The Impact of Increased Planting Flexibility on Planting Decisions Across Texas

By J. Marc Raulston, Steven L. Klose, Joe L. Outlaw, and James W. Richardson

Abstract

Increased acreage planting flexibility granted through the last three farm bills has allowed agricultural producers to make production choices without government programs driving their decisions. Planted acre data for program crops in seven Texas regions is used to describe producers' responses to the increased flexibility.

Introduction

The last three farm bills have provided legislation allowing varying levels of freedom with regard to choice of crops grown ranging from marginal flexibility to complete flexibility. Increased acreage planting flexibility over the last fifteen years has allowed agricultural producers to make production choices with less control and influence from government program provisions. Several relevant studies have been completed using a wide range of methodologies to examine producer behavior when granted more liberties concerning planting decisions. Thompson, Knight, and Boren (1990) used a decision model (decision tree structure) to study the benefit of 50/92 and 0/92 reduced planting alternatives provided for in the 1985 farm bill for central Texas farm program participants. They found that risk neutral producers would not benefit from these provisions; however, risk averse producers would derive considerable gains from these provisions in growing seasons when low yields are likely by reducing acres planted. A mean-standard deviation (E-S) analysis was used by Chien and Leatham (1994) to evaluate impacts of planting flexibility provided for in the 1990 farm bill on crop mix, farm income, and uncertainty involved in farming.




J. Marc Raulston; Research Associate; Texas A&M University

Steven L. Klose; Assistant Professor and Extension Economist; Texas A&M University

Joe L. Outlaw; Professor & Extension Economist; Texas A&M University

James W. Richardson; Regents Professor and Senior TAES Faculty Fellow; Texas A&M University

They concluded that benefits derived from planting flexibility were not great enough to overcome the 15 percent loss in deficiency payments for those participating in the farm program. Wu, Walker, and Brusven (1997) used an integrated systems model to evaluate the relationship between planting flexibility and conservation compliance terms in the 1985 and 1990 farm legislation. One key finding relevant to their research is that when both provisions are working in tandem, producers' behavior is more driven by prevailing market conditions. Westcott, Young, and Price (2002) approached the broader scope of studying the impacts of the 2002 Farm Act on planting decisions of major field crops. Key, Lubowski, and Roberts (2004) utilized Agricultural Census data to compare changes in planted acres for the 1992-1997 period between farm program participants and a control group of producers not participating in commodity programs.

The primary objective of this research is to examine producer response with respect to crops planted after the passage of each piece of legislation that granted increased planting flexibility. This study will focus specifically on planted acreage changes for program crops occurring after the 1990, 1996, and 2002 farm bills were implemented in seven multi-county regions of Texas.

Background

Prior to passage of the 1990 farm bill, the Food Security Act of 1985 (1978-1985) was the prevailing farm program. Under the 1985 farm bill, producers were required to plant to their base to receive government payments, essentially limiting the ability to respond to changing market conditions. The Food Agricultural Conservation and Trade Act of 1990 (1991-1996) allowed producers to grow any eligible commodity except for fruits and vegetables on a maximum of 25 percent of base acres. Under the 1990 Act, 15 percent of base acreage was referred to as normal flex acreage. A producer could plant the normal flex acres to the original crop or another eligible commodity. Regardless of their planting decision on the flex acres, producers did not receive deficiency payments on 15 percent of crop base acres. On an additional 10 percent of the base acreage, producers received deficiency payments only if they planted the original program crop. This acreage was called optional flex acreage. Prior to this legislation, producers were required to grow the original program crop on base acreage to receive government support.

In an effort to further expand planting flexibility, the Federal Agriculture Improvement and Reform Act of 1996 (1997-2002) provided for full planting flexibility on previous crop acreage bases, with the only restrictions involving growing fruits and vegetables.

The Farm Security and Rural Investment Act of 2002 (2002-present) retained provisions for full planting flexibility on crop acreage bases with the continued fruit and vegetable restriction and permitted farmers the option to update base acres and program payment yields.

Data and Methods

Planted acre data was collected from the National Agricultural Statistics Service database for all program crops grown in seven multi-county regions in Texas (USDA National Agricultural Statistics Service 2006). Acreage was analyzed for program crops including corn, cotton, oats, peanuts, rice, sorghum, soybeans, sunflower, and wheat. The locations of the seven regions in the study are shown in Figure 1 and include the Panhandle (Moore and Sherman Counties), South Plains (Dawson and Gaines Counties), Blacklands (Milam and Williamson Counties), Middle Coast (Colorado and Wharton Counties), Coastal Bend (San Patricio and Nueces Counties), Winter Garden (Zavala and Uvalde Counties) and the Lower Rio Grande Valley (Cameron and Willacy Counties). These regions provide a cross section of major crop production areas to examine planted acreage trends. The data were divided by commodity into four time periods (Period 1: 1985-1990; Period 2: 1991-1996; Period 3: 1997-2002; and Period 4: 2003-2004) corresponding to implementation of major farm bill legislation. Commodities comprising less than five percent of total program crop acreage in a given county will not be discussed, but those results are reported in Table 1 for the seven regions. Planting patterns were examined between these periods to determine the extent to which producers have made crop mix changes under the changing environment of farm bill planting flexibility. Average planted acres for each period was compared to the previous period to determine if a statistically significant shift in planted acres occurred. Because the number of years in the individual periods were not equal, a two sample student-t test was utilized to test for statistically significant changes in the means. Depending on the comparison between a calculated test value and a critical value for each series, the test either fails to reject with 95 percent confidence the hypothesis that the two

means are equal or rejects with 95 percent confidence the hypothesis that the means are equal. Table 1 reports the program crop acres planted in each of the seven multi-county regions. Numbers in bold indicate that the average planted acres for a crop is statistically different from the average planted acres for the crop under the previous farm program. Table 2 provides a regional summary of significant changes in planted acres of government program crops between farm bill periods. Available state average market prices for all program crops were also collected from USDA-NASS and categorized into the aforementioned farm bill periods (Table 3). A two sample student-t test was utilized for comparing average prices between farm bill periods to determine if statistically different average market prices were prevalent between the periods. Price comparisons serve to isolate shifts in market conditions that may have encouraged planted acreage responses with increased flexibility granted through the 1990 farm bill and the 1996 farm bill.

Results

The strongest planted acreage shift occurred following passage of the 1996 farm bill dubbed "Freedom to Farm" (Period 2 to Period 3). The changes in acres planted following passage of the 1990 legislation were a close second. These two time periods represent more significant changes in flexibility compared to the 2002 farm bill. The analysis suggests that most producer reaction allowed by increased planting flexibility had already occurred before passage of the 2002 legislation. Changes in planting patterns following the 2002 bill are minimal reflecting the continuation of flexibility similar to the 1996 legislation.

The two regions that experienced the least change in planted acreage were the Lower Rio Grande Valley and the Winter Garden. These are also the major areas of the state with a history of growing fruits and vegetables or other specialty crops, indicating that the remaining fruit and vegetable planting restriction could be limiting any potential acreage shifts in program crops in these regions.

The only statistically different price shift occurred when examining the periods before and after passage of the 1996 farm bill. The price shifts in the late 1990s definitely provided market signals for producers to react to in the new era of planting flexibility. Interestingly, mean peanut price decreased during the period while planted acres of peanuts showed a statistically significant increase in the South Plains region. The peanut shift coincides with the elimination of the peanut quota system, but the increase in peanut acres in a historically cotton producing region supports the hypothesis that planting flexibility has allowed producers to align planting decisions with more favorable market conditions.

Following are results of the comparison by multi-county region, highlighting changes in planted acreage of program crops.

Blacklands

Average acres planted to corn more than doubled following passage of the 1996 legislation, while cotton saw a 60 percent decline and sorghum experienced a 36 percent reduction in planted acres (Table 1). Previously, cotton had experienced a 37 percent increase following passage of the 1990 bill. Wheat experienced a 43 percent decline in planted acres in the years following passage of the 1990 bill.

Coastal Bend

The years following passage of the 2002 bill saw a 67 percent decrease in average corn acres planted (Table 1). This is only one of three significant shifts that occurred following the 2002 legislation. The Coastal Bend region realized a 47 percent increase in cotton acres after passage of the 1990 bill. In fact, the area saw a 22 percent increase in total acres planted to program crops following the 1990 farm bill.

Lower Rio Grande Valley

The Lower Rio Grande Valley made a significant shift from corn to grain sorghum following the 1990 bill (Table 1). Corn experienced a 57 percent decline in planted acres while sorghum experienced a 52 percent increase in average planted acres. Acreage shifts in other time periods were negligible.

Middle Coast

Cotton acres increased by a magnitude of 2.6 times (160 percent) after the 1990 bill went into effect in the Middle Coast region (Table 1). Another significant increase of 46 percent occurred after passage of the 1996 bill. Rice acreage in the region has steadily declined since the 1996 bill (13% decrease for the period average), as producers were no longer required to

plant the crop to receive their government payments. Soybeans saw a 145 percent increase after the 1996 bill and planted acreage has remained at that level in recent years.

Panhandle

The Panhandle region as a whole experienced the most significant shifts in average planted acres of program crops (Table 1). Corn acres effectively doubled following passage of the 1990 bill, followed by a 26 percent increase after passage of the 1996 bill. Acres planted to sorghum have experienced a considerable amount of volatility throughout the study period. They decreased 42 percent after the 1990 bill was passed, then increased 36 percent in the years following passage of the 1996 bill. Finally, sorghum acres have declined by 38 percent since passage of the 2002 bill.

South Plains

The South Plains is a region of Texas where average planted acres of program crops have remained relatively stable (Table 1). The only significant change was an explosion of peanut acreage following passage of the 1996 bill, effectively tripling the acres planted to peanuts.

Winter Garden

The only significant change occurring in the Winter Garden region was a 24 percent decline in grain sorghum acreage since passage of the 2002 bill (Table 1).

Discussion

A variety of factors may contribute to the absence of major shifts in cropping decisions as increased planting flexibility is granted through farm legislation. Some producers express concern that future farm legislation may rely on planting histories for updating government program payment acres and yields, as did the 2002 farm bill. Local market conditions and the accessibility of these markets are other hurdles. Due to current fruit and vegetable planting restrictions, the potential loss of government payments is a possible reason for the lack of shifts in regions where vegetable and other specialty crops are grown.

Limited irrigation water or the prevalence of drought conditions may have limited producers in the Lower Rio Grande Valley on the crops they can plant. Additionally, limited water may prevent producers from modifying their current planting patterns, especially in regions that must compete with growing populations and municipalities for water. Complementary crops also affect cropping patterns. For example, corn and grain sorghum may both be planted and harvested with the same equipment. In addition, the maturities of the crops are staggered enough to allow for timely harvests. The requirement of highly specialized equipment along with providing work for labor year round may also be reasons for planting particular crops.

The hope for higher returns on alternative crops that involve increased production risk given local growing conditions may be identified in certain regions. Corn has become increasingly expensive to grow in the Panhandle region as irrigation fuel costs have dramatically increased. With energy prices on the rise, producers began experimenting with growing cotton, a crop traditionally grown in more southern regions of the state. Data at the time of the analysis was not available past 2004; however, it is expected that planted acres for 2005 and 2006 will illustrate an even greater shift to cotton occurring in the Panhandle Region. Equipped with shorter season cotton cultivars, producers are able to experiment with growing cotton due in part to planting flexibility granted through farm bill legislation. Improved market conditions for corn are expected to curtail the trend toward cotton, a response allowed by current flexibility provisions. Increasing stress will likely be placed on the availability of water in the Panhandle region with the expected increase in corn production and as the construction of ethanol plants occur in the region.

In addition, the prospect of growing higher valued specialty crops may entice some producers to shift acreage to these crops if certain proposed legislation comes to fruition. For example, the Winter Garden region historically plants less acreage to program crops, as they plant a significant quantity of fruits, vegetables, and other specialty crops. Recent WTO rulings against the U.S. cotton program have brought into question the WTO compliance of the bulk of U.S. agricultural policies, specifically the aforementioned fruit and vegetable planting exclusion. The Farming Flexibility Act of 2005 proposed by Representative Mike Pence (HR2045) provided for even more planting flexibility, as his proposal would have removed the planting restriction on program crop base acres, allowing a producer to grow fruits and vegetables as long as they are grown for processing.

Conclusion

Some areas of Texas have experienced significant acreage shifts over the last fifteen years. While these shifts may have been the result of changing weather patterns, market conditions, available crop varieties, or policy changes, one certainty is that the gradually increasing planting flexibility provisions of federal legislation have opened the door to producer responses in planted acres. Acreage responses under free market conditions would be expected to occur intermittently as market signals warrant; however, planting restrictions of historic farm bills limited acreage responses. When these restrictions are removed, shifts in planted acres are observed in periods marked by the progression of planting flexibility in farm legislation. Observed acreage shifts in some regions may indicate a build up of market and production conditions for which acreage responses were previously not possible. Still other regions, following many years of planting restrictions, show no changes reflecting the limited production options in the area. These results can have significant implications for the use of planted acres data. Any analysis of supply response should consider the legislative environment of the time and the degree of planting flexibility extended to producer choices.

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Figure 1. Locations of seven multi-county regions of Texas

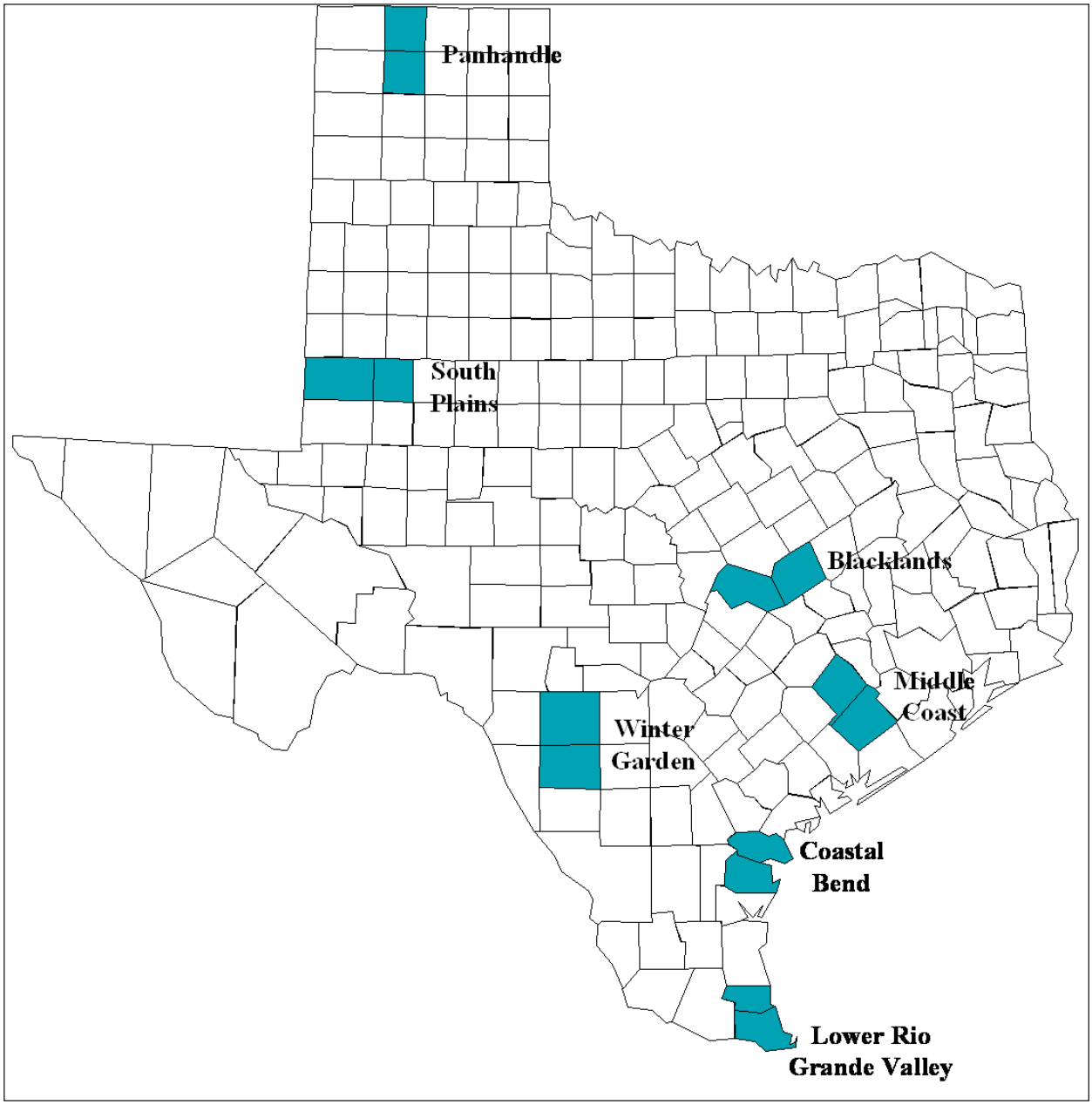

Table 1. Average planted acres of government program crops for seven regions of Texas, 1985-2004

	Barley	Corn	Cotton	Oats	Sorghum	Wheat	Soybeans	Rice
Blacklands								
Period 1 (1985-1990)	-	29,483	63,550	30,633	105,517	78,900	433	-
t-statistic[1]	-	-3.13	-2.83	1.89	0.62	3.30	0.33	-
p-value[1]	-	0.026	0.020*	0.091	0.554	0.011*	0.750	-
Period 2 (1991-1996)	-	53,183	**87,267**	21,517	99,983	**45,117**	300	-
t-statistic	-	-4.22	6.90	0.04	2.79	1.86	-0.22	-
p-value	-	0.004**	0.000**	0.968	0.021*	0.095	0.834	-
Period 3 (1997-2002)	-	**120,567**	**35,033**	21,350	**64,150**	30,217	383	-
t-statistic	-	-0.50	-0.02	-1.98	1.36	0.09	1.58	-
p-value	-	0.645	0.988	0.104	0.232	0.935	0.190	-
Period 4 (2003-2004)	-	129,600	35,150	26,850	50,300	29,600	-	-
Coastal Bend								
Period 1 (1985-1990)	-	58,483	147,617	417	258,900	6,450	-	-
t-statistic	-	-0.20	-4.97	-0.74	-1.29	3.01	-	-
p-value	-	0.849	0.001**	0.478	0.229	0.020*	-	-
Period 2 (1991-1996)	-	61,917	**217,233**	733	293,750	**1,567**	-	-
t-statistic	-	0.57	-0.36	0.19	-0.09	2.14	-	-
p-value	-	0.590	0.732	0.851	0.931	0.099	-	-
Period 3 (1997-2002)	-	52,750	223,500	600	296,067	-	-	-
t-statistic	-	6.60	0.36	-1.33	1.22	-	-	-
p-value	-	0.001**	0.780	0.240	0.310	-	-	-
Period 4 (2003-2004)	-	**17,550**	200,950	1,400	267,050	-	-	-
Lower Rio Grande Valley								
Period 1 (1985-1990)	-	42,217	192,950	-	119,667	1,000	683	-
t-statistic	-	3.76	-0.09	-	-4.55	1.99	1.00	-
p-value	-	0.004**	0.927	-	0.001**	0.103	0.374	-
Period 2 (1991-1996)	-	**18,217**	194,767	-	**181,867**	-	-	-
t-statistic	-	-0.23	2.20	-	-1.20	-	-1.99	-
p-value	-	0.824	0.064	-	0.274	-	0.117	-
Period 3 (1997-2002)	-	19,217	153,200	-	195,600	-	1,850	-
t-statistic	-	0.61	1.03	-	-1.04	-	1.99	-
p-value	-	0.650	0.349	-	0.487	-	0.117	-
Period 4 (2003-2004)	-	17,300	144,200	-	205,300	-	-	-
Middle Coast								
Period 1 (1985-1990)	-	79,350	20,517	5,383	79,400	2,583	11,250	95,100
t-statistic	-	1.53	-5.50	2.87	0.17	1.94	1.22	-1.44
p-value	-	0.176	0.002**	0.028	0.865	0.088	0.263	0.187
Period 2 (1991-1996)	-	67,717	**53,517**	2,050	77,933	867	8,600	102,933
t-statistic	-	2.44	-2.79	1.00	0.98	-0.20	-5.18	3.65
p-value	-	0.045	0.021*	0.358	0.351	0.843	0.002**	0.005*
Period 3 (1997-2002)	-	52,633	**78,300**	900	71,233	983	**21,033**	**89,050**
t-statistic	-	0.04	0.22	1.99	0.93	-2.74	-0.09	1.28
p-value	-	0.972	0.839	0.103	0.525	0.223	0.942	0.421
Period 4 (2003-2004)	-	52,100	76,450	-	61,650	4,400	22,050	81,300

Table 1. Cont'd.

	Barley	Corn	Cotton	Oats	Sorghum	Wheat	Soybeans	Sunflower	Peanuts
Panhandle									
Period 1 (1985-1990)	6,300	64,300	-	1,600	99,100	246,367	1,750	-	-
t-statistic	3.49	-6.46	-	0.64	3.01	0.45	3.35	-1.58	-
p-value	0.013*	0.000**	-	0.545	0.024*	0.670	0.020	0.175	-
Period 2 (1991-1996)	**967**	**129,300**	-	1,017	**57,050**	235,217	-	633	-
t-statistic	1.90	-2.88	-	-0.42	-3.07	-1.47	-3.31	-1.96	-
p-value	0.116	0.018*	-	0.688	0.013*	0.192	0.030	0.107	-
Period 3 (1997-2002)	-	**162,767**	-	1,333	**77,467**	250,767	6,967	6,083	-
t-statistic	-	2.06	-1.97	0.73	6.18	-2.53	1.02	-0.58	-
p-value	-	0.095	0.300	0.519	0.002**	0.240	0.353	0.585	-
Period 4 (2003-2004)	-	143,000	5,700	650	**48,400**	306,750	4,350	7,950	-
South Plains									
Period 1 (1985-1990)	-	-	506,850	-	67,350	79,017	500	417	-
t-statistic	-	-	-2.68	-	-0.46	1.33	1.46	1.00	-2.90
p-value	-	-	0.025	-	0.658	0.219	0.203	0.374	0.034
Period 2 (1991-1996)	-	-	551,017	-	85,483	64,417	-	-	28,983
t-statistic	-	-1.39	-1.93	-	-0.86	0.37	-2.23	-2.99	-5.47
p-value	-	0.222	0.086	-	0.413	0.720	0.090	0.030	0.002**
Period 3 (1997-2002)	-	950	576,650	-	126,750	60,183	733	1,033	**87,783**
t-statistic	-	0.04	2.22	-	2.75	-2.88	2.23	0.74	1.78
p-value	-	0.969	0.270	-	0.040	0.213	0.090	0.593	0.326
Period 4 (2003-2004)	-	900	543,800	-	29,850	117,000	-	550	74,450
Winter Garden									
Period 1 (1985-1990)	-	25,533	19,983	31,017	16,800	37,983	300	-	-
t-statistic	-	-0.85	2.30	-0.31	-1.76	0.91	1.00	-	-
p-value	-	0.417	0.047	0.765	0.121	0.393	0.363	-	-
Period 2 (1991-1996)	-	27,517	13,517	32,417	21,817	35,867	-	-	-
t-statistic	-	-0.18	1.95	-1.40	-0.14	0.70	-	-	-
p-value	-	0.862	0.109	0.203	0.890	0.509	-	-	-
Period 3 (1997-2002)	-	28,000	9,533	38,833	22,217	33,517	-	-	-
t-statistic	-	2.40	-4.05	2.36	4.35	-2.44	-	-	-
p-value	-	0.096	0.154	0.065	0.007*	0.058	-	-	-
Period 4 (2003-2004)	-	21,000	18,200	34,200	**16,900**	41,700	-	-	-

Source: USDA: National Agricultural Statistics Service

* Significant at 95% confidence level

** Significant at 99% confidence level

[1] The t-statistics and corresponding p-values are presented between the means being compared

Table 2. Summary of significant changes in planted acres of government program crops for seven regions of Texas, 1985-2004

	Barley	Corn	Cotton	Sorghum	Wheat	Soybeans	Rice	Peanuts
Blacklands								
Period 1 to 2			Increase		Decrease			
Period 2 to 3		Increase	Decrease	Decrease				
Period 3 to 4								
Coastal Bend								
Period 1 to 2			Increase		Decrease			
Period 2 to 3								
Period 3 to 4		Decrease						
Lower Rio Grande Valley								
Period 1 to 2		Decrease		Increase				
Period 2 to 3								
Period 3 to 4								
Middle Coast								
Period 1 to 2			Increase					
Period 2 to 3			Increase			Increase	Decrease	
Period 3 to 4								
Panhandle								
Period 1 to 2	Decrease	Increase		Decrease				
Period 2 to 3		Increase		Increase				
Period 3 to 4				Decrease				
South Plains								
Period 1 to 2								
Period 2 to 3								Increase
Period 3 to 4								
Winter Garden								
Period 1 to 2								
Period 2 to 3								
Period 3 to 4				Decrease				

Table 3. State average market prices for program crops grown in Texas, 1985-2004

	Barley	Corn	Cotton	Oats	Sorghum	Wheat	Soybeans	Rice	Sunflower	Peanuts
	$/bu.	$/bu.	$/lb.	$/bu.	$/cwt.	$/bu.	$/bu.	$/cwt.	$/cwt.	$/ton
Period 1 (1985-1990)	1.99	2.40	0.55	1.94	3.73	2.93	5.32	7.06	10.26	596.67
t-statistic[1]	-2.72	-1.94	-1.17	-0.26	-1.63	-1.37	-0.83	-1.32	-1.71	0.81
p-value[1]	0.035	0.085	0.275	0.801	0.137	0.208	0.426	0.219	0.121	0.455
Period 2 (1991-1996)	2.69	2.77	0.61	2.02	4.39	3.52	5.74	8.26	12.25	555.00
t-statistic	2.23	2.38	2.49	0.63	2.04	1.98	1.90	1.11	-0.13	4.14
p-value	0.067	0.041	0.034	0.551	0.076	0.095	0.089	0.298	0.900	0.003**
Period 3 (1997-2002)	2.02	2.35	0.45	1.81	3.66	2.75	4.86	6.81	12.38	**449.67**
t-statistic	-	-2.36	-0.37	-1.16	-1.86	-2.25	-2.39	-0.74	-2.63	2.91
p-value	-	0.065	0.773	0.331	0.122	0.110	0.253	0.492	0.047	0.034
Period 4 (2003-2004)	-	2.60	0.49	2.06	4.06	3.20	6.43	7.66	14.30	387.00

Source: USDA: National Agricultural Statistics Service

* Significant at 95% confidence level

** Significant at 99% confidence level

[1] The t-statistics and corresponding p-values are presented between the means being compared