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The Value of Planting Flexibility Provisions in the 1990 Farm Bill to Three Representative Texas Farms

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Abstract

The 1990 Farm Bill reduces deficiency payments but also provides more planting flexibility for program participants. In this study, a mean-standard deviation analysis is used to analyze the impacts of planting flexibility provisions on crop selection decisions, farm returns, and farm risk. Results show that gains from the added planting flexibility do not offset the mandatory loss in the deficiency payments for program participants. Planting flexibility will lead to an increase in corn and wheat planted in the Northern Plains and an increase in cotton planted in the Rolling Plains and Coastal Bend, Texas.

Keywords: planting flexibility, farm programs, risk

The 1990 Farm Bill reduces deficiency payments to farmers but provides more crop planting flexibility for program participants. Program participants can plant any crop, except fruits and vegetables, on normal flex acres (NFA) and optional flex acres (OFA). NFA is 15 percent of the Crop Acreage Base (CAB) and OFA is an additional 10 percent of the CAB. Program participants will be eligible to receive available nonrecourse loans on NFA and OFA, but they will not receive deficiency payments on any NFA, or on the OFA planted to alternate crops. Program participants will benefit from the planting flexibility, but the benefits from planting flexibility will not likely compensate fully for the loss in deficiency payments. Moreover, it is not clear how the planting flexibility provisions will affect agricultural policy objectives such as maintaining farm incomes and stabilizing the supply of program crops.

Planting flexibility provisions were not part of previous farm programs and few studies address

this topic. During the 1990 Farm Bill debate, Richardson et al. used a whole-farm simulation model to evaluate the impact of including more crop planting flexibility in the farm bill on farm profitability and risk. However, results obtained from the simulation model provided little information about optimal crop combinations. Although Westcott developed a general analytical framework to examine planting flexibility alternatives and their influences on land allocation, no empirical work was conducted in his study.

In this study, a mean-standard deviation (E-S) analysis is used to analyze the impacts of the planting flexibility provisions on crop selection decisions, farm returns, and farm risk. The trade-off between the reduction in the deficiency payments and planting flexibility is investigated for current and alternative policy provisions. Representative farms in the Northern Plains, Rolling Plains, and Coastal Bend areas of Texas are studied. First, we present the theoretical framework.

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Second, the procedures and data of the study are discussed. Finally, the empirical results, summary, and conclusions of the study are reported.

Theoretical Framework

Mean-variance (E-V) models are commonly used to analyze the crop-mix decisions for risk-averse decision-makers (Adams et al.; Weimar and Hallam; Featherstone and Moss; Musser and Stamoulis; Scott and Baker; Perry et al.). Under the assumption that a farmer's utility function is negatively exponential and returns are normally distributed, Freund showed that the E-V objective function is maximized at the same point as if one maximizes expected utility. Thus, the certainty equivalent of farm net returns (CE), assuming an E-V objective function, can be written as

$$CE = E[NR] - \frac{\lambda}{2} Var[NR] \quad (1)$$

where $E[NR]$ is the expected farm net returns, $Var[NR]$ is the variance of farm net returns, and λ is the constant Pratt-Arrow coefficient of absolute risk aversion. However, the coefficient of absolute risk aversion, λ , in this form provides no statistical meaning and is difficult to interpret. Thus, it is also difficult to use the E-V model to evaluate the impact of different policy provisions on a farmer when the level of risk aversion is held constant.

The mean-standard deviation (E-S) models, pioneered by Tobin, have gained little attention. The rationale and justification of E-S models were presented by Tsiang. McCarl and Bessler developed a link between E-V and E-S risk aversion coefficients. Following McCarl and Bessler, we transform the E-V model in equation (1) to the E-S model as

$$CE = E[NR] - \rho \sigma[NR] \quad (1')$$

where, $\sigma[NR]$ is the standard deviation of the net returns and $\rho = \frac{\lambda}{2} \sigma[NR]$. The risk aversion parameter, ρ , now can be interpreted as the number of standard errors needed to discount the expected net returns. Thus, a confidence limit can be associated with the risk aversion parameter under the normality assumption of the net returns.

Brink and McCarl elicited risk aversion coefficients (ρ) from 38 farmers and reported that ρ ranged from 0 to 1.25. We model farmers that are slightly risk averse ($\rho=0.32$), moderately risk averse ($\rho=0.675$), and highly risk averse ($\rho=1.15$). This means that the level of net returns that is 0.32, 0.675, and 1.15 standard deviations below the mean will be maximized for slightly, moderately, and highly risk averse farmers, respectively. Under the assumption of normality, there is a 62.5 percent, 75 percent, and 87.5 percent likelihood that a farmer will receive the risk adjusted net return, respectively.

In this study, the CE of farm net returns are maximized assuming an E-S objective function. The objective function is specified as

$$\begin{aligned} \text{Max}_{X^B, X^Y, Y^B, Y^Y} CE = & \sum_{n=1}^N \frac{NR_n}{N} - \\ & \rho * \sqrt{\frac{\sum_{n=1}^N \left(NR_n - \sum_{n=1}^N \frac{NR_n}{N} \right)^2}{N}} \end{aligned} \quad (2)$$

where NR_n is the total net returns for the n_{th} state of nature, and N is the number of possible states of nature. The choice variables in the model are the acres of base crops planted on NFA (X^B) and on OFA (X^Y) and the acres of nonbase crops planted on the NFA (Y^B) and on the OFA (Y^Y). Base crops are the crops on which the farm has established CAB.

The objective function is maximized subject to the following constraints and accounting identities:

$$\begin{aligned} \sum_{i=1}^J \sum_{j=1}^J R_{ni} * X_{ij}^B + \sum_{i \neq j}^J \sum_{j \neq i}^J R_{ni} * X_{ij}^Y + \sum_{j=1}^J R_{nj}^d * X_{ij}^Y + \\ \sum_{j=1}^J R_{nj}^d * X_j + \sum_{j=1}^J \sum_{k=1}^K R_{nk}^{nb} * (Y_{kj}^B + Y_{kj}^Y) - NR_n = 0; \\ n=1, \dots, N \end{aligned} \quad (3)$$

$$X_j = (1 - \alpha_j - \beta - \gamma) * CAB_j ;$$

for all j

(4)

$$\sum_{i=1}^I X_{ij}^\beta + \sum_{k=1}^K Y_{kj}^\beta = CAB_j * \beta ;$$

$j=1, \dots, J$

(5)

$$\sum_{i=1}^I X_{ij}^\gamma + \sum_{k=1}^K Y_{kj}^\gamma = CAB_j * \gamma ;$$

$j=1, \dots, J$

(6)

$$X_i + \sum_{j=1}^J X_{ij}^\beta + \sum_{j=1}^J X_{ij}^\gamma - \sum_{t=1}^T BA_{it} * \mu_t = 0 ;$$

$i=1, \dots, I$

(7)

$$\sum_{i=1}^I X_i + \sum_{i=1}^I \sum_{j=1}^J X_{ij}^\beta + \sum_{i=1}^I \sum_{j=1}^J X_{ij}^\gamma - \sum_{t=1}^T \mu_t = 0$$
(8)

$$X_{ij}^\beta, X_{ij}^\gamma, Y_{kj}^\beta, Y_{kj}^\gamma, \mu_t \geq 0$$

- where
- R_{ni} = net returns per acre, excluding deficiency payments, for base crop i in the n_{th} state of nature,
 - R_{nj}^d = net returns per acre, including deficiency payments, for base crop j in the n_{th} state of nature,
 - R_{nk}^{nb} = net returns per acre for nonbase crop k in the n_{th} state of nature,
 - X_{ij}^β = acres of base crop i planted on NFA for base crop j ,
 - X_{ij}^γ = acres of base crop i planted on OFA for base crop j ,
 - Y_{kj}^β = acres of nonbase crop k planted on NFA for base crop j ,

- Y_{kj}^γ = acres of nonbase crop k planted on OFA for base crop j ,
- X_j = acres of base crop j planted on its non-flexible CAB,
- β = percentage of CAB that is NFA,
- γ = percentage of CAB that is OFA,
- α_j = percentage of CAB for base crop j that must be taken out of production,
- BA_{it} = percentage of planted acre for crop i in time t for each region,
- μ_t = step variable for time t ,
- J = the total number of base crops j ,
- I = the total number of base crops i that can be grown on flexible acres,
- K = the total number of nonbase crops k that can be grown on flexible acres, and
- T = the total number of years in constructing historical crop mix constraint.

The first constraint, Equation (3), is an identity that accounts for NR_n for each state of nature n . There are three types of net returns per acre involved in the calculation of NR_n . Net returns without deficiency payments (R_{ni}) are the returns from NFA used to plant base or alternate base crops and from OFA used to plant alternate base crops. Net returns with deficiency payments (R_{nj}^d) are the returns from OFA or from nonflexible acres used to plant base crops. Net returns for nonbase crop (R_{nk}^{nb}) are the returns from NFA or OFA used to plant nonbase crops. Thus, there are five components of NR_n : total net returns from base and alternate base crops planted on NFA, total net returns from alternate base crops planted on OFA, total net returns from base crops planted on OFA, total net returns from base crops planted on nonflexible CAB, and total returns from nonbase crops planted on NFA and OFA.

R_{ni} is the sum of cash receipts per acre (CR_{ni}), Findley loan payments per acre (FLP_{ni}) or

marketing loan payments per acre (MLP_{ni}) minus the variable costs per acre (VC_{ni}) for commodity i . FLP_{ni} is applied to wheat and feed grains, while MLP_{ni} is applied only to cotton and rice in 1991 provisions. CR_{ni} are obtained by multiplying the commodity price by the yields per acre. FLP_{ni} are the difference between the formula loan rate and the commodity price, multiplied by yields per acre, if the formula loan rate is greater than the commodity price; otherwise FLP_{ni} are zero. Under the assumption that the marketing loan repayment rate is set at the adjusted world price, MLP_{ni} are obtained by multiplying the difference between the formula loan rate and the adjusted world price by yields per acre if the formula loan rate is greater than the adjusted world price; otherwise MLB_{ni} are zero. R_{ni}^d is R_{ni} plus deficiency payments (DP_{ni}). DP_{ni} are obtained by multiplying the difference between the target price and the higher of the formula loan rate or U.S. average commodity price by the program yields per acre. R_{nk}^{nb} is cash receipts per acre minus the variable cost per acre for nonbase crop k .

The second constraint, Equation (4), is an identity defining the non-flexible acreage for each base crop. X_i is a constant and not a choice variable because α , β , and γ are constant. The third constraint, Equation (5), restricts crops planted in NFA to be equal to 15 percent of CAB for each crop. The fourth constraint, Equation (6), restricts crops planted in OFA to be equal to 10 percent of CAB for each crop. Equations (7) and (8) are specified to account for such constraints as timeliness, resources, and crop rotations proposed and discussed by McCarl. They are incorporated into the model such that timeliness, resources, and crop rotation constraints can be modeled by restricting the planted acreage for each crop to be no greater than a linear combination of the historical planted acreage.

Procedures and Data

The E-S model is used to determine which crops will be optimal to plant on flexible acres for selected representative farms. In addition to the current law, we also model the representative farms: A) without any planting flexibility and without any reduction in the deficiency payments (similar to the 1985 Farm Bill) and B) without any planting

flexibility but with a 15 percent reduction in the deficiency payments. The CE is used to compare the current and the two alternative policy provisions at selected levels of risk aversion for each study area. The policy scenarios without planting flexibility will, of course, only have one solution.

The three representative farms modeled in this study are A) a sorghum-wheat-corn irrigated farm in the Northern Plains, B) a cotton-wheat nonirrigated farm in the Rolling Plains, and C) a sorghum-corn-cotton nonirrigated farm in the Coastal Bend areas of Texas. The sizes of these farms are considered moderate: 1280-acre farm in the Northern Plains, 996-acre farm in the Rolling Plains, and 1338-acre farm in the Coastal Bend. It is assumed that payment limitation provisions do not affect the moderately sized farms modeled in this study. The corn, wheat, and sorghum base acreage for the representative farm in the Northern Plains is 264, 604, and 412 acres, respectively. The cotton and wheat base acreage for the representative farm in the Rolling Plains is 580 and 416 acres, respectively. The corn, cotton, and sorghum base acreage for the representative farm in the Coastal Bend is 40, 900, and 398 acres, respectively. All base crops for each farm are inside the farm programs and are receiving program payments.

According to 1991 farm provisions, crops allowed on the flexible acres include: any program crop including wheat, feed grains, cotton, or rice; oilseeds such as soybeans, canola and sunflowers; and all nonprogram crops except fruits and vegetables. To investigate the value of the planting flexibility provisions in the 1990 Farm Bill, we allow NFA and OFA to be used to plant base crops and nonbase crops, either program crops, oilseeds, or nonprogram crops, for each study area. Crops, other than base crops, with more than 1,000 planted acres in each study area were chosen as the alternate nonbase crops. The crops planted in each study area, however, were predominately base crops. Only one alternate crop was chosen for each region: sunflowers, sorghum, and wheat for Northern Plains, Rolling Plains, and Coastal Bend, respectively.

There are five states of nature defined for R_{ni} , R_{nj}^d , and R_{nk}^{nb} . The value of stochastic variables for each state of nature is defined as the observed

value in a year from 1986 to 1990. Each state of nature is unique and there is an equal likelihood that each state of nature will occur. The 1991 farm program provisions, including the announced target price, formula loan rate, and the required acreage reduction for each crop, are obtained from the Agricultural Stabilization and Conservation Service (ASCS) office of the USDA. Prices received by farmers and the yields per acre for the years 1986-90 are obtained from the Texas Agricultural Statistical Service (TASS) county statistics. Program payment yields are obtained from the county ASCS office in each study area. U.S. average farm prices and average adjusted world price for cotton are obtained from the *Agricultural Outlook* for 1986-90. The variable costs per acre for each crop in each area are obtained from the most recent *Texas Crop Enterprise Budgets* which are collected and developed by experts of the Texas Agricultural Extension Service (TAES) as a general guide to farmers in each area. The mean and standard deviation (*SD*) of net returns per base crop, with and without deficiency payments, and per nonbase crop for each representative farm are reported in table 1.

Empirical Results and Implications

The model was used to solve for the optimal crop mix and performance measures, at selected risk aversion levels for each representative farm. The model was solved separately for selected policy provisions to disentangle the impact of lower deficiency payments and greater planting flexibility in the 1990 Farm Bill on farmers. First, it was assumed that the 1985 policy provisions were in effect (i.e., no decrease in deficiency payments and no planting flexibility provisions). Second, it was assumed that the 1990 policy provisions were in effect but without the planting flexibility provisions. Third, it was assumed that the 1990 policy provisions were in effect with the planting flexibility provision. The results are reported in table 2.

Under the 1990 Farm Bill, representative farmers in the Northern Plains area have the highest *CE* per acre (table 2). Representative farms in the Coastal Bend have the highest expected net returns per acre but they also have the highest standard deviation of net returns. The expected net returns in the Northern Plains are only slightly lower than that

of Coastal Bend, but the standard deviation is substantially less. The expected net return per acre and the standard deviation for representative farms in the Rolling Plains are moderate compared to the other two areas. These results generally support the findings of Richardson et al. in which farms in the Northern Plains, Coastal Bend, and Rolling Plains are characterized as economically profitable, viable, and stressed, respectively.

Crops Planted on Flexible Acres

Neither NFA nor OFA are used to plant nonbase crops on any of the representative farms modeled (table 2). This is not surprising because the expected net returns per acre for nonbase crop in each area are either negative or too small to be viable (table 1). The low returns to nonbase crops also help explain why crops planted in these areas are predominately base crops (TASS).

OFA are not used to flex out of base crops in the Northern Plains because alternate crops grown on OFA would not receive deficiency payments and the net returns to base crops with deficiency payments dominate (higher expected net returns and lower variance) the net returns to alternate crops without deficiency payments (table 1). However, it would be optimal for slightly, moderately, and highly risk averse farmers to flex out of all NFA for sorghum and corn and flex into wheat (table 2). The flex out of sorghum to wheat is expected because the net returns to wheat without deficiency payments dominate the net returns to sorghum without deficiency payments (table 1). The expected net return to corn without deficiency payments is only slightly larger than the expected net return to wheat without deficiency payments but the standard deviation is twice as large, thus, it is optimal for risk averse farmers to flex out of corn and flex into wheat. Only the risk neutral farmer would choose to flex out of sorghum into corn.

The expected net returns to cotton without deficiency payments are more than twice the expected net returns to wheat even with deficiency payments for the representative farm in the Rolling Plains (table 1). However, the standard deviation on cotton net returns is also significantly higher. The expected net return to wheat without deficiency payments is negative but its standard deviation is

Table 1. Mean and Standard Deviation (S D) of Net Returns per Acre, 1986 - 1990.

	Base Crop				Nonbase Crop	
	With Deficiency Payments		Without Deficiency Payments			
	Mean	S D.	Mean	S D	Mean	S D
Northern Plains						
Corn	\$114.74	14.92	\$48.70	39.93	N/A	N/A
Wheat	86.92	14.78	48.52	19.41	N/A	N/A
Sorghum	95.90	18.22	46.54	41.42	N/A	N/A
Sunflowers	N/A	N/A	N/A	N/A	\$-24.87	26.36
Rolling Plains						
Cotton	97.86	55.78	47.09	67.81	N/A	N/A
Wheat	21.02	10.09	-0.27	10.26	N/A	N/A
Sorghum	N/A	N/A	N/A	N/A	-8.54	18.02
Coastal Bend						
Corn	23.68	56.12	-9.91	44.10	N/A	N/A
Cotton	117.22	99.64	47.33	84.25	N/A	N/A
Sorghum	55.90	34.10	24.87	31.58	N/A	N/A
Wheat	N/A	N/A	N/A	N/A	0.32	41.08

N/A—Not Applicable

less than the standard deviation on returns to cotton without deficiency payments. It is optimal for slightly risk averse farmers to flex all of the wheat OFA and NFA to cotton (table 2). Moderately risk averse farmers only flex wheat NFA to cotton. The highly risk averse farmers flex cotton NFA to wheat.

The expected net returns to cotton and sorghum without deficiency payments are higher than the expected net returns to corn with deficiency payments for the representative farm in the Coastal Bend (table 1). The expected net returns to cotton without deficiency payments are more than twice the expected net returns to corn with deficiency payments but the standard deviation for cotton is also higher. The expected net return to sorghum without deficiency payments is only slightly larger than the expected net return to corn but the standard deviation for sorghum is smaller. The expected net returns to corn without deficiency payments is

negative. Thus, it is optimal for slightly risk averse farmers to flex all of the corn OFA and NFA to cotton and for moderately and highly risk averse farmers to flex all of the corn OFA and NFA to sorghum (table 2). The expected net returns to cotton without deficiency payments are higher than the expected net returns to sorghum without deficiency payments, but cotton returns also have a higher standard deviation (table 1). The slightly risk averse farmers flex sorghum NFA to cotton and the moderately and highly risk averse farmers flex cotton NFA to sorghum (table 2).

In general, the optimal use of flexible acres in this study for risk neutral and slightly risk averse farmers are consistent with shifts in planted acreage observed in 1991 in the counties where the representative farms reside (TASS). These results are also consistent with the study by Brink and McCarl in which they report 90 percent of the

Table 2 Performance Measures and Optimal Crop Mix Under the 1985 Farm Bill and the 1990 Farm Bill (with and without Planting Flexibility Provisions)

Region	Risk Aversion Level	Item	1985 Farm Bill	1990 Farm Bill	
				Without Planting Flexibility	With Planting Flexibility
Northern Plains	Slightly	Net Returns per Acre (\$)	85.3	78.2	78.3
		Mean	9.5	11.3	10
		Standard Deviation	82.3	74.5	75.1
		Certainty Equivalent			
		Crop Mix (Acres)			
		Corn	244	244	205 ^a
	Moderately	Sorghum	381	381	319 ^a
		Wheat	513	513	615
		Net Returns per Acre (\$)	85.3	78.2	78.3
		Mean	9.5	11.3	10
		Standard Deviation	78.9	70.5	71.5
		Certainty Equivalent			
	Highly	Crop Mix (Acres)			
		Corn	244	244	205 ^a
		Sorghum	381	381	319 ^a
		Wheat	513	513	615
		Net Returns per Acre (\$)	85.3	78.2	78.3
		Mean	9.5	11.3	10
Rolling Plains	Slightly	Standard Deviation	74.4	65.1	66.8
		Certainty Equivalent			
		Crop Mix (Acres)			
		Corn	244	244	205 ^a
		Sorghum	381	381	319 ^a
		Wheat	513	513	615
	Moderately	Net Returns per Acre (\$)	61.6	55.3	59.9
		Mean	34.5	34.1	40.5
		Standard Deviation	50.9	44.4	46.9
		Certainty Equivalent			
		Crop Mix (Acres)			
		Cotton	551	551	655
	Highly	Wheat	354	354	250 ^b
		Net Returns per Acre (\$)	61.6	55.3	58.8
		Mean	33.5	34.1	38.1
		Standard Deviation	39	32.3	33.1
		Certainty Equivalent			
		Crop Mix (Acres)			
Coastal Bend	Slightly	Cotton	551	551	613
		Wheat	354	354	291 ^a
		Net Returns per Acre (\$)	61.6	55.3	51.7
		Mean	33.5	34.1	27.9
		Standard Deviation	23.1	16.2	19.6
		Certainty Equivalent			
	Moderately	Crop Mix (Acres)			
		Cotton	551	551	464 ^a
		Wheat	354	354	441
		Net Returns per Acre (\$)	90.8	80.7	83.6
		Mean	73.4	69.9	74
		Standard Deviation	67.3	58.3	59.9
	Highly	Certainty Equivalent			
		Crop Mix (Acres)			
		Corn	37	37	276
		Cotton	855	855	925
		Sorghum	368	368	308 ^a
		Net Returns per Acre (\$)	90.8	80.7	80.1
	Slightly	Mean	73.4	69.9	65.1
		Standard Deviation	41.3	33.5	36.2
		Certainty Equivalent			
		Crop Mix (Acres)			
		Corn	37	37	27 ^b
		Cotton	855	855	720 ^a
	Moderately	Sorghum	368	368	513
		Net Returns per Acre (\$)	90.8	80.7	80.1
		Mean	73.4	69.9	65.1
		Standard Deviation	6.4	0.3	5.2
		Certainty Equivalent			
		Crop Mix (Acres)			
	Highly	Corn	37	37	27 ^b
		Cotton	855	855	720 ^a
		Sorghum	368	368	513

^aFlexed out of all available NFA^bFlexed out of all available NFA and OFA

farmers in their study demonstrated risk aversion parameters, ρ , of 0.25 or less.

The planted acres of wheat in the representative county in the Northern Plains increased 5,600 acres, from 61,600 acres to 67,200 acres (TASS). The planted acres of corn increased 10,600 acres, from 54,100 acres to 64,700 acres, and planted acres of sorghum decreased 7,400 acres

from 30,500 acres to 23,100 acres. The planted acres of cotton in the representative county in the Rolling Plains increased to 99,200 acres in 1991 from 92,900 acres in 1990, and planted acres of wheat decreased to 89,000 acres from 99,600 acres during the same time period (TASS). The planted acres of cotton in the representative county in the Coastal Bend increased dramatically from 90,300 acres to 116,900 acres, a 26,600-acre increase from

1990 to 1991 (TASS). The planted acres of sorghum have fallen from 120,700 acres to 115,100 acres, a 5,600-acre decrease, while planted acres of corn decreased slightly from 6,400 acres to 6,300 acres during the same period.

Benefits from Planting Flexibility

The 1985 Farm bill is compared to the 1990 Farm Bill by subtracting the risk adjusted net returns per acre, measured as the *CE*, for each farming situation in 1991 under the 1990 Farm Bill provisions from the *CE* under the 1985 Farm Bill provisions. The benefits from planting flexibility are similarly measured by subtracting the *CE* under the 1990 Farm Bill provisions with planting flexibility from the *CE* under the 1990 Farm Bill provisions with no planting flexibility.

The 1990 Farm Bill with planting flexibility in comparison to the 1985 Farm Bill reduced the *CE* by \$6.2, \$6.1, and \$4.1 for slightly, moderately, and highly risk averse farmers, respectively, when averaged over the three representative farms (table 2). The *CE* would have been reduced even more without the planting flexibility provisions. The *CE* would have been \$1.6, \$1.5, and \$3.3 lower, respectively, for slightly, moderately, and highly risk averse farmers without the planting flexibility provisions.

Representative farmers in the Northern Plains and slightly risk averse farmers in the Coastal Bend were hurt the most by the 1990 Farm Bill with a \$7 reduction in the *CE* when compared to farming under the 1985 Farm Bill provisions (table 2). Farmers in the Northern Plains flexed into wheat and although wheat had a higher mean and lower variance than alternate crops, the difference was small, thus benefits from the planting flexibility provisions were less than \$2.00 per acre. Similarly, slightly risk averse farmers in the Coastal Bend flexed into cotton but the benefits from growing additional cotton was also less than \$2.00 per acre. Highly risk averse farmers in the Coastal Bend were hurt the least by the 1990 Farm Bill with only a \$1.2 reduction in the *CE*. Highly risk averse farmers in the Coastal Bend were able to increase their *CE* \$4.9 by flexing into sorghum to reduce risk, thus partially offsetting the loss from lower deficiency payments.

Conclusions

The 1990 Farm Bill reduces the deficiency payments program participants can receive. However, the newly introduced planting flexibility provisions provide farmers an opportunity to achieve higher returns by adjusting their crop mix in response to the market signals. It is not clear how much the benefit from the planting flexibility will offset the loss in deficiency payments. In this study, the E-S analysis incorporating farm program provisions is employed to analyze the impacts of the planting flexibility provisions on optimal crop mix, farm returns, and farm risk for representative farms in the Northern Plains, Rolling Plains, and Coastal Bend areas of Texas.

Results of this study show, as expected, that the 1990 Farm Bill provisions affect farmers differently in different geographical regions and affect farmers in a geographical region differently due to different risk attitudes. The results also show that nonbase crops do not enter into the optimal crop mix at any risk aversion level in the study areas. This result implies that farms in each study area do not have many opportunities to plant crops that are not already in the government program and this result is consistent with the actual county statistics.

We conclude from this study that the 1990 Farm Bill provisions do not provide as much financial support as the 1985 Farm Bill provisions. Farmers who depend on government support most, such as the Northern Plains area, are hardest hit by the new provisions. The results provide evidence that the 15 percent mandatory reduction in the deficiency payments is too substantial to be fully offset by the newly introduced planting flexibility provisions. Although the planting flexibility provision benefits program participants through adjusting crop shifts in response to market signals to maximize their expected utilities, the gains are not large enough to offset the loss in the deficiency payments.

The change in optimal crop mixes for representative farmers who exhibit profit maximizing or slightly risk averse attitudes in this study are consistent with the actual cropping pattern

changes observed in each study area. Crop shifts in the NFA or OFA have resulted in an increase in the corn and wheat planted acreage for the Northern

Plains area and the cotton planted acreage for the Rolling Plains and Coastal Bend areas.

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