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Economic Analysis of Two Cost-Share Programs to Improve Ground Water Quality; Fencing: A Marketing Alternative

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ECONOMIC ANALYSIS OF TWO COST-SHARE PROGRAMS TO IMPROVE GROUND WATER QUALITY

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There has been a great deal of speculation regarding the course of U.S. farm policy in the remainder of this decade. As policymakers prepare the 1995 farm bill, there is an increased interest in weighing the promise of policy options such as "green" or "stewardship" programs. A recent task force emphasized the challenges in the Great Plains region of providing sufficient economic incentives to induce voluntary adoption of farming practices and systems that are friendly to water quality. "Green" programs could help to provide the required economic incentive.

The goal of the research reported in this article was to determine whether the economic incentives offered through certain existing environmental provisions of the Federal farm program are sufficient to induce Western Corn Belt/Northern Great Plains farmers in environmentally sensitive areas to adopt farming practices and systems that are thought to improve ground water quality.

"Green" Programs

Attention was focused on the Integrated Crop Management (ICM) cost-share program and the Water Quality Incentive Program (WQIP). These programs started as pilot efforts in the early 1990's and, thus far, have had limited funding. National policymakers need to know whether these programs are viable options to expand upon and/or substantially modify in the 1995 farm bill. This research is intended to provide such policy insights for grain farming areas in which ground water quality is a critical concern.

The ICM program incorporates pest and nutrient management, crop selection and rotation, and conservation measures into a more comprehensive management program than is usually associated with

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FENCING: A MARKETING ALTERNATIVE

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Many farmers like the idea of buying put options to set a minimum price for a commodity they are producing and will deliver to market at a later date. This strategy is a form of price insurance. The producer picks a strike price to set a level of price protection and pays a premium that varies in amount with the level of protection desired. If a high price is desired, a high premium is paid and if a lower price is desired, a lower premium is paid. After the farmer buys the put, if price goes up, the put expires worthless and a higher cash price is received; if price goes down, the put is offset to collect the premium which can be added to the lower cash price.

Currently, for new crop soybeans, a November Chicago Board of Trade (CBOT) $6.00 put can be bought for 33 cents per bushel on a 5,000 bushel contract (1,000 bushel contracts are available). The minimum expected price (floor price) at harvest is calculated by subtracting the premium and the basis from the strike price, as follows:

Put Strategy -- Buy November $6.00 CBOT Soybean Option

STRIKE PRICE	$6.00
Premium	- .33
Expected Basis	- .50
Minimum Price	$5.17

Basis is the relationship between your local price and the Chicago futures price and can be obtained from historical records. Expected basis, estimated when the put is purchased, and actual basis, known at harvest time, can be different and thus the minimum price of $5.17 per bushel could vary by a few cents per bushel.

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Agricultural Conservation Program cost share. Practices may include soil and tissue testing, field scouting, cover crops, green manures, improved rotations, composting, and other techniques for reducing the use of agri-chemicals.

The WQIP is a voluntary program to encourage producers to adopt practices that improve water quality. It provides incentive payments for farms to develop and implement 3- to 5-year farm management plans that will protect water quality through reduction in the waste stream of agricultural pollutants, including fertilizer, manure, and pesticides. Participating farmers must agree to implement a water quality plan approved by the USDA, report their usage rates of nutrient, pesticide, and animal waste materials for the previous 3 years, and supply well test results, soil tests, tissue tests, and application levels to the Natural Resources Conservation Service and the local conservation district for each year in the program.

The research reported in this article is being conducted on case farms over the Big Sioux Aquifer (BSA). Preventing ground water contamination from fertilizers, pesticides, and animal wastes is a major objective of the BSA Water Quality Demonstration Project. The BSA Project is aimed at protecting ground water quality in shallow aquifers by identifying farm management practices which are environmentally sound and economically feasible. The goal is to promote voluntary adoption of innovative production practices, management systems, and land treatment to reduce or eliminate contamination of the aquifer by agricultural operations.

Methods of Analysis

Four case study farms are being used for analyses. They represent different farm sizes, soils, cropping systems, topography, and management in the BSA study area.

The case farms are a mix of three dryland operations and one irrigated operation. Farm #1 is a dryland operation that uses reduced tillage on a corn-soybean rotation, with some alfalfa. Farm #2 is a dryland operation that uses some aspects of reduced tillage on corn, soybeans, and oats. Farm #3 is a dryland operation that has corn, soybeans, oats, alfalfa, and clover. This is a part-time farm that uses a high level of stewardship. Farm #4 is an irrigated operation that uses conventional tillage on continuous corn under a center-pivot sprinkler irrigation system.

Crop enterprise budgets have been developed for these farms using a budget generator package called CARE (Cost And Return Estimator). Profitability results (from CARE) for individual crops, fields, and soils have been aggregated to a rotation and farming system level with special spreadsheets that take Federal farm program acreage set-aside requirements into account.

Farming system analyses were conducted by examining the profitability of the system before and after enrollment in the ICM program and/or the WQIP. In addition to "before" and "after" analyses, we conducted profitability analyses for possible additional **practice** changes. These are changes that some farmers are not actually using yet, but that could be added to the "after" scenario. One is banding fertilizer at planting and another is splitting nitrogen fertilizer applications. Other changes involve **system** changes. The system changes involve switching to more diverse crop rotations than existed in the "before" and "after" scenarios for each individual case farmer.

Results

The per acre profitability results shown in Table 1 are composites for all farming systems on the affected fields of each case farm; they were determined by dividing the "whole-farm" results by the number of acres. Shown in the first row of data are "baseline" net returns/acre for each case farm; these represent net returns in a "typical" year "before" entering the ICM or WQIP program. In the second row are estimates of what net returns are likely to be in a typical year "after" entering into the ICM or WQIP program and making associated farm management adjustments.

Estimated "before" and "after" net returns on Case Farm #1 were the same, because the crop consulting services received under the ICM program for that farm did not lead directly to any farming practice or system changes. Estimated net returns increased substantially on Case Farm #2 (by $30/acre), where the ICM program contributed to a decision to switch to no-till practices for corn and soybeans and to begin drilling soybeans. Net returns were estimated to increase by $6/acre on Case Farm #3, where the WQIP involved reduced usage of inorganic fertilizer and changes in pesticides on corn. Estimated net returns increased substantially ($18/ac) on Case Farm #4, where the WQIP involved eliminating dry preplant inorganic fertilizer.

The third and fourth rows of data in Table 1 constitute profitability estimates for possible additional **practice** changes. Each--analyzed individually, rather than in combination--appears to add modestly to net profitability in each case.

The final rows show estimates for four additional hypothetical scenarios, these involving system changes. All involve changes to more diverse crop rotations than existed in the "before" and "after" scenarios. The first two include oats (as a nurse crop for alfalfa), alfalfa (harvested for 2 years after seeding), soybeans, and corn in 6-year rotations. In one alternative, soybeans are grown 2 years out of 6 and corn is only grown 1 year; in the other, soybeans are grown 1 year and corn is grown 2 years. Both of these scenarios appear to add to net farm profitability--compared to the "after" scenario on Case Farms #1, #2, and #3.

The last two alternatives are system changes for Case Farm #4. This farm also has hypothetical scenarios that involve system changes to more diverse rotations, but the scenarios are different from those of the other farms because the irrigated farm's baseline involves a continuous corn rotation. In one alternative, a 6-year rotation, alfalfa (clear-seeded) is harvested 2 years, and soybeans and corn are each grown for 2 years. The other alternative for Case Farm #4 is a corn/soybean rotation. (Corn/soybean rotations were part of the baseline for some of the other case farms.) Neither one of these system alternatives appear to be as profitable as the continuous corn rotation in the "after" scenario.

Sensitivity analyses were conducted for alfalfa yields and prices. The purpose of these analyses was to determine how sensitive the rankings of the different systems were to assumed alfalfa prices and yields. Farm #1 and Farm #3 required a drop of 35% or more in alfalfa prices or alfalfa yields before the diverse systems became less profitable than the baseline "after" systems. These farms have some alfalfa in their baseline systems, which explains the large percentage drop in prices or yields needed to make the diverse systems less profitable. Farm #2 does not have alfalfa in its baseline system. This farm would require an 18% drop in prices or a 25% drop in yields before the diverse systems would become less profitable than the baseline system.

Profitability comparisons are not considered to be very sensitive to assumed alfalfa prices and yields for these farms, since percentage decreases were in excess of 10% before profitability rankings were affected. These sensitivity analyses were not conducted for Farm #4 because the baseline system (continuous corn under a center-pivot irrigation system) was more profitable than the diverse rotation using assumed prices and yields.

Conclusions

Economic results showed no change in "typical year" net profits "after" participation in ICM or WQIP (compared to "before" participation) on one farm, a modest increase on another, and substantial increases on the other two. These results imply that the ICM program and the WQIP can enhance the profitability of some farms, while encouraging practices to improve water quality. Simulation of additional **practice** changes thought to improve ground water quality showed possible modest increases in profits. Simulated **system** changes, involving adoption of more diverse crop rotations, also added to profitability under some circumstances.

Table 1. Profitability Estimates for Selected Management Scenarios on Four Case Farms

Management scenario	Net returns to land and management ($/ac.)			
	Case Farm #1	Case Farm #2	Case Farm #3	Case Farm #4
Baseline ("before" ICM or WQIP)	$92	$39	$95	$63
"After" ICM or WQIP	$92	$69	$101	$81
Banding fertilizer at planting	N/A	$71	$102	N/A
Splitting nitrogen applications	$93	$73	$102	$88
Diverse rotation with 1 yr oats, 2 yrs alfalfa, 2 yrs soybeans, & 1 yr corn (between soybean years)	$109	$96	$109	N/A
Diverse rotation with 1 yr oats, 2 yrs alfalfa, 2 yrs corn, & 1 yr soybeans (between corn yrs)	$106	$83	$111	N/A
Diverse rotation with 2 yrs alfalfa, 2 yrs soybeans, & 2 yrs corn	N/A	N/A	N/A	$54
Corn/soybean rotation	N/A	N/A	N/A	$75

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Address Correction Requested

(Fencing ... cont'd from p.1)

If a producer is leery of paying 33¢ per bushel or around $10 per acre for price insurance, a technique called <u>fencing</u> can be used to set a minimum price that covers cost of production but reduces upside potential compared to the buy a put strategy. With fencing, the marketer seeks a strike price on a put option that carries a premium similar in amount to a higher strike price call option. The put option is bought and the call option is sold. Premium paid for the put offsets premium received for the call. Selling the call requires margining and sets a ceiling on the amount of price upside potential the marketer could receive. One objective of the call portion of the fence is to pick a strike price that is high enough so that there is a low probability of price getting that high.

Currently, new crop soybean options offer a very good fencing opportunity. A $5.50 November put can be bought for 10¢ per bushel and a $7.75 call can be sold for 10¢ per bushel. The price floor and ceiling are as follows:

Fence Strategy -- Buy November $5.50 Put Option and Sell November $7.75 Call Option

Floor Price - Put		Ceiling Price - Call	
STRIKE PRICE	$5.50	STRIKE PRICE	$7.75
Premium - Put	- .10	Premium - Put	- .10
Premium - Call	+ .10	Premium - Call	+ .10
Basis	- .50	Basis	- .50
Minimum Price	$5.00	Maximum Price	$7.25

If the futures price goes below the strike price for the put after this strategy is executed, the put is sold and the premium collected offsets a decline in cash soybean price. The premium originally collected for selling the call is kept. However, that premium is reduced by the original premium paid for the put. If futures prices go up but not beyond the $7.75 call strike price, the soybean cash price goes up, the put is worthless and the marketer keeps the 10¢ call premium. If the futures price goes above the $7.75 call strike price, margin money is paid to cover call losses, but they are offset by increases in the cash price. The put is worthless and expires. The put premium of 10¢ per bushel was paid up front and is a business cost, but it is offset by the 10¢ premium received when the call was sold.

As with the put strategy, if the actual basis at harvest does not equal the estimated basis of 50¢ per bushel under the futures, the net price received will change from the expected minimum or maximum by the amount actual basis differs from expected basis.

This marketing alternative can be used for any commodity that has futures and options contracts. Sometimes the market doesn't offer a wide fence, difference between expected minimum and maximum price, like the opportunity currently offered in soybeans, but the astute marketer evaluates the opportunities often and executes the fence when it fits the business' marketing plan.

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