Estimating The Value of the 0/92 Reduced Planting Alternatives of the 1985 Farm Bill For Farm Program Participants

Troy N. Thompson, Thomas O. Knight, and Billy D. Boren

Abstract

The 50/92 and 0/92reduced planting alternativestives of the 1985 farm bill allow farm program participants more flexibility in making production decisions. Specifically, these provisions relax the incentive to produce inherent in earlier commodity programs that linked deficiency payments directly to harvested acreage. This study examined the value of this additional decision flexibility for crop producers in the Blacklands of Central Texas. The results suggest that the reduced planting alternatives would not be used by, and have no value for risk neutral producers, but have substantial value for risk averse producers who would reduce planted acreage in years when yield expectations are low.

Key words: decision tree, decoupling, farm bill, risk analysis

For more than 50 years, comodity programs have been the primary policy instruments used by the United States government to support and stabilize farm incomes. Although these programs usually have required producers to remove some acreage from production in order to qualify for benefits, they have encouraged production on the remaining acreage by linking payments to acreage planted for harvest. Thus, commodity programs may have induced inefficient allocation of resources to production of program crops, even though supply control has often been a stated program objective.

The 1985 farm bill included a new reduced-planting alternative for cotton, feed grains, rice, and wheat program participants. This alternative, commonly referred to as the 50/92 option, relaxed the production incentive inherent in earlier commodity programs. Under this provision, a producer who plants for harvest between 50 and 92 percent of a farm's permitted acreage for one of these crops receives 92 percent of the deficiency payment he/she would receive if permitted acreage were planted (*i.e.*, 92 percent of his/her maximum possible deficiency payment for the crop).[1] Thus, the deficiency payment loss associated with a 50 percent acreage reduction is only 8 percent. The 50/92 provisions for wheat and feed grains were modified by the Omnibus Budget Reconciliation Act of 1987 to become 0/92 options, allowing producers to receive 92 percent of their maximum deficiency payments by planting for harvest from zero to 92 percent of permitted acreage.

The 50/92 and 0/92 redced planting options clearly afford commodity program participants more latitude to respond to market forces. As Becker and Carr have suggested, these alternatives may be viewed as limited forms of "decoupling"—a proposed policy option which has been a dominant theme of the farm program debate since 1985 (Boschwitz 1987a; Boschwitz 1987b; Breimyer; Grennes 1988a; Grennes 1988b; Harkin *et al.*). Decoupling refers to the separation of farm program payments from current-year production. A policy of complete decoupling would place no restrictions on the use of commodity program acreage (*i.e.*, any crop could be grown). The 50/92 and 0/92 provisions are less flexible, requiring acreage removed from production to be devoted to conservation uses, with harvesting of crop or forage products largely prohibited. Despite these restrictions, the reduced planting options of the 1985 farm bill may have

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[1] At this point, three terms should be defined. Farm program *base acreage* for a commodity program crop is a farm's historically established acreage for the crop—specifically, for wheat and feed grains, the average acreage of the crop harvested or considered planted for harvest in the previous five crop years. A farm's *acreage reduction requirement* for a program crop is the percentage of base acreage that must be removed from production in order to qualify for commodity program participation. *Permitted acreage* is *base acreage* less the acreage reduction requirement. Thus, permitted acreage is the maximum acreage of a crop that may be harvested under the commodity program.

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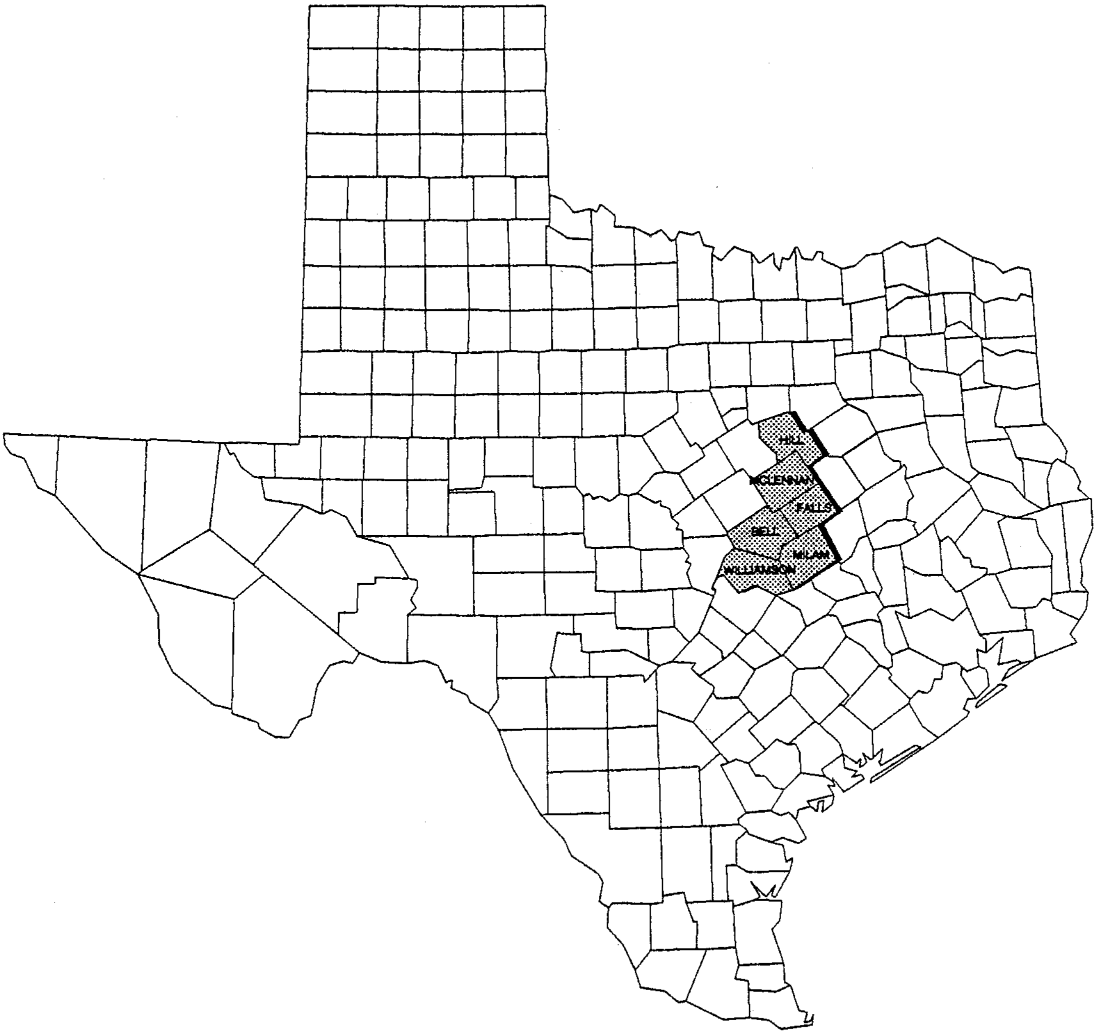


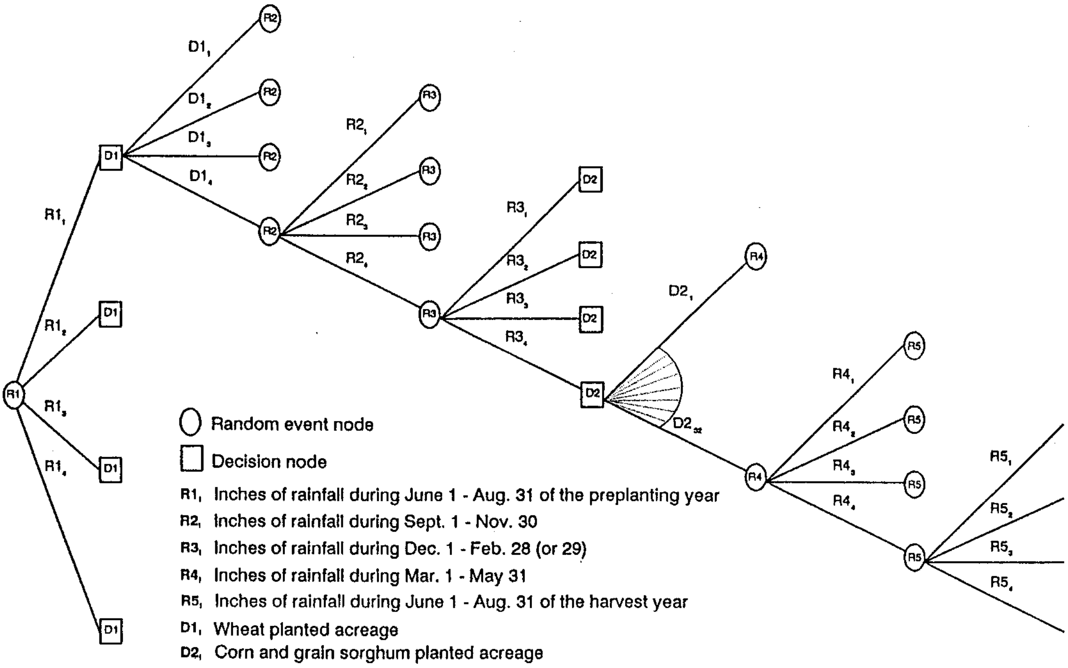
Figure 1. The Blacklands Land Resource Area of Texas

benefits for crop producers in years when the risk of negative market returns from crop production is perceived to be substantial.

This study examined the benefits of the 0/92 reduced planting provisions of the 1988 wheat and feed grains programs for crop producers in the Blacklands land resource area of Central Texas. A dynamic decision model was developed to incorporate the effects of yield uncertainty into the decision process. Yield expectations at planting time were conditioned on preplanting weather. The model was used to estimate (1) the frequency with which producers exhibiting different risk preferences and price expectations would elect to take a reduced planting decision, and (2) the expected value of the reduced planting alternatives compared with earlier, more restrictive policies.

PROBLEM SETTING AND DECISION MODEL STRUCTURE

The Texas Blacklands is a dryland crop production region characterized by rich black soils. The study area (Figure 1) consists of six counties in the Central Blacklands. Primary farm program crops produced in the area are corn, cotton, grain sorghum, and wheat. The most important nonprogram crop is hay. Many farms in the study area are diversified; however, specialized wheat farms are not uncommon in the northern part of the region. Rainfall is the most important climatic factor influencing crop yields in the study area. Although the average annual rainfall of 39 inches is adequate for production of all of the major crops, both annual and seasonal rainfall are highly variable. Frequent summer droughts are especially damaging to corn and grain sorghum yields.



Note: The decision tree shown here is only a partial representation of the model structure. A full representation would be symmetric with each branch from the nodes having a set of subsequent branches like those shown for the path depicted.

Figure 2. Representation of Decision Model Structure

Figure 2 is a partial representtion of the decision model used in the analysis. This model was designed to evaluate corn, grain sorghum, and wheat production alternatives under the provisions of the 1988 farm program. Cotton production was not included in the decision model because the example farms used in the analysis were located in Bell County, in the northern part of the study area, where cotton is grown on less than 5 percent of farm program acreage and a majority of farms grow no cotton at all.

The decision model has a decision tree structure (Anderson *et al.*; Schlaifer) with five random event nodes and two decision nodes. The random event nodes (R1-R5 in Figure 2) are associated with rainfall amounts during specified time periods. These nodes have four branches, indicating the number of alternative values used for the rainfall variables. These values were derived from 50 years of rainfall data recorded at a selected weather station in the study area. The 50 observations on each variable were ranked and partitioned into quartiles. Medians of the observations in the quartiles were used as the four values for the rainfall variables. By construction, these values were considered to be equally likely, each occurring with a probability of 0.25.

Planting acreages for wheat and feed grains are the alternative actions represented by the two decision nodes (D1, D2) in Figure 2. Although planted acreages for wheat, corn, and grain sorghum are continuous variables with an infinite number of possible values, computational considerations placed constraints on the alternatives evaluated. Four wheat planting levels incorporated into the decision model included:

(a) plant wheat base acreage,
(b) plant permitted acreage,
(c) plant 50 percent of permitted acreage, and
(d) plant no wheat.

Feed grains planting decisions incorporated into the model are described in Table 1. Alternatives considered include the planting of corn on grain sorghum base or grain sorghum on corn base, because the 1988 feed grains program affords this flexibility. Also considered was the opportunity to participate in the 10 percent paid diversion program for feed grains. This program pays producers a fixed amount per acre, based on an announced payment rate and their farm program payment yield, to remove from production 10 percent of base acreage in addition to the standard acreage reduction requirement. Planting more than base acreage for either wheat or feed grains was not considered because such a decision disqualifies the farm from receiving farm program benefits on any crop.

Table 1. Feed Grains Planting Alternatives Included in the Decision Model

Feed Grains Planting Strategies	Acreage Planted	Percent of Feed Grains Acreage Planted to Each Crop	
		Corn	Grain Sorghum
1	Base[a]	100	0
2	Base	80	20
3	Base	60	40
4	Base	40	60
5	Base	20	80
6	Base	0	100
7	Permitted[b]	100	0
8	Permitted	80	20
9	Permitted	60	40
10	Permitted	40	60
11	Permitted	20	80
12	Permitted	0	100
13	Permitted with PD[c]	100	0
14	Permitted with PD	80	20
15	Permitted with PD	60	40
16	Permitted with PD	40	60
17	Permitted with PD	20	80
18	Permitted with PD	0	100
19	1/2 Permitted	100	0
20	1/2 Permitted	80	20
21	1/2 Permitted	60	40
22	1/2 Permitted	40	60
23	1/2 Permitted	20	80
24	1/2 Permitted	0	100
25	1/2 Permitted with PD[d]	100	0
26	1/2 Permitted with PD	80	20
27	1/2 Permitted with PD	60	40
28	1/2 Permitted with PD	40	60
29	1/2 Permitted with PD	20	80
30	1/2 Permitted with PD	0	100
31	No Acreage with PD	0	0
32	No Acreage with no PD[e]	0	0

[a] Historical five-year planted acreage for feed grains.

[b] Base acreage minus acreage reduction requirement.

[c] Permitted acreage under the paid diversion program.

[d] One-half of permitted acreage under the paid diversion program.

[e] Planting no acreage while participating in the paid diversion program.

Now that the random event and decision nodes have been defined, the decision tree in Figure 2 can be more clearly described. There are four possible, equally likely, rainfall values in the time period from June 1 to August 31. Choice among four alternative wheat planting decisions ($D1_i$) can be conditioned on the observed value of R1. Two random events (R2 and R3), each with four equally likely outcomes, intervene before the feed grains planting decision is made. Thirty-two alternative planted acreages and

Table 2. Description of Variables Included in Crop Yield Models[a]

Variable	Description
	Technological Variables
Fertilization	
N	Pounds of nitrogen applied per acre
P	Pounds of phosphorus applied per acre
Cultivar	
X(i) i = 1 - 4	Dummy variables identifying the crop variety planted on the demonstration plot. The data set included plots planted to the five major crop varieties grown during the study period.
	Climatological Variables
R1[b]	Inches of rainfall during June 1 - Aug. 31 of the planting or preplanting year.
R2	Inches of rainfall during Sept. 1 - Nov. 30
R3	Inches of rainfall during Dec. 1 - Feb. 28
R4	Inches of rainfall during Mar. 1 - May 31
R5[c]	Inches of rainfall during June 1 - Aug. 31 of the harvest year.
DAYS 45[d]	Number of days with low temperature less than 45º F during Mar. 15 - Apr. 30
	Other Variables
PD	Planting date based on the number of days from the earliest observed planting date for the crop to the date the plot was planted
REG (i) i = 1 - 5	Dummy variables that subdivide the study area into six subregions

[a] Also included in quadratic formulations are squared terms for all variables except the dummy variables as well as cross terms such as N * P. Square-root formulations included linear and square-root terms for all variables except the dummy variables and cross terms of the form $N^{1/2} * P^{1/2}$.

[b] Included in the wheat yield model only.

[c] Included in the corn and grain sorghum yield models.

[d] Included in the corn model only.

combinations of corn and grain sorghum can be chosen based on the observed rainfall amounts in preplanting time periods as well as the wheat planting decision taken. This final decision is followed by two random rainfall events, each of which assumes four possible values. Thus, the decision tree is symmetric with 131,072 (4^6*32) terminal branches.

MODEL INPUTS

Inputs required by the decision model included (1) alternative values for the random events, (2) alternative actions or decisions, (3) corn, grain sorghum, and wheat yield distributions conditioned on the values of the random rainfall variables, (4) crop prices, (5) farm program parameters, and (6) crop production costs and costs for maintaining conservation practices on land removed from production under the farm program. Values for the random events and decision alternatives were described in the previous section. This section explains the sources of information and methods used to derive the remaining model inputs.

YIELD DISTRIBUTIONS

The dynamic yield distributions used in the decision model were derived from ordinary least squares (OLS) yield equations estimated using Extension Service demonstration plot data for the time period 1975-1984. These demonstration plots were planted by crop producers in the six-county study area, in cooperation with county Extension personnel. Data recorded for the plots included location, fertilization rates, cultivar, planting date, harvest date, and yield. Other data required are values for rainfall and temperature variables. Because these data were not recorded at the demonstration plot sites, they were estimated based on data from the two weather reporting stations nearest each plot. For example, the rainfall amount on a given day for a demonstration plot was estimated by weighing rainfall amounts recorded at the two nearest weather reporting stations in inverse proportion to their distances from the demonstration plot.

Incorporation of uncontrollable climatological variables in production function and supply analysis dates back at least to the work of Wallace. The preponderance of studies using this approach have estimated regional yields, or regional or national production, based on aggregate input variables, trend variables, and selected weather variables or weather indices (e.g., Butell and Naive; Griliches; Oury; Teigen; Vroomen and Hawthorn). Climatological variables have been incorporated into micro-level production functions in studies by Byerlee and Anderson, de Janvry, Griffin *et al.*, and Ryan and Perrin.

Independent variables included in the crop yield regression models estimated in this study are described in Table 2. Technological variables were nitrogen and phosphorus application rates and dummy variables for crop variety. Climatological variables were chosen for inclusion in the models based on discussions with agronomists who specialize in the production of each of the crops. Precipitation variables correspond to those included as random events in the decision model. A temperature variable for the time period of pollination also was included in the corn model. Other variables included

Table 3. Crop Yield Regression Models

Wheat Yield Model[a]

$$Y_w = -525.466 + \underset{(0.181)}{0.133}\ N + \underset{(6.690)}{9.730}\ N^{1/2} + \underset{(0.202)}{0.099}\ P - \underset{(2.706)}{3.886}\ P^{1/2} + \underset{(1.672)}{9.987}\ X1$$

$$-\underset{(1.693)}{6.012}\ R1 + \underset{(10.748)}{3.078}\ R1^{1/2} + \underset{(7.191)}{2.054}\ R2 + \underset{(33.607)}{80.114}\ R2^{1/2}$$

$$+ \underset{(7.881)}{1.961}\ R3 + \underset{(56.875)}{187.832}\ R3^{1/2} + \underset{(7.221)}{1.408}\ R4 + \underset{(31.092)}{104.021}\ R4^{1/2}$$

$$- \underset{(0.296)}{1.190}\ PD + \underset{(2.418)}{7.968}\ PD^{1/2} + \underset{(4.048)}{11.861}\ \text{REG3} - \underset{(4.713)}{16.247}\ \text{REG4}$$

$$+ \underset{(0.235)}{0.402}\ (N^{1/2} \ast P^{1/2}) + \underset{(0.536)}{2.554}\ (N^{1/2} \ast R1^{1/2}) - \underset{(2.592)}{7.835}\ (N^{1/2} \ast R2^{1/2)}$$

$$- \underset{(12.987)}{53.707}\ (R3^{1/2} \ast R4^{1/2})$$

Number of observations = 102

R-SQUARE = 0.86

Corn Yield Model[a]

$$Y_c = -245.684 + \underset{(0.755)}{1.977}\ N - \underset{(0.003)}{0.007}\ N^2 + \underset{(0.353)}{0.799}\ P - \underset{(0.008)}{0.017}\ P^2 + \underset{(3.908)}{7.406}\ X1$$

$$+ \underset{(6.282)}{10.751}\ X4 + \underset{(6.577)}{19.952}\ R2 - \underset{(6.345)}{0.809}\ R2^2 + \underset{(7.308)}{11.712}\ R + \underset{(0.592)}{0.477}\ Re^2 + \underset{(3.968)}{16.882}\ R4$$

$$- \underset{(0.173)}{0.729}\ R4^2 + \underset{(1.441)}{8.665}\ R5 - \underset{(0.085)}{0.334}\ R5^2 - \underset{(0.519)}{1.172}\ \text{DAYS 45} - \underset{(0.584)}{2.565}\ PD + 0.022\ PD^2$$

$$+ \underset{(4.287)}{32.460}\ \text{REG5} - \underset{(0.043)}{0.067}\ (N \ast R3) - \underset{(0.393)}{1.136}\ (R2 \ast R3) + \underset{(0.053)}{0.113}\ (R6 \ast PD)$$

Number of observations = 92

R-SQUARE = 0.86

Grain Sorghum Yield Model[a]

$$Y_{gs} = -5349.205 + \underset{(33.40)}{46.657}\ N - \underset{(0.185)}{0.175}\ N^2 + \underset{(20.130)}{23.318}\ P - \underset{(0.297)}{0.275}\ P^2 + \underset{(368.50)}{1083.210}\ R2$$

$$- \underset{(18.123)}{14.162}\ R2^2 + \underset{(387.410)}{218.649}\ R3 - \underset{(34.805)}{23.489}\ R3^2 - \underset{(148.41)}{65.736}\ R4 - \underset{(9.038)}{18.012}\ R4^2$$

$$+ \underset{(160.85)}{20.877}\ R5 - \underset{(4.003)}{19.444}\ R5^2 + \underset{(58.475)}{122.626}\ PD - \underset{(1.242)}{3.8097}\ PD^2 - \underset{(34.382)}{151.149}\ (R2 \ast R3)$$

$$+ \underset{(30.387)}{76.399}\ (R3 \ast R4) + \underset{(16.833)}{45.202}\ (R4 \ast R5) + \underset{(8.633)}{17.889}\ (R3 \ast PD) - \underset{(4.498)}{8.721}\ (R4 \ast PD)$$

Number of observations = 132

R-SQUARE = 0.70

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in the models were planting date and dummy variables for subareas with similar soils.

The estimated crop yield regression models are presented in Table 3. These models were arrived at using the SAS backward elimination procedure (SAS Institute, p. 764). Considerable structure was, however, imposed on the models. Specifically, the set of regressors that the agronomists strongly considered to be appropriate for inclusion were forced into the models. These variables were linear and squared terms for nitrogen, phosphorus, four precipitation variables, and planting date.[2] The pollination period temperature variable also was forced into the corn model. The backward elimination procedure was used to select among the remaining variables that were considered to be "potentially"

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[2] The precipitation variable for the time period June 1 through August 31 of the planting year for wheat (R1) was included only in the wheat yield model, while the precipitation variable for the time period June 1 through August 31 of the harvest year was included in the corn and grain sorghum models but not the wheat model since this time period is after wheat is harvested in the study area.

but not "clearly" appropriate regressors for the yield models.

Each crop yield model was estimated in both quadratic and square-root formulations. The models in Table 3 were selected based on the signs and significance of the variables included. R-square statistics indicated that all three models explained a large part of the yield variations in the demonstration plot data.

The estimated crop yield equations were used in the decision model to generate yield distributions at different points in time. This was accomplished by fixing the values of all variables except the rainfall variables (events), which were unknown at the time. For example, a planting period (September 1) wheat yield distribution is generated by fixing the values of all variables in the wheat yield equation except those for R2, R3, and R4.[3] The 64 possible combinations of these variables generate a wheat yield distribution with 64 possible outcomes which are equally likely by construction.

CROP PRICES

Model results were calculated for six alternative price levels. This sensitivity analysis was done to gain insight into the effects of different general commodity price levels on the use and value of the reduced planting alternatives. Bell County Commodity Credit Corporation (CCC) loan rates for the 1988 crop year were used as a reference for these price levels. Specifically, results were calculated for prices 10 and 20 percent below the 1988 CCC loan rates, prices equal to the 1988 loan rates, and prices 10, 20, and 50 percent above the 1988 loan rates for the three crops.[4]

FARM PROGRAM PARAMETERS

Farm program parameters used in the analysis are shown in Table 4. National target prices were $2.93 per bushel for corn, $2.78 per bushel for grain sorghum, and $4.23 per bushel for wheat. Bell County CCC loan rates are shown, as well as the costs for nine months of commercial storage and the resulting estimated effective price floors provided by CCC loans.[5] The $1.77 price floor for corn was 13 percent below the county loan rate, while price floors for grain sorghum and wheat were 18 percent and 11 percent, respectively, below the loan rates for those commodities. Acreage reduction requirements are the percentages by which harvested acreage must be reduced from historically established farm program base acreage to qualify for commodity program participation. Also given are the paid diversion payment rates for corn and grain sorghum, as well as the guaranteed minimum deficiency payment rates. These guaranteed minimum rates apply only to acreage removed from production under the 0/92 options. Their purpose is to protect producers who use the reduced planting alternatives from price-related deficiency payment risk. For example, a producer whose price and yield expectations are low might elect to plant no acreage under the 0/92 provision, anticipating substantial deficiency payment revenue. However, if higher prices occur, deficiency payments could be substantially reduced—potentially to zero—leaving the 0/92 participant with no crop to sell and lower than expected or perhaps no revenue from deficiency payments. Thus, the guaranteed minimum deficiency payment rates were instituted beginning in 1988 to protect 0/92 participants from this risk.

CROP PRODUCTION COSTS AND COSTS FOR MAINTAINING LAND REMOVED FROM PRODUCTION

Also presented in Table 4 are production costs for each of the three crops, as well as costs for maintaining required conservation practices on land removed from production under the commodity programs. Production costs were separated into preharvest variable costs, and a minimum per acre harvest cost. These costs were incorporated into the decision

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[3] Values for nitrogen and phosphorus application rates were fixed at levels recommended by agronomists. These values were consistent with application rates commonly used in the study area. Also, these values were somewhat below the yield-maximizing levels based on the estimated yield equations, when other variables were fixed as described here. Cultivars used were assumed to be the best-performing cultivars as indicated by the estimated yield equations. Temperature and planting date variables were set at their means, while the region selected was the one in which Bell County is located.

[4] Use of fixed (deterministic) prices in conjunction with stochastic yields may appear curious and, therefore, merits explanation. The six deterministic price levels used in the analysis provide useful insight into the effects of different general price levels In the underlying work, conducted by Thompson, additional results were generated using stochastic prices. Two price distributions were used, based on composite subjective price distributions elicited from agricultural lenders in the study area during the preplanting seasons of the 1987 and 1988 crop years. Although these results are not reported here, the essential finding was that price variability had little effect on the value of the 0/92 options. That is, results calculated using the price distributions were very similar to those calculated using fixed prices approximately equal to the means of the distributions.

[5] CCC loans provide minimum prices or price floors for corn, grain sorghum, and wheat commodity program participants. However, since these nonrecourse loans require producers to pay the cost of nine months' storage in order to forfeit the commodity as payment in full, the effective price floor is equal to the loan rate less this storage cost.

model in this way so that a test could be performed to prevent the incurring of harvest costs if such costs exceed gross revenue—in this case the crop would not be harvested. The estimated costs for maintaining conservation practices on acreage removed from production applied to land idled under the regular acreage reduction requirements, the paid diversion program, and the 0/92 provisions, since similar conservation practices are required for all three.

SOLUTION PROCEDURE

The decision model depicted in Figure 2 was implemented as a FORTRAN program which follows a backward induction solution process (Chapters 1 and 2 of Schlaifer provide a more complete description of the backward induction process than is possible here.). Sequential decision problems were solved through backward induction by starting at the terminal branches or end points and working backward to the initial node. The utility at each terminal branch was calculated first. In this application the utility function used was the constant absolute risk aversion function of the form

(1) $u(x) = -e^{-rx}$

where x is final consequences in dollars, u(x) is the utility of the dollar amount x, and r is the Pratt-Arrow absolute risk aversion coefficient. After utility values were assigned to the terminal branches, the problem was solved by moving backward, calculating expected utilities at random event nodes, and selecting the decision with maximum expected utility at each decision node. The final solution at the initial node was the expected utility of the decision problem—in this case the expected utility of the wheat and feed grains production alternatives evaluated before the uncertainty associated with any of the random variables had been resolved.

To estimate the value of the reduced planting alternatives, the decision model was solved twice for each example farm situation. In one of these runs the model was solved as described. In the second run a restricted version of the model was solved. This restricted model did not include the reduced planting options as decision alternatives. Thus, the two model solutions were the expected utilities (or expected returns in the risk-neutral case) of the wheat and feed grains production alternatives with and without the 0/92 reduced planting options. In order to derive the

Table 4. Farm Program Parameters, Crop Production Costs, and Costs for Maintaining Land Removed from Production

	Crop		
Parameter	Corn	Grain Sorghum	Wheat
Farm Program Parameters			
Target Price ($/bu)	2.93	2.78	4.23
CCC Loan Rate ($/bu)	2.04	1.75	2.37
Nine-Month Storage Cost ($/bu)	0.27	0.27	0.27
CCC Loan Rate Net of Storage ($/bu)	1.77	1.48	2.10
Acreage Reduction Requirement (%)	10	10	27.5
Paid Diversion Payment Rate ($/bu)	1.75	1.65	N/A
Guaranteed Min. Deficiency Payment Rate ($/bu)	1.10	0.62	1.53
Crop Production Costs and Costs for Land Removed From Production			
Preharvest Variable Costs ($/acre)	82.45	77.20	85.50
Harvest Costs Per Bushel ($/bu)	0.33	0.33	0.37
Minimum Per Acre Harvest Costs ($/acre)	14.00	14.00	13.25
Costs for Maintaining Land Removed From Production ($/acre)	13.10	13.10	14.30

Table 5. Estimated Benefits of Reduced Planting (RP) Alternatives for Example Bell County Texas Farms Based on Nonstochastic Prices.

	Price											
	20% Below Loan Rate		10% Below Loan Rate		Loan Rate		10% Above Loan Rate		20% Above Loan Rate		50% Above Loan Rate	
Pratt-Arrow Coefficient	% RP	Value ($)	%RP	Value ($)	% RP	Value ($)	% RP	Value ($)	%RP	Value ($)	%RP	Value ($)
1,000-Acre Wheat Farm												
0	0	0	0	0	0	0	0	0	0	0	0	0
0.00005	0	0	0	0	0	0	0	0	0	0	25	517
0.0001	100	3,465	100	3,272	100	2,277	75	1,992	75	1,881	100	9,269
0.0002	100	12,489	100	12,220	100	10,490	100	10,008	100	9,732	100	20,270
0.0003	100	18,242	100	18,039	100	16,496	100	15,397	100	14,301	100	28,148
1,000-Acre Wheat and Feed Grains Farm												
0	0	0	0	0	0	0	0	0	0	0	0	0
0.00005	0	0	0	0	0	0	0	0	0	0	0	0
0.0001	0	0	0	0	0	0	0	0	0	0	25	3,228
0.0002	100	9,202	100	9,079	75	8,362	50	10,130	50	12,228	100	21,223
0.0003	100	13,239	100	13,084	100	11,830	100	13,370	100	15,675	100	25,654

dollar value of the difference (if any) between these expected utilities (or returns), the certainty equivalent for each was calculated. The difference between the two certainty equivalents was the maximum dollar amount the decision-maker would be willing to pay to have the 0/92 decisions available. Stated differently, it was the dollar value of the 0/92 decision alternatives to the decision maker.[6]

RESULTS

Results were derived for two example farms representative of those commonly found in Bell county. These example farms were (1) a 1,000-acre wheat farm and (2) a 1,000-acre wheat and feed grains farm. Five alternative values of the Pratt-Arrow absolute risk aversion coefficient were used to represent producers with different risk attitudes. Specifically, the values used were 0.0 to represent risk neutrality, 0.00005 and 0.00001 to represent moderate risk aversion, and 0.0002 and 0.0003 to represent strong risk aversion. These values were within the ranges which have been elicited from agricultural producers in previous studies (Love and Robison, Wilson and Eidman; King and Oamek). They provided a sensitivity analysis of the effect of risk aversion on the use and value of the reduced planting alternatives.

Results for the example farms are summarized in Table 5. Presented for each price and risk aversion combination are (1) the percent of the time a reduced planting alternative would be taken (*i.e.*, the percent of the time when a reduced planting option would result in expected utility, or returns in the risk-neutral case, larger than that for other planting alternatives)[7] and (2) the value of the reduced planting alternatives.

Results for the example wheat farm indicated that a risk-neutral, profit-maximizing producer would never choose a reduced planting option. A moderately risk-averse producer with risk attitudes characterized by a 0.00005 Pratt-Arrow coefficient would have maximized expected utility by taking a reduced planting option only if he/she expected a wheat price 50 percent above the loan rate. The expected value of the reduced planting alternatives for these producers who expect a price 50 percent above the loan rate was $517.00. It may appear curious that risk-averse producers with higher price expectations would benefit from the reduced planting options while producers with lower price expectation would not. This occurred because a high price resulted in a larger proportion of total income being derived from the market (*i.e.*, from crop sales), with reduced farm program payments. Since market-derived income

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[6] In the risk-neutral or profit-maximizing case this is simply the difference in expected returns with and without the reduced planting options.

[7] For example, four possible weather events precede the wheat planting decision. It may be found that expected utility or expected returns are maximized by planting permitted acreage when three of these events occur and by planting no acreage when the fourth event occurs. Therefore, a reduced planting option would, in the long run, be expected to be taken 25 percent of the time.

was subject to yield uncertainty while farm program payments were not, income uncertainty was greater with a high price than with a price near the loan rate. The same pattern emerged for moderately risk-averse producers represented by a Pratt-Arrow coefficient of 0.0001. In this case the frequency with which a reduced planting option would be taken ranged from 75 to 100 percent, with estimated expected values from $1,881 to $9,269.

Strongly risk-averse wheat producers characterized by risk aversion levels of 0.0002 and 0.0003 would have maximized expected utility by using reduced planting alternatives 100 percent of the time. The estimated value of the reduced planting alternatives for these producers was large, ranging from $9,732 to $20,270 for a risk aversion level of 0.00002 and from $14,301 to $28,148 for a risk aversion level of 0.0003.

The estimated value of the reduced planting alternatives was, in general, smaller for the diversified wheat and feed grain farm than for the specialized wheat farm. These results indicated that reduced planting alternatives would not have been used by profit maximizing producers and, therefore, had no value for them. Moderately risk-averse producers characterized by a Pratt-Arrow coefficient of 0.00005 also would not have used the reduced planting options; while moderately risk-averse producers characterized by a Pratt-Arrow coefficient of 0.0001 would have used a reduced planting alternative only if they expected prices 50 percent above the loan rates for the three commodities. In this case the expected value of the reduced planting alternatives was $3,228. Reduced planting was almost universally indicated for strongly risk averse wheat and feed grains producers, with the value of these alternatives ranging from $8,362 to $21,223 for a Pratt-Arrow coefficient of 0.0002 and from $11,830 to $25,654 for a Pratt-Arrow coefficient of 0.0003.

CONCLUSIONS AND IMPLICATIONS

The 50/92 and 0/92 reduced planting alternatives have been incorporated into commodity programs under the 1985 farm bill primarily for the purpose of supply control. An additional potential benefit of these provisions, however, is that they afford commodity program participants more flexibility to respond to market forces. This study provided estimates of the value of this additional flexibility for commodity program participants in one crop-producing region. The study findings contribute to a better understanding of the merits of the 0/92 options, which have heretofore been discussed and debated but not quantified. Therefore, these results should be useful to policy makers and other participants in the farm policy debate in evaluating whether these or similar provisions should be incorporated into future commodity programs.

Two features of the example farm results which warrant discussion are the effects of risk attitudes and commodity price levels on the estimated value of the reduced planting alternatives. Risk attitudes were found to be extremely important. The reduced planting alternatives were found to have no value for risk-neutral producers, regardless of their yield or price expectation. The value for moderately or strongly risk-averse producers, however, was in some cases found to be substantial—especially if price expectation was either low or high (prices above target levels were not analyzed).

Perhaps the most important result concerning the effect of commodity price levels is that the estimated value of the reduced planting alternatives, in general, was largest for producers with high price expectations. This result highlights an attribute of current commodity programs that is perhaps not universally recognized—that high but below target-level prices significantly increase the risk faced by commodity program participants. With high prices, a larger proportion of a commodity program participant's income comes from the market, with less income derived from government payments. Market income is a function of yield and, thus, is subject to yield variability. Commodity program payments are based on historically-established farm program yields and are not subject to the risk associated with current-year yield variability. Therefore, risk-averse commodity program participants are more likely to benefit from the reduced planting alternatives when income uncertainty is increased due to higher prices.

Two primary implications can be drawn. One is that the reduced planting alternatives may have significant value for risk-averse commodity program participants but would not be used by profit-maximizing producers in the study area. The second is that the value of the reduced planting alternatives for risk averse producers, in part, derives from the somewhat perverse effect of price on income uncertainty for commodity program participants. This may lead to the conclusion that the 0/92 or similar provisions that afford participants more flexibility to respond to economic forces should be included in future commodity programs, especially when income stabilization is a significant policy objective.

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