work	$6.50	$6.50	$3.25	$0.00
Drying	$20.00	$18.60	$10.00	$0.00
Interest	$7.00	$7.00	$3.50	$0.00
Equipment - Variable	$19.00	$11.44	$19.00	$0.52
Equipment - Fixed	$23.50	$14.15	$23.50	$0.58
Labor - Hired	$4.31	$3.23	$4.31	$0.00
Labor - Operator	$18.10	$13.58	$18.10	$1.10
Land	$93.50	$93.50	$93.50	$93.50
Cost Per Acre	$328.34	$318.00	$243.38	$106.20
Average Price (98-00)	$1.92	$1.92	$1.92	$1.92
Revenue per Acre	$245.76	$228.48	$102.82	$0.00
Revenue minus Oper. Cost	$10.92	$3.98	-$47.06	-$12.70
Net Revenue per Acre	-$82.58	-$89.52	-$140.56	-$106.20
Return per bushel	-$0.65	-$0.75	-$2.62	

CASH CORN	Southeast			
	Conventional	No-till	Strip Cropping	Permanent Cover
YIELD	128	119	53.55	0
seed	$34.00	$34.00	$17.00	$10.50
fertilizer	$61.00	$61.00	$30.50	$0.00
chemical	$30.00	$44.00	$15.00	$0.00
Misc.	$11.43	$11.00	$5.72	$0.00
Custom Work	$6.50	$6.50	$3.25	$0.00
Drying	$20.00	$18.60	$10.00	$0.00
Interest	$7.00	$7.00	$3.50	$0.00
Equipment - Variable	$19.00	$11.44	$19.00	$0.52
Equipment - Fixed	$23.50	$14.15	$23.50	$0.58
Labor - Hired	$4.31	$3.23	$4.31	$0.00
Labor - Operator	$18.10	$13.58	$18.10	$1.10
Land	$93.50	$93.50	$93.50	$93.50
Cost Per Acre	$328.34	$318.00	$243.38	$106.20
Average Price (98-00)	$1.92	$1.92	$1.92	$1.92
Revenue per Acre	$245.76	$228.48	$102.82	$0.00
Revenue minus Oper. Cost	$10.92	$3.98	-$47.06	-$12.70
Net Revenue per Acre	-$82.58	-$89.52	-$140.56	-$106.20

CASH CORN	North Central			
	Conventional	No-till	Strip Cropping	Permanent Cover
YIELD	125	116	52.2	0

seed	$34.00	$34.00	$17.00	$10.50
fertilizer	$61.00	$61.00	$30.50	$0.00
chemical	$30.00	$44.00	$15.00	$0.00
Misc.	$11.43	$11.00	$5.72	$0.00
Custom Work	$6.50	$6.50	$3.25	$0.00
Drying	$20.00	$18.60	$10.00	$0.00
Interest	$7.00	$7.00	$3.50	$0.00
Equipment - Variable	$19.00	$11.44	$19.00	$0.52
Equipment - Fixed	$23.50	$14.15	$23.50	$0.58
Labor - Hired	$4.31	$3.23	$4.31	$0.00
Labor - Operator	$18.10	$13.58	$18.10	$1.10
Land	$59.00	$59.00	$59.00	$59.00
Cost Per Acre	$293.84	$283.50	$208.88	$71.70
Average Price (98-00)	$1.91	$1.91	$1.91	$1.91
Revenue per Acre	$238.75	$221.56	$99.70	$0.00
Revenue minus Oper. Cost	$3.91	-$2.94	-$50.17	-$12.70
Net Revenue per Acre	-$55.09	-$61.94	-$109.17	-$71.70

CASH CORN	North			
	Conventional	No-till	Strip Cropping	Permanent Cover
YIELD	117	109	49.05	0
seed	$34.00	$34.00	$17.00	$10.50
fertilizer	$61.00	$61.00	$30.50	$0.00
chemical	$30.00	$44.00	$15.00	$0.00
Misc.	$11.43	$11.00	$5.72	$0.00
Custom Work	$6.50	$6.50	$3.25	$0.00
Drying	$20.00	$18.60	$10.00	$0.00
Interest	$7.00	$7.00	$3.50	$0.00
Equipment - Variable	$19.00	$11.44	$19.00	$0.52
Equipment - Fixed	$23.50	$14.15	$23.50	$0.58
Labor - Hired	$4.31	$3.23	$4.31	$0.00
Labor - Operator	$18.10	$13.58	$18.10	$1.10
Land	$30.00	$30.00	$30.00	$30.00
Cost Per Acre	$264.84	$254.50	$179.88	$42.70
Average Price (98-00)	$1.89	$1.89	$1.89	$1.89
Revenue per Acre	$221.13	$206.01	$92.70	$0.00
Revenue minus Oper. Cost	-$13.71	-$18.49	-$57.17	-$12.70
Net Revenue per Acre	-$43.71	-$48.49	-$87.17	-$42.70
Return per bushel	-$0.37	-$0.44	-$1.78	

CASH CORN	North Central			
	Conventional	No-till	Strip Cropping	Permanent Cover
YIELD	125	116	52.2	0
seed	$34.00	$34.00	$17.00	$10.50
fertilizer	$61.00	$61.00	$30.50	$0.00
chemical	$30.00	$44.00	$15.00	$0.00
Misc.	$11.43	$11.00	$5.72	$0.00
Custom Work	$6.50	$6.50	$3.25	$0.00
Drying	$20.00	$18.60	$10.00	$0.00
Interest	$7.00	$7.00	$3.50	$0.00
Equipment - Variable	$19.00	$11.44	$19.00	$0.52
Equipment - Fixed	$23.50	$14.15	$23.50	$0.58
Labor - Hired	$4.31	$3.23	$4.31	$0.00
Labor - Operator	$18.10	$13.58	$18.10	$1.10
Land	$59.00	$59.00	$59.00	$59.00
Cost Per Acre	$293.84	$283.50	$208.88	$71.70
Average Price (98-00)	$1.91	$1.91	$1.91	$1.91
Revenue per Acre	$238.75	$221.56	$99.70	$0.00
Revenue minus Oper. Cost	$3.91	-$2.94	-$50.17	-$12.70
Net Revenue per Acre	-$55.09	-$61.94	-$109.17	-$71.70
Return per bushel	-$0.44	-$0.53	-$2.09	

CASH CORN	North			
	Conventional	No-till	Strip Cropping	Permanent Cover
YIELD	117	109	49.05	0
seed	$34.00	$34.00	$17.00	$10.50
fertilizer	$61.00	$61.00	$30.50	$0.00
chemical	$30.00	$44.00	$15.00	$0.00
Misc.	$11.43	$11.00	$5.72	$0.00
Custom Work	$6.50	$6.50	$3.25	$0.00
Drying	$20.00	$18.60	$10.00	$0.00
Interest	$7.00	$7.00	$3.50	$0.00
Equipment - Variable	$19.00	$11.44	$19.00	$0.52
Equipment - Fixed	$23.50	$14.15	$23.50	$0.58
Labor - Hired	$4.31	$3.23	$4.31	$0.00
Labor - Operator	$18.10	$13.58	$18.10	$1.10
Land	$30.00	$30.00	$30.00	$30.00
Cost Per Acre	$264.84	$254.50	$179.88	$42.70
Average Price (98-00)	$1.89	$1.89	$1.89	$1.89
Revenue per Acre	$221.13	$206.01	$92.70	$0.00
Revenue minus Oper. Cost	-$13.71	-$18.49	-$57.17	-$12.70
Net Revenue per Acre	-$43.71	-$48.49	-$87.17	-$42.70
Return per bushel	-$0.37	-$0.44	-$1.78	

Appendix 2.

Estimated Regional Soybean Budgets

Cash Soybeans	South			
	Conventional	No-till	Strip Cropping	Permanent Cover
YIELD	40	40	18	0
seed	$32.00	$32.00	$16.00	$10.50
fertilizer	$25.00	$25.00	$12.50	$0.00
chemical	$34.04	$49.56	$24.78	$0.00
Misc.	$2.20	$2.20	$2.20	$0.00
Custom Work	$10.63	$10.63	$5.32	$0.00
Drying	$0.00	$0.00	$0.00	$0.00
Interest	$4.99	$4.99	$2.50	$0.00
Equipment - Variable	$17.11	$17.11	$17.11	$0.52
Equipment - Fixed	$18.43	$18.43	$18.43	$0.58
Labor - Hired	$2.84	$2.84	$2.84	$0.00
Labor - Operator	$8.98	$8.98	$8.98	$1.10
Land	$92.50	$92.50	$92.50	$92.50
Cost Per Acre	$248.72	$264.24	$203.15	$105.20
Average Price (98-00)	$5.30	$5.30	$5.30	$5.30
Revenue per Acre	$212.00	$212.00	$95.40	$0.00
Revenue minus Oper. Cost	$55.78	$40.26	-$15.25	-$12.70
Net Revenue per Acre	-$36.72	-$52.24	-$107.75	-$105.20
Return per bushel	-$0.92	-$1.31	-$5.99	

Cash Soybeans	Central			
	Conventional	No-till	Strip Cropping	Permanent Cover
YIELD	40	40	18	0
seed	$32.00	$32.00	$16.00	$10.50
fertilizer	$25.00	$25.00	$12.50	$0.00
chemical	$34.04	$49.56	$24.78	$0.00
Misc.	$2.20	$2.20	$2.20	$0.00
Custom Work	$10.63	$10.63	$5.32	$0.00
Drying	$0.00	$0.00	$0.00	$0.00
Interest	$4.99	$4.99	$2.50	$0.00
Equipment - Variable	$17.11	$17.11	$17.11	$0.52
Equipment - Fixed	$18.43	$18.43	$18.43	$0.58
Labor - Hired	$2.84	$2.84	$2.84	$0.00
Labor - Operator	$8.98	$8.98	$8.98	$1.10
Land	$59.00	$59.00	$59.00	$59.00
Cost Per Acre	$215.22	$230.74	$169.65	$71.70
Average Price (98-00)	$5.30	$5.30	$5.30	$5.30
Revenue per Acre	$212.00	$212.00	$95.40	$0.00
Revenue minus Oper. Cost	$55.78	$40.26	-$15.25	-$12.70
Net Revenue per Acre	-$3.22	-$18.74	-$74.25	-$71.70
Return per bushel	-$0.08	-$0.47	-$4.13	

Cash Soybeans	North			
	Conventional	No-till	Strip Cropping	Permanent Cover
YIELD	38	38	17.1	0
seed	$32.00	$32.00	$16.00	$10.50
fertilizer	$25.00	$25.00	$12.50	$0.00
chemical	$34.04	$49.56	$24.78	$0.00
Misc.	$2.20	$2.20	$2.20	$0.00
Custom Work	$10.63	$10.63	$5.32	$0.00
Drying	$0.00	$0.00	$0.00	$0.00
Interest	$4.99	$4.99	$2.50	$0.00
Equipment - Variable	$17.11	$17.11	$17.11	$0.52
Equipment - Fixed	$18.43	$18.43	$18.43	$0.58
Labor - Hired	$2.84	$2.84	$2.84	$0.00
Labor - Operator	$8.98	$8.98	$8.98	$1.10
Land	$30.00	$30.00	$30.00	$30.00
Cost Per Acre	$186.22	$201.74	$140.65	$42.70
Average Price (98-00)	$5.30	$5.30	$5.30	$5.30
Revenue per Acre	$201.40	$201.40	$90.63	$0.00
Revenue minus Oper. Cost	$45.18	$29.66	-$20.02	-$12.70
Net Revenue per Acre	$15.18	-$0.34	-$50.02	-$42.70
Return per bushel	$0.40	-$0.01	-$2.93	

[1] These are not intended to represent any individual farm, but rather the average costs across wide geographical regions.

[2]The following acreage figures all come from the Summary Report, 1997 Natural Resources Inventory, USDA, revised December 2000.

[3] Wisconsin 1999 Transect Survey County Summary Reports, DATCP, 6/1/00 DRAFT.

[4] These figures come directly from the report.

[5] The base budgets assume conventional tillage systems, meaning production practices do not result in a continuous residue level of more than 30 percent.

[6] There are potentially dozens of ways tillage (and rotation) systems might be altered in an attempt to reduce soil erosion. This study reduces these to just a few options in order to make the project scope manageable.

[7] These are available from http://www.nass.usda.gov:81/ipedbcnty/main2.htm.

[8] In general, conservation tillage practices result in about a 7 percent reduction in corn yields over conventional tillage, and no significant change in soybean yields. Personal conversation with Dr. Joe Lauer, University of Wisconsin – Extension Corn Specialist.

[9]Proposed Rule NR 154, Natural Resources Board, DNR, January 24, 2001.

[10] Revenues in the budgets are based on average prices from 1998 to 2000, and average cost estimates. This study estimates costs producers would have faced if they had been forced to comply with the erosion guidelines in the last year or so. In the remainder of this study, revenue refers revenues minus operating costs in the budgets considered. Operating costs include all but land rent.

[11] The NRCS data does not provide a county-by-county breakdown of acres by level of erosion. However, the DATCP survey does, and the relative percentages across counties in that study were used to estimate the regional distribution of acres in the NRCS data.

[12] It is likely some of this ground is already in no-till, and may require a more significant change in management practice to bring it into compliance.

[13] This will decline in futures years as the costs of changing management practices dissipate.

[14] There were 12 Wisconsin counties that did not participate in the 1999 Transect Survey. This partially explains the difference in acreage estimates using DATCP versus NRCS data.

[15] Using the NRCS data, we extrapolated to the 2000 crop acreage numbers. For this analysis, we use the actual numbers from 1999.

[16] Based on DATCP estimates, the vast majority of southern cropland exceeding an erosion rate of t in the Southwest. As such, budget rental rates are for that area.

.[17] This only accounts for sheet and rill erosion.

[18] The Implications of Nutrient Management Regulations on Farms Within the Driftless Region of Wisconsin, Dennis Frame, Agricultural Agent, UW-Extension and Trempealeau County, June 1997.

[19] These come from a summary sheet of costs that were completed with input from both DATCP and DNR.