"CAN FARMERS SURVIVE THE FEDERAL FARM SECURITY ACT?"

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INTRODUCTION

The title raises an interesting question that has several ramifications. First, how many farmers can afford to leave the farm program given the current unstable level of commodity prices? In the 1990 Food Security Act (FSA) all the economic benefits of the federal farm program are linked to conservation compliance. It seems more realistic to approach the topic of FSA survival by looking at the costs and benefits of participation. To do this the short-run and long-run economic impacts both on and off the farm have to be evaluated. FSA attempts to reduce the economic and environmental impacts of erosion by requiring farmers to use approved conservation practices on highly erodible lands. The way chosen to do this is to tie the farm program benefits to the use of a Soil Conservation Service approved conservation plan. The carrot used to make the pill easier to swallow is continuation of farm program benefits. The stick or penalty is the loss of all farm program benefits.

COSTS OF CONSERVATION COMPLIANCE

The costs of conservation compliance are the added costs of applying the Soil Conservation Service (SCS) approved conservation Practices, as per an approved conservation plan. These are the conservation practices required by SCS to meet FSA minimum standards for erosion control on highly erodible lands. Three conservation practices are examined in this analysis; they are: 1) minimum tillage used as an alternative to conventional tillage, 2) divided slopes and minimum tillage combined, and 3) strip cropping and minimum tillage combined. The farm analyzed is a 1,000 acre wheat-barley-pea farm located in northern Idaho. In this analysis only the added costs of farming the land with the required conservation practices are being evaluated.

Minimum tillage is a practice used to manage crop residues to control soil erosion. It helps farmers maintain specific levels of residue both above and below the soil surface, improving soil organic matter, soil structure, and water infiltration. Lighter equipment and fewer tillage operations are used, and farmers spend less time and money on tillage. Minimum tillage reduces fuel, oil, and repair costs on tractors and farm machinery, and therefore it should extend the lives of farm machinery and equipment. This shows up in table 1 as a lower cost for each crop. The reduction in cost for tillage operations varies from $1.80 to $2.43 per acre. On a 1,000 acre farm with a 3 year wheat, barley, pea rotation and minimum tillage vs, conventional tillage should reduce the costs of tillage by $2,196, table 1. This $2,196 consists of reduced cash outlay savings in terms of reduced fuel costs along with oil, and labor costs.

Dividing the field at the dead furrow (12-15 percent hill slope) and farming each part of the field in different crops is the divided slopes practice. The point is to grow alternate crops on the upper and lower slopes of the field. This allows the cover conditions on a slope to vary, decreases the slope length, and increases the protective cover that permits greater water infiltration, and reduces water runoff. Divided slopes on farm fields are beneficial in

reducing soil erosion and in improving down stream water quality. This practice is relatively easy to apply and maintain.

Table 1. Comparisons of Costs of Conventional and Minimum Tillage for a 1,000 acre Northern Idaho Wheat, Barley Pea Farm.

Crops	acres	Cost per acre: Conv. tillage	Cost per acre: Min. tillage	Savings
WW after SP	334	$29.98	$28.18	$1.80
SB after WW	333	$40.47	$38.04	$2.43
SP after SB	333	$39.36	$37.00	$2.36
	1,000			

Crops	Acres	Total Costs: Conv. till.	Total Costs: Min. till.	Savings
WW	334	$10,013	$9,413	$601
SB	333	$13,477	$12,668	$809
SP	333	$13,107	$12,320	$786
Totals	1,000	$36,597	$34,401	$2,196

Legend: WW = winter wheat Conv. till. = Conventional tillage
SB = Spring barley Min. till. = Minimum tillage
SP = Spring peas

Field size and shape influence the loss of time and efficiency of using divided slopes. Studies done on divided slopes have identified three field conditions which affect the costs of farming divided slopes (1). Large gently rolling fields are the easiest to adapt to divided slopes with a low efficiency loss (efficiency loss of 2.5 percent). In most cases these would be fields of over 150 acres in size with a southwest orientation. Fields ranging from 50 to 150 acres were classified as medium efficiency loss fields (efficiency loss of 9.2 percent) in their ability to be adapted to divided slope farming. Those less than 50 acres in size were classified as high efficiency loss fields (efficiency loss of 19 percent).

It was assumed that 400 acres would be farmed using only minimum tillage, of the land in divided slopes 60 acres were high efficiency loss fields, 180 acres were medium efficiency loss fields, and 360 acres were low efficiency loss fields. The fields with divided slopes would be tilled using minimum tillage. Divided slopes costs were estimated as $36,065, or $469 more than the costs of farming them with conventional tillage (table 2). The distribution of these costs shows that the added costs related to the inefficiency losses of divided slopes were offset by the reduced costs of minimum tillage.

Strip cropping is the systematic arrangement of strips or bands of crops that serve as barriers to erosion. The planting of alternating strips or three or more crops across the slope of a field creates a rough soil surface that reduced runoff velocity, allows for better water absorption, and with a winter crop in one of the strips provides a more stable soil horizon during the critical erosion months in the Palouse region of northern Idaho. The land used for strip cropping would usually be on steeper ground, and would not typically be a large part of

most farms. This is particularly true where divided slopes are also used in the farming operation.

Table 2. Estimated Costs of Divided Slopes on a 1,000 Acre Northern Idaho Wheat Barley Pea Farm, 1992.

Part I Per acre costs for divided slopes

	Conventional tillage costs per acre	Per Acre Costs (using minimum tillage) Efficiency Loss High 19%	Medium 9.1%	Low 2.5%
WW after SP	$29.98	$35.68	$32.71	$30.73
SB after WW	$40.47	$48.16	$44.15	$41.48
SP after SB	$39.36	$46.84	$42.94	$40.34

Part II. Estimated costs of using divided slopes on a 1,000 acre northern Idaho farm.

	Conventional tillage total costs	Total Costs (using minimum tillage) Minimum tillage costs	Divided Slopes costs	Total costs
WW after SP	$10,013	$3,776	$6,364	$10,140
SB after WW	$13,477	$5,059	$8,590	$12,649
SP after SB	$13,107	$4,921	$8,355	$13,276
Totals	$36,597	$13,756	$23,309	$36,065

Net difference between conventional tillage and divided slope, $36,065 - $36,597 = $469.

Legend: WW = winter wheat,
SB = spring barley
SP = spring peas.

If the strip cropping practice is added to the farm it would be used on 90 acres or that land with slopes over 30 per cent. The added time required to farm strips relative to conventional tillage was calculated using the Field Tillage Simulation program developed at the University of Idaho.[1] The output of this program includes the number turns, field efficiency, speed, miles traveled, elapsed time, time spent turning, and the number of acres farmed. In addition the costs of fuel, oil, lube and repair costs for tractors and farm machinery were also calculated, along with the increased costs of fertilizer, herbicide, and seed related to overlapping problems related tillage and spray machinery operation. Added turns and implement overlapping was estimated to result in a 10 to 20 percent increase in chemical and fertilizer use. The added costs related to using strip cropping are shown in table 3. The costs are per acre costs for each crop. The added costs for winter wheat were $18.01 per acre, those for spring barley were $11.52 per acre, and those for spring peas were $11.33 per acre.

[1]Unpublished computer program obtained from C. E. Peterson, Department of Agricultural Engineering, University of Idaho.

Table 3. Estimated Added Costs of Strip-Cropping Relative to Conventional Tillage on a 1,000 acre Northern Idaho Wheat-Barley-Pea Farm.

Crop	Acres	Added fuel oil, lube and repairs/acre	Added labor per acre	Added herb-icide, fert- & seed	Total added costs/acre
Winter wheat	30	$1.18	$0.68	$16.15	$18.01
Spring barley	30	$1.74	$0.81	$8.97	$11.52
Spring peas	30	$1.74	$1.19	$8.41	$11.33

Table 4 shows an example of a complete farm operation involving minimum tillage, divided slopes and strip cropping on a 1,000 acre farm in the Cow Creek watershed. The total tillage cost of farming included the following practices. Minimum tillage alone was used on 400 acres, strips and minimum tillage on 90 acres, and divided slopes with minimum tillage on 510 acres. The total cost of tillage on this farm would be $37,576. This figure is $978 more than the cost of conventionally farming. What this indicates is that the savings related to minimum tillage offset a considerable portion of the costs of applying these conservation practices.

Table 4. Estimated Costs of Using Minimum Tillage, Divided Slopes, and Strip-Cropping and a 1,000 acre Northern Idaho Wheat-Barley-Pea Farm.

Part I. Acreage

Crop	Minimum tillage (acres)	Divided slopes		Strips (acres)	Total acreage
		Medium (acres)	Low (acres)		
Winter Wheat	134	50	120	30	334
Spring barley	133	50	120	30	333
Spring peas	133	50	120	30	333
Totals	400	150	360	90	1,000

Part II. Costs of tillage

Crop	Minimum tillage	Divided slopes with minimum tillage		Strips with minimum tillage	Totals
		Medium	Low		
Winter wheat	$3,776	$1,636	$3,668	$1,386	$10,485
Spring barley	$5,059	$2,208	$4,978	$1,487	$13,731
Spring peas	$4,921	$2,147	$4,841	$1,450	$13,359
Totals	$13,756	$5,990	$13,507	$4,323	$37,576

Part III. Differences Crop	Cost of conventional tillage	Cost of divided slopes & strip-cropping	Net differences
Winter wheat	$10,013	$10,485	$472
Spring barley	$13,517	$13,731	$214
Spring peas	$13,146	$13,359	$213
	$36,676	$37,575	$899

In this table 5 the conventional system is compared to: 1) a straight minimum tillage system, 2) a divided slope system combined with minimum tillage, and 3) a system that uses strips with minimum tillage. These comparisons are shown at the bottom of the table indicating both cost increases and savings related to each system. The minimum tillage system is the most cost efficient in that it saves $2,196. The next most efficient system is the divided slope minimum tillage system that costs $467 more than the conventional system. The divided slope-stripcropping system with minimum tillage increased costs by $978. When all of the other systems are compared to the minimum tillage system they tend to be less efficient. However, the loss of efficiency is very small over all. In percentage terms, the losses in terms of economic efficiency were: 1) Conventional tillage versus minimum tillage there is an efficiency gain of 6 percent; 2) in the case of conventional tillage versus divided slopes with minimum tillage there is an efficiency loss of 1 percent; and 3) in the case of conventional tillage versus strip-cropping and divided slopes with minimum tillage the efficiency loss was 2.6 percent. It is concluded that conservation compliance has not been expensive for most farmers. On a per acre basis the cost increases for divided slope farming were $0.47 per acre, and those for the strip-cropping program were $0.98 per acre when compared to conventional tillage.

Table 5. A Comparison of Alternative Tillage Systems on a 1,000 Acre Northern Idaho Wheat-Barley-Pea Farm.

		Comparisons			
	Acres	Conventional tillage	Minimum tillage	Divided slopes	Strip-cropping
Winter wheat	334	$10,013	$9,413	$10,140	$10,485
Spring barley	333	$13,477	$12,668	$13,649	$13,731
Spring peas	333	$13,107	$12,320	$13,275	$13,359
	1,000	$36,597	$34,401	$37,064	$37,575
Net difference between conventional tillage and divided slopes and strip-cropping alternatives		$0	($2,196)	$467	$978
Net difference between minimum tillage and divided slopes and strip cropping alternatives			$0	$2,663	$3,174

When cost comparisons were made between the minimum tillage, divided slopes, and stripcropping alternatives, the costs were $2,663 higher for divided slopes, and $3,174 higher for the stripcropping. The relative economic efficiency loss was higher at 7.7 percent for divided slopes, and 9.2 percent for strip-cropping. The per acre increases in tillage costs for divided slopes alternative were $2.66 per acre, and that for strip-cropping was $3.17 per acre. These are still nominal costs when compared to the income received under participation in the farm programs. As a point of comparison the average cost per acre for the most complicated conservation program on the representative farm used in this analysis varied between $0.98 and $3.17 per acre depending upon whether conventional tillage or minimum tillage was used as the base for comparisons. The average payment for the average acre of wheat produced in Latah County was $62.23 per acre and that same payment for barley was $29.13. The cost of conservation practices yields a significant return to the farmers who participate in the farm program.

In summary, minimum tillage when compared to conventional tillage saves farmer's money. It saves enough money that it should offset most of the increased costs related to using divided slopes and strip cropping under the conditions assumed in this study. And when the costs of conservation compliance are compared to the benefits of the farm program it is clear that participating in conservation compliance pays relative to loosing all farm program benefits. However, one does have to apply these practices to specific farm situations to determine the magnitude of the costs and resulting economic benefits. Farmers need to look carefully at their SCS conservation plans and evaluate the changes that are required for them to be in compliance with the 'conservation compliance provisions.' These increased costs of these changes need to be evaluated, and they will need detailed studies of how these changes will affect their farms. Not every farm situation will be the same as the one presented in this analysis. It is concluded in this study that farmers gain more from the farm program than they might lose by any increased costs related to conservation compliance under the 1990 Food Security Act.

It should be pointed out that although the costs of tillage may be reduced, some if not all of this reduction may be offset by increased pesticide application. As tillage is reduced weed, insect, and disease problems may increase in the short run because of the changed cropping environment. Farmers need to recognize that moving to a new tillage system is more complicated than reducing the amount of tillage used. The tillage system that existed prior to this change was a system in equilibrium, when changes are made this often upsets this equilibrium allowing weeds, insects, and diseases to invade. So until a new equilibrium is established some additional costs related to controlling these pests may occur. However, in a period of 3 to 5 years a new equilibrium should be established and these costs should diminish.

SOIL EROSION BENEFITS

The soil erosion benefits related to the use of the above conservation practices for the case study farm used in this analysis were obtained from the SCS Field Technical Guide (3). The practices used in this case study would reduce soil erosion by the following amounts according to the estimates used in this guide. Minimum tillage reduced soil erosion from an average of 16.2 tons to 11.7 tons per acre, or a net saving of 4.5 tons per acre. In aggregate terms the amount of soil saved was 4,500 tons for the farm. When both minimum tillage and divided slopes were used to control erosion, the average soil loss was reduced from the 16.5 tons per acre under conventional tillage to 6.0 tons per acre under divided slopes, or 10.5 tons per acre. When minimum tillage, divided slopes and strip cropping were used, the average soil loss was reduced from the 16.5 tons per acre under conservation tillage to 5.2 tons per acre. In the aggregate a total reduction of 11.3 tons per acre, or 11.3 tons per acre,table 6.

Table 6. Estimated Soil Losses in Ton per Acre for Alternative Tillage Practices for a 1,000 Acre Northern Idaho Wheat-Barley-Pea Farm.

	Acres of cropland by slope category				
Tillage practice	Flat 400	Slight 360	Medium 150	High 90	Avg. 1,000
Conventional tillage (T/ac.)	8.1	17.4	22.0	30.7	16.5
Minimum tillage (T/ac.)	4.6	13.1	17.2	23.0	8.2
Minimum tillage plus divided slopes (T/ac.)	4.6	4.9	6.5	8.8	6.0
Minimum tillage, divided slope, and strips (T/ac.)	4.6	3.7	5.5	7.4	5.2
Tillage practice					
Conventional tillage (Tons)	3,240	2,610	7,920	2,763	16,533
Minimum tillage (Tons)	1,840	1,965	6,192	2,070	8,197
Minimum tillage plus divided slopes (Tons)	1,840	735	2,340	792	5,707
Minimum tillage, divided slopes and strips (Tons)	1,840	555	1,980	498	5,193

In terms of the total tons of soil saved, the application of these practices is impressive. Total soil loss under conventional tillage which used heavy tillage equipment such as moldboard plows and heavy offset disks were estimated to be 16,533 tons per year on the 1,000 acres. Minimum tillage would reduce this by about half to 8,197 tons per acre. The use of divided slopes combined with minimum tillage would decrease to 5,707 tons, and by adding strips the soil loss would be reduced to 5,193 tons. In the case where both divided slopes and strip-cropping were used the average soil loss would meet the SCS soil loss tolerance level of 5 tons per acre, which is the level for the area that the case study farm was located in. In fact the divided slopes alone almost meet this level, and in most cases it would be a judgment call as to whether the strips would be needed.

A further point relates to the value of what is being accomplished by using conservation practices to reduce erosion. There are two points that need to be recognized with regard to the benefits generated by erosion control. First there is the on-site benefits that relate to maintaining and enhancing the productivity of the farm. The second source of benefits would be the reduction in off-site damages. These damages include sedimentation and water quality problems to which erosion is a contributor. In this study only the off-site benefits will be considered, and they will consist of the reduction in erosion as measured above in table 6. The value per ton of soil eroded was estimated in a study done by Michalson in 1991 (2). In this study the value estimated was $1.32 per ton of soil. Using this value the contribution made by the case study farm is shown in table 7.

Table 7. The Estimated Value of Off-site Benefits Related to Controlling Soil Erosion on a 1,000 Acre Northern Idaho Wheat-Barley-Pea Farm.

	Acres of land by slope category				
	Flat	Slight	Medium	High	Total
	400	150	360	90	1,000
Conventional tillage	$0	$0	$0	$0	$0
Minimum tillage	$1,848	$851	$2,281	$915	$5,895
Minimum tillage plus divided slopes	$1,848	$2,475	$7,366	$2,602	$14,291
Minimum tillage, divided slopes and strips	$1,848	$2,713	$7,841	$2,990	$15,392

The reduction in off-site damages is impressive. These savings are also a measure of the environment benefits related to the conservation compliance program. Looking at the total column in table 7, it appears that the case study farm is generating between $6,000 to over $15,000 of environmental benefits by using the practices listed in table 7. The environmental benefits of minimum tillage alone were $5,895. The use of minimum tillage and divided slopes generated added, environmental benefits of $8,696, and these increased further to $9,497 when strips were added to the farm plan. The margin between the use of minimum tillage plus divided slopes and minimum tillage, divided slopes, and strips was only $1,101. This indicates that the effectiveness of these practices declines as more of them are used. It is clear that farmers who participate in the conservation compliance program are generating environmental benefits in terms of off-site environmnetal benefits. Further it is also clear that these environmental benefits have not been recognized by the policy makers.

In conclusion, the cost of applying the conservation practices required for participation in the conservation compliance part of the farm program is not excessively high. In the case where a farmer may be moving from conventional tillage to minimum tillage there are savings in fuel and time because tillage operations are reduced. Even in the case where the number and types of conservation practices do require more time and money the increased costs were minor varying from about $1.00 per acre up to a maximum of $3 per acre. However when the benefits generated by these programs are considered, farmers are not being credited for the environmental benefits that these conservation plans generate. The magnitude of these benefits is considerable ranging from approximately $6,000 to over $15,000 for the whole farm. These numbers translate into $6 and $15 per acre, and should be compared to the cost of the conservation practices which farmers are being asked to use. Over all it does appear that farmers can survive under "Food Security Act," (FSA) because the increased costs are not great enough to offset the benefits that the FSA provides, namely $62.23 per acre for wheat, and $29.13 for barley payments on average. The significant point is that the environmental benefits which this program is generating is being ignored in terms of the farmer's contribution. It would be a better world for farmers if the FSA was recognizing their contribution toward environmental enhancement.

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