# The Use of United States' Farm Commodity Programs in Sustainable Production Systems: An Economic Case Study

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Abstract

Using data from a long term farming systems trial of sustainable and conventional cash grain rotations, the relative merits of participating in the government farm programs were examined. These rotations were studied using a twenty year simulation of the 1990 Farm Program, 1990 Farm Program with expanded flex provisions, and three proposals for the 1995 Farm Program. These different commodity programs do provide a beneficial income safety net for farmers who have made the decisions to practice sustainable crop rotations. The benefits, however, are less than those for conventional farmers. In general, sustainable program participants face 1) restrictions in practicing their rotations, 2) reduced land values due to a loss of base acreage, and 3) smaller income streams from reduced deficiency payments. Program alternatives which offer 100% flexibility allow sustainable farmers to largely avoid the first two problems just mentioned.

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## Introduction

It is widely believed that federal commodity programs in their present form (1990 legislative base) are incompatible with the adoption of sustainable agricultural production systems. Indeed, a number of studies clearly demonstrate the bias introduced by commodity program provisions for monocultural production. This bias is especially clear from analyses conducted prior to implementation of the 1990 farm bill. For example, comparisons of conventional with alternative, low input crop rotations adaptable to the Palouse region of the Pacific Northwest showed that alternative rotations could be expected to provide greater net economic returns to production only in the absence of commodity program participation, even though variable costs for the alternative rotations were lower and specific commodity's yields were assumed constant across rotations (Goldstein and Young, 1987; Young and Painter, 1990). Similar results were found for production systems in other regions. Duffy (1987) showed monocultural corn in Iowa to be 19 to 97 percent more profitable than four less intensive rotations when participation in commodity programs under the provisions of the 1985 Food Security Act was assumed, but found that all four rotations economically outperformed monocultural corn without corn program participation. Dobbs, Leddy and Smolik (1988) found more mixed effects in comparing alternative systems for the Northern Plains, but

verified that commodity programs' deficiency payments, set-asides, and base acreage provisions affect the relative profitability of sustainable crop rotations. In all of these early studies, a particularly strong effect was associated with the inflexibility commodity program participants faced in making crop planting decisions. Participants had to fully plant base acreage to a commodity program crop in order to maximize government subsidy payments. This necessity precluded the use of input-reducing, soil quality enhancing rotations.

In 1990, commodity programs were made more flexible. Congress set both a minimum, mandatory percentage (15%) and an optional maximum percentage (additional 10%) of base acres on which commodity program participants would forego deficiency payments and could plant non-program commodities without sacrificing base. While this was hailed as an action that reduced rotation disincentives, subsequent studies showed the persistence of some bias against sustainable rotations in commodity programs as those programs continue to link subsidy payments to production levels (Faeth et al., 1991; Faeth, 1995).

Well documented findings of incompatibility between commodity programs and the comparatively profitable (by standard measures of net returns) employment of sustainable agricultural systems are probably responsible for what appears to be the popular notion that one cannot farm sustainably and also be a commodity program participant. In this paper, we challenge and test that notion. In particular, we ask whether, in fact, commodity program participation might not act as an advantageous buffer against increased economic risk during the transition from conventional to sustainable production systems. We further test the possibility that sustainable rotations can be maintained while simultaneously participating in

commodity programs and identify any differences in the characteristics of "sustainable" and typical commodity program participation. Finally, we examine the impact of some proposed legislative changes in commodity programs on the feasibility and advisability of joint program participation and employment of a sustainable production system.

## Mechanics of Commodity Field Crop Programs

Producers of wheat, corn, cotton, sorghum, oats, barley, and rice may choose to participate in federal commodity programs geared to production on established base acreage of any one or several program crops. Base acreage[1] is established by enrolling with the USDA and maintaining plantings of a particular crop on a specific amount of acreage[2] over a five year period for a given farm.

Once a program base acreage and average yield per acre have been established, a commodity program participant will receive a supplementary deficiency payment on a proportion of base acreage. The deficiency payment is equal to the difference between a government-established target price, and either the average market price or a government-established floor price (called the loan rate), whichever is higher.

When anticipated market conditions indicate a large supply of a given program crop, program participants are required to set aside a proportion of base acres. No crop may be harvested from these set-aside acres, and the farmer must plant a cover crop or implement a

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[1]Commodity programs for a range of other crops (e.g., peanuts, sugar, and tobacco) operate differently, and do not involve direct government payments.

[2]Base acreage is a number of acres. No specific fields are designated as base or non-base acres.

related conservation practice. This set-aside proportion is the main feature of what is called the Acreage Reduction Program (ARP); ARP percentages vary among years and among crops. For example, if a program participant has a base acreage for corn of 100 acres and the ARP equals 10%, then he/she can plant only 90 acres of corn.

In the 1990 Farm Bill, a 15% mandatory (called "normal") flex provision reduced payment by 15 % and allowed program participants to plant whatever crops they wished on that acreage and still maintain their base. On this mandatory flex acres (i.e. 15 acres for a 100 acre base), farmers do not receive any deficiency payments. There is an additional 10% referred to as optional flex acres. If program participants plant their program crop on that acreage (i.e. 10 acres), they receive deficiency payments. However, they may choose to plant another crop and voluntarily forego another 10% of deficiency payments. These flex acres are a form of partial decoupling between what farmers plant and the payments they receive from farm programs. On the remaining 65 acres, in this example, the program participant must plant corn and does receive deficiency payments.

In order to maintain the base acreage history which determines the number of acres from which set-aside must occur and on which deficiency payments are made, a commodity program participant must plant a minimum of base acres minus ARP and flex acres to the program crop each year. Failure to do so results in a diminishment of base acreage at the rate of one-fifth of non-planted base (less flex) per year.

rotation followed a rotation of corn, corn, soybeans, corn, and soybeans. The sustainable rotation was hairy vetch winter cover and corn, winter rye cover and soybeans, and winter wheat for grain. The two farms had similar assets with 600 acres of cropland and a 360 acre corn base. The conventional farm planted 360 acres of corn and 240 acres of soybeans. The sustainable farm planted 200 acres each of corn, soybeans, and winter wheat (with their associated winter cover crops). Per acre returns were developed by valuing all outputs and inputs (except for on-farm labor). After 10 years of crop growth and soil investment, the average per acre return of the sustainable rotation for the period 1991-1994 was $68, $11, and $77 per acre for corn, wheat, and soybeans. Over the same period for the conventional rotation, the per acre returns were $43 and $63 for corn and soybeans, respectively. When onfarm labor is valued and the cost of the investment in the biological transition is prorated, then the per acre returns are approximately equal. For more detail and discussion concerning these results, see Hanson et al. (1995).

Using the above data, we simulated the effects of current commodity programs on a conventional and a sustainable farm over 20 years (1996-2015). We used the actual level of flex mandated by the 1990 farm bill, that is 15 percent normal flex and 10 percent optional flex, and an ARP of 6.5% for corn which represents the average percentage over the period, 1990-1995. We assumed a deficiency payment for corn of .50 cents/bushel (1990-94 average) and an ASCS program yield of 97.1 bushels/acre. We isolate the effects of the commodity programs by assuming that an economic, agronomic and management equilibrium has already been reached in the first year of the change to the sustainable rotation. Our model simulates the effects on program base acres and net farm income for 20 years.

## Results

### *Effect on Program Base Acreage*

Base acres are calculated as the historical average of the program crop planted over the previous five years. Figure 1 traces the effects of the change from conventional to sustainable in production on corn base acres over the 20 years of the simulation (with and without flex acres for both systems). Because crop choices in the conventional rotation are unchanging, the program base acres for corn are a constant 360 acres over the simulation. The flex provision in the farm program does not affect crop acreage in the conventional rotation.

The sustainable rotation grows 200 acres of corn. With the flex provision, the corn base begins to decline in year two and then levels off at 292 acres. It is interesting to note that the corn base reaches an equilibrium at a level that is significantly higher than the actual acres planted by the farmer. This phenomenon can be called "protecting base" and is attributed to the flex and ARP provisions used in the analysis. In particular, 6.5% of 292 corn base acres (19 acres) is allocated to the ARP requirement and planted in winter wheat as a cover crop (cannot be harvested). For the flex provisions, 25% (15% mandatory and 10% optional flex) or 73 acres is planted to soybeans (non-program crop). Consequently, with 200 acres of corn, 73 acres of soybeans planted on corn flex acres, and 19 acres of winter wheat planted as a cover crop on the corn ARP, the farmer is able to maintain a 292 acre corn base. The farmer still raises a total of 200 acres of soybeans; 73 on the corn flex and 127 on other non-program acres. The farmer also raises 200 acres of wheat, but can only harvest 181 acres because 19 acres must be plowed under as a cover crop.

Figure 1 also shows the effect on base acreage without a flex provision. In this case, the base acreage reaches a lower equilibrium at 214 acres. Fourteen acres, or 6.5% of the base acreage, are planted to cover crop winter wheat. On the remaining 200 acres, the farmer raises corn. The farmer still raises 200 acres of soybeans; all 200 acres of soybeans are planted on non-program acres. The farmer raises 200 acres of wheat though only 186 can be harvested for grain.

In the previous discussion, we assumed that the ARP was constant across the 20 years of the simulation. The actual ARP for corn between 1990 and 1995 varied between zero and ten percent. When this variability was included in the simulation, the corn base declined to 278 acres. This change occurred because in the years when the corn ARP was zero, more corn base was lost than when it was held constant. A varying ARP can, however, present another significant problem for a farmer who is farming sustainably and maintains a strict rotation. The problem occurs when the ARP requirements exceed the difference of the actual acres planted and the program base acres. For example, assume that the farm's program base has declined to 215 acres, and 200 acres of corn are planted each year. If the ARP is increased to 10 percent, then to remain eligible for farm program payments, 21.5 acres of corn must be idled. This means that the legal maximum number of corn acres that can be planted is 193.5 (215-21.5). At this point, the farmer must decide between the value of what may be considered two distinct assets: 1) program base acres, and 2) the agronomic and ecological value of the rotation. This is the point that may critics cite as proof that current commodity programs discourage crop rotations. Only in certain situations (i.e. non-program crops are planted on flex acres), would flex provisions help a farmer in this situation.

*Effect on Farm Income*

Table 1 shows the value of the corn program, expressed in equivalent annual income, for the sustainable and conventional farmer. It compares the non-program option with the 1990 program for both types of farms. In addition, a second version of the 1990 farm bill was examined where the optional flex acres were increased so that the sum of ARP, mandatory flex, and optional flex equaled 100%. In the absence of commodity program participation, the sustainable rotation had an approximate $800 advantage over the conventional -- a farm income of $31,240 compared to $30,426. This difference was attributable to the sustainable system's lower purchased production costs and comparable yields (Hanson et al., 1995). When the two farms were entered in the 1990 farm program, the conventional farmer benefited more by participation. This increase was due to a larger payment by the government for benefits associated with corn -- deficiency payments of $13,720 compared to $9,710. More specifically, corn government payments were calculated using the average corn deficiency payment for the period, 1990-1994, ASCS county yield for corn in the FST study area, and actual acres of corn grown. "Cover crop wheat" refers to the cost of maintaining a winter cover crop on those acres satisfying the ARP requirement. The conventional farmer has a higher base acreage and therefore more expenses associated with ARP cover crops. Even though the 1990 farm program favored the conventional farmer, it generally did not preclude the sustainable farmer from participating and receiving significant benefits.

Amending the 1990 program to increase the flex provisions to 100% had no effect on the conventional farmer. Conventional farmers tend to have rotations already developed which are designed to receive maximum benefits from the existing farm program. In this

case, increasing the flexibility of the farm program does not affect crop choices. However, for the sustainable farmer, he/she was able to maintain their corn base at the original level of 360 acres rather than letting it decline to 292 acres. This particular rotation showed no immediate gains to this flexibility; a biologically rigid rotation did not allow expansion of corn acreage. In fact, net farm income was reduced slightly because of the increased wheat cover crop acres (and related loss of market wheat sales). However, this particular example understates the value of maintaining the higher program base. First, several studies in the Midwest show the value of this program base when capitalized in the land values to be $20 per acre for a 50% corn base in Illinois (Duffy and Taylor) and $200 per acre in Iowa (Herriges, Barickman, and Shogren). Also, maintaining the base helps keep options open to either revert back to the previous conventional rotation or make changes in their sustainable rotation.

*Alternative Commodity Program Proposals*

In the 1995 political environment of reducing the budget deficit, several new farm bills have been proposed in both the House and the Senate. Each one has been designed to save billions of dollars from the farm programs over the next seven years. The Republican proposals generally try to meet the Budget Reconciliation figure of cutting 13.4 billion dollars from agricultural appropriations. The Democratic farm bill proposals aim for smaller cuts, similar to President Clinton's proposed cut of about 4 billion dollars. We chose to simulate the relative effect of several proposals[3] on base acres and net farm income for a sustainable

[3]At the time of the analysis none of the following bills have been made into law. It is likely that the proposal finally selected will differ from the three presented here.

farmer and a conventional farmer. Table 2 describes these bills by their authors, but we have placed quotations around their names to indicate these bills are works in progress.

The proposal that has, perhaps, gotten the most attention from the media and in Congress is Congressman Roberts' Freedom to Farm Act (FTFA) of 1995 (H.R. 2195). Introduced in early August 1995, the bill would create a seven year contract between the federal government and commodity program participants in which past participants would receive an annual payment based on the percentage of their historical farm payments. Farm spending would be capped so that payments would decline each of the seven years as the transition to a market oriented program progresses. The spending cap would, by definition, ensure that 13.4 billion dollars be saved over seven years. ARPs and set-aside programs would be eliminated. A Commission would be established to monitor the transition and make decisions about farm programs at the end of the seven year transition.

In the Senate, two proposals have gained early support. In September 1995, Senator Lugar, Chair of the Agriculture Committee, released summary language that will likely form the basis for his farm bill proposal (bill number not available, 9/28/95). Like Roberts' proposal, Lugar's plan would require participating farmers to enter a seven-year contract for the receipt of income support payments. While both Roberts' and Lugar's proposals cap spending to conform with the budget target of 13.4 billion dollars over seven years, Lugar's proposal maintains the basic price and income support mechanisms of current commodity programs. The budgetary savings are achieved through increasing the normal flex acres to 35 percent, thus reducing the number of acres on which farmers receive payments, and decreasing target prices by approximately 3% per year to conform with annual budget targets.

Lugar's plan also calls for an end to ARPs and an increase of optional flex to 65 percent. Producers would be required to adhere to conservation compliance programs.

Senator Cochran's farm bill proposal (S. 1155) is similar to Lugar's proposal except it aims to save only 5.7 billion dollars in farm spending over seven years. The bill maintains the basic structure of current commodity programs by continuing the ARPs at 10% and normal flex requirements at 25%, and increasing the optional flex acres to 65 percent. Producers will continue to receive deficiency payments based on the difference of real market and 1990 target prices.

Table 2 shows the changes in net farm income expressed in equivalent annual income and as a percent of the current 1990 farm program. Because of the flexibility offered by all of these bills, sustainable farmers would be able to maintain a higher corn base of 360 acres. In Robert's Freedom to Farm, base acreage for both rotations were equal to zero because the existing program structure had been eliminated.

On a percentage basis, the Cochran, Lugar, and Roberts' bills all reduce farm income more for the conventional farm than for the sustainable farmer. This result is related to the result in Table 1 for the 1990 program where farm income, on a percentage basis, increased more for the conventional farmer as compared to not participating. In general, the existing 1990 farm program increases income more for the conventional farmer than the sustainable farmer when compared to not participating; similarly reducing farm program benefits then reduces farm income more for the conventional farmer than the sustainable alternative. Even though the three bills described here reduce benefits more on a percentage basis to the conventional farmer, the conventional farmer still receives higher payments for each of the

respective legislative alternatives. None of the three bills, however, preclude the sustainable farmer from participating.

Under the output price and deficiency payment assumptions for Table 2, Cochran's proposal had the least negative effect on farm income for both the sustainable and conventional rotations, Roberts' option had the greatest negative effect on both, and Lugar's proposal changes had intermediate effects. These relative rankings change dramatically if a high market price for corn is assumed. When the market price for corn is greater than the target price, there are no deficiency payments. If the market price is just less than the target price, then deficiency payments are small. This means that, in Table 2, government payments for corn would be reduced to near zero under the Cochran and Lugar alternatives if corn prices were high. Revenue for market corn would also increase under that scenario. In contrast, government payments for corn under Roberts' bill are set for the 7 year period independent of market prices. Under the high price scenario, it is likely that farm income would be the highest under the Roberts' scenario because its market corn sales would also increase similar to the other scenarios, yet, in contrast to the others, its government payments for corn would remain the same. Similarly, in periods of very low corn prices, the disadvantages of the Roberts' bill would only increase.

## Conclusion

The 1990 commodity program does provide a beneficial income safety net for farmers who have made the decisions to practice sustainable crop rotations. The benefits, however, favor conventional farmers over sustainable farmers. Current legislative proposals that act to

increase the flexibility under which commodity program participation takes place w
increase the benefits that sustainable farmers receive by participating, but not comp
eliminate the bias that favors conventional farmers. The implication of the commo
program bias is that a conventional commodity program participant has to carefully
factors -- the asset and income values of improved soil quality (yield-enhancing), v
additional value of land (base acreage related) and income values associated with hi
deficiency payments in making the decision to switch to a sustainable rotation. Inc
flexibility reduces losses in land value associated with lower base acreage. A farm
time horizon is long, whose expectations about the continuation of commodity pro
their present form is pessimistic, and/or whose knowledge of the benefits of soil q
good, may well choose to capitalize on improved soil quality and change to the su
rotation rather than stay with the conventional rotation and be assured of the full d
assets generated by commodity program participation. On the other hand, farmer
share these views may not make the sustainable transition. This indicates that perc
regarding sustainable agriculture and farm program participation are affected by l
view (as potentially related to age, land tenure, bequest values, and philosophy), p
expectations (as influenced by various interest groups), and knowledge and under
soil quality relationships.

# Fig 1. The Effect of Flex Acres on Program Base Acres for Corn Grown Conventionally and Sustainably with a 6.5 ARP%

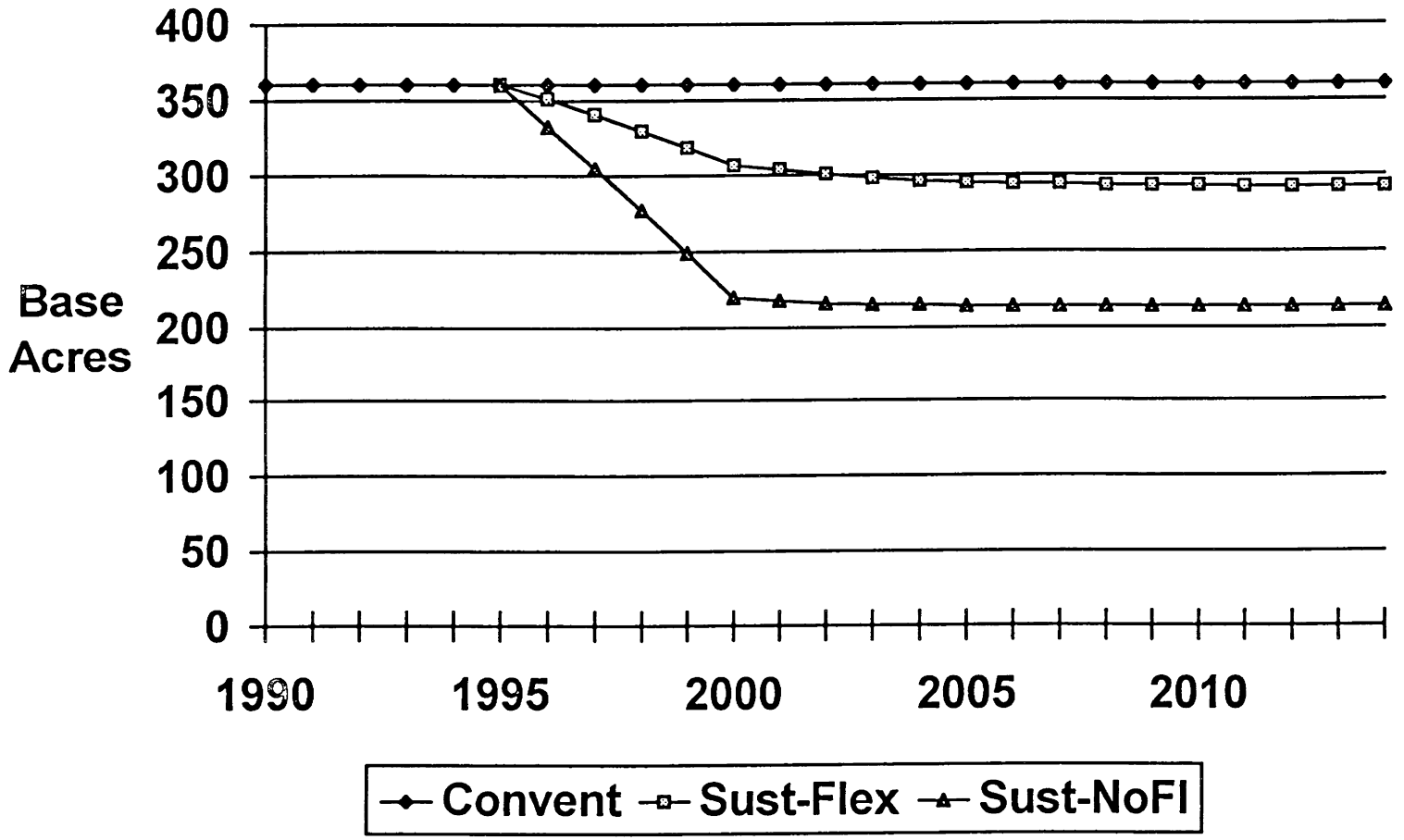

Table 1. Comparisons of ending base acres and annual equivalent farm incomes for a sustainable and conventional rotation when the current farm program is compared to the non-program option and flexibility is increased in the current program, 1996-2015.

| | Terminal Corn Base (acres) | Market Corn ($) | Corn Government Payments ($) | Market Wheat ($) | Market Soybeans ($) | Cover Crop Wheat ($) | Farm Income ($) | Farm Income % of 1990 Program |
|---|---|---|---|---|---|---|---|---|
| *Organic Rotation* | | | | | | | | |
| Non-Program | -- | 13,662 | 0 | 2,148 | 15,430 | 0 | 31,240 | 79.9% |
| 1990 Program ARP (.065), Flex (.15, .10) | 292 | 13,662 | 9,710 | 1,930 | 15,430 | -1,623 | 39,109 | 100.0% |
| 1990 High Flex Version ARP (.065), Flex (.15, .785) | 360 | 13,662 | 9,710 | 1,897 | 15,430 | -1,872 | 38,827 | 99.3% |
| *Conventional Rotation* | | | | | | | | |
| Non-Program | -- | 15,426 | 0 | 0 | 15,000 | 0 | 30,426 | 73.7% |
| 1990 Program ARP (.065), Flex (.15, .10) | 360 | 14,423 | 13,720 | 0 | 15,000 | -1,872 | 41,272 | 100.0% |
| 1990 High Flex Version ARP (.065), Flex (.15, .785) | 360 | 14,423 | 13,720 | 0 | 15,000 | -1,872 | 41,272 | 100.0% |

Table 2. Comparisons of ending base acres and annual equivalent farm incomes for a sustainable and conventional rotation when the current farm program is compared among various alternative farm bill programs being currently debated (1996-2015).

| | Terminal Corn Base (acres) | Market Corn ($) | Corn Government Payments ($)[1] | Market Wheat ($) | Market Soybeans ($) | Cover Crop Wheat ($) | Farm Income ($) | Farm Income % of 1990 Program |
|---|---|---|---|---|---|---|---|---|
| *Organic Rotation* | | | | | | | | |
| 1990 Program<br>ARP (.065), Flex (.15, .10) | 292 | 13,662 | 9,710 | 1,930 | 15,430 | -1,623 | 39,109 | 100.0% |
| "Cochran"<br>ARP (.1), Flex (.25, .65) | 360 | 13,662 | 9,710 | 1,761 | 15,430 | -2,880 | 37,683 | 96.4% |
| "Lugar" (payment reduction)<br>ARP (0), Flex (.35, .65) | 360 | 13,662 | 3,994 | 2,148 | 15,430 | 0 | 35,234 | 90.1% |
| "Roberts" (payment reduction)<br>No program requirements | 0 | 13,662 | 2,277 | 2,148 | 15,430 | 0 | 33,517 | 85.7% |
| *Conventional Rotation* | | | | | | | | |
| 1990 Program<br>ARP (.065), Flex (.15, .10) | 360 | 14,423 | 13,720 | 0 | 15,000 | -1,872 | 41,272 | 100.0% |
| "Cochran"<br>ARP (.1), Flex (.25, .65) | 360 | 13,883 | 11,361 | 0 | 15,000 | -2,880 | 37,364 | 90.5% |
| "Lugar" (payment reduction)<br>ARP (0), Flex (.35, .65) | 360 | 15,426 | 4,673 | 0 | 15,000 | 0 | 35,099 | 85.0% |
| "Roberts " (payment reduction)<br>No program requirements | 0 | 15,426 | 3,218 | 0 | 15,000 | 0 | 33,644 | 81.5% |

[1]Deficiency payments for corn are inversely related with the market price for corn for the 1990 Program, Cochran, and Lugar scenarios, i.e. high market prices for corn can reduce or eliminate deficiency payments. Government payments under Roberts are guaranteed, and do not change with corn prices.