A study of forward contracting of cotton by Arizona farmers

A STUDY OF FORWARD CONTRACTING OF COTTON BY ARIZONA FARMERS

by

Mohamed Abdalla Elhedi

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APPROVAL BY THESIS DIRECTOR

This thesis has been approved on the date shown below:

Robert S. Firch
ROBERT S. FIRCH
Professor of Agricultural Economics

April 27, 1981
Date

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ABSTRACT

The main objective of this study was to investigate the benefits accruing to Arizona cotton producers from forward contracting as a recently introduced marketing method. The study is based on a sample data that covered four counties over the 1974 through the 1979 seasons.

The sample data consisted of a number of forward contracts that were written during the six cropping seasons. Based on the information in the contracts, the sample data were grouped into six sub-samples by contract types. Within each contract type, the contracts were arranged according to the dates on which they were written and a comparison was made between the prices of the paired contract types to verify whether the prices of the paired contract types were the same or different. Analysis of variance and the Least Significant Difference Test were the main statistical procedures used to achieve this objective.

A simple graphical presentation was used to show the relationship between the prices of the December futures contracts and forward contracts as two distinct marketing methods.

Since they have other alternatives for marketing their cotton, it would be appropriate to compare the gross returns from forward contracting to the gross returns from spot sales at Phoenix on the first week of December of the year in which the crop was grown.

CHAPTER 1

INTRODUCTION

Forward contracting has become a very important method of marketing cotton, especially upland cotton, in the United States. Although it was introduced as a marketing method in the early 1950's, forward contracting did not become a general marketing practice until the early 1970's. Cotton farmers were in doubt of the success of this marketing method when it was first introduced and through time more farmers started to use it. The importance of this marketing method is related to the fact that cotton producers, regardless of their volume of production, could use it as an alternative to selling their crop in the spot market or through farmers' marketing cooperatives.

Unlike futures markets, forward contracting is particularly important for small cotton producers whose seasonal output falls short of the futures market specifications. Trading in cotton futures requires a minimum of 100 bales in addition to the financial requirements (a deposit and an account with a brokerage firm).

When a cotton producer contracts part or all of his anticipated output at a specified price, he is actually locking in his expected gross returns when the crop is ready for the market. A cotton farmer would contract only when he sees that the offered price would be higher than the cost of producing the crop and eventually a minimum level of net returns could be insured in the future. For those farmers who contract ahead of

the cotton planting period, profit maximization is the only criterion on which they base their contracting commitments because they have the option of shifting to more profitable crops. On the other hand, farmers who contract after the crop is planted operate on the basis of maximizing their profits or minimizing their anticipated losses. Therefore forward contracting is particularly important for those farmers who would contract before the planting period. If these farmers could assess accurately their total costs of producing the crop then they could make use of forward contracting to reduce future risks and uncertainties associated with price changes between the time the contract is made and the time when the crop is ready for the market.

In the United States the cotton belt is divided into four production regions (based on the U.S.D.A. classifications); The far west region includes Arizona, California and New Mexico; The Southwestern region includes Oklahoma and Texas; The South central region includes Arkansas, Louisiana, Missouri, Mississippi and Tennessee; and the Southeastern region includes Alabama, Georgia, North and South Carolinas. A study by the Texas Agricultural Market Research and Development Center (January 1975) for 1970-1974 cropping seasons showed the following:

a) "Cotton contracting was more prevalent in the far west region, the lower Rio Grande Valley of Texas and the Mississippi Delta than elsewhere".

b) In the southeastern region the cotton yield and quality variations were higher than elsewhere.

c) In the west regions (the far west and the southwest) farmers prefer contracts on acreage basis to contracts on bale basis.

d) Forward contracting accounted for a very low percentage of the total cotton output in the southwestern region. The low percentage of contracting was largely due to the relatively high variability in cotton yield in this region and as a result both cotton producers and buyers had refrained from forward contracting as a marketing method.

Forward Contracting in Arizona

Cotton producers in Arizona have a number of options for fixing the price on their crop. These options include forward contracting, futures market, spot market and cooperative marketing. For those producers who are not members of a cooperative or who cannot meet the requirements for cotton futures markets, forward contracting and spot markets are the only options available to them. This study covered the 1974 through 1979 seasons. The data were collected from four countries: Maricopa, Pima, Pinal and Yuma. Forward contracting in this study refers to the written agreement between Arizona cotton producers as sellers and the ginning firms as agents for buyers of a specified quantity or acreage of cotton at a fixed price. The names of the ginning firms will not be disclosed due to the highly confidential nature of the information.

Objectives

The main objective of this study is to study the benefits from forward contracting accruing to Arizona cotton producers. Although both long staple (Pima) and short staple (American upland) varieties are grown in Arizona, the focus of this study is centered on upland which contributes the larger share in terms of total area and output.

Specific objectives to study are:

1. The farmers' preference as to the different types of contracting included in the study.
2. The effect of contracting period on the level of contract prices.
3. The effect of forward contracting on the level of cotton prices throughout the contracting period in Arizona. Although it is difficult to separate the effect of forward contracting from the overall effect of supply and demand for cotton in the United States and the rest of the world, the effect of forward contracting is believed to provide cotton producers with the right tool to decide on the total cotton acreage they would plant next season. Forward contracting is believed to stabilize the supply and demand for cotton in the United States and as a result, cotton producers would expect more stable cotton prices as more and more cotton producers are attracted by this marketing method in the future.
4. The time when a farmer should contract part or all of his anticipated output. Because the contracting period could begin twelve or more months before the time the crop is ready for marketing, a farmer should avoid those times of the contracting period when the cotton prices are expected to decline sharply. This decision-making procedure is particularly important to those farmers who have already planted their cotton crop.
5. The effect of forward contracting on the stability of farmers' incomes from their cotton sales.
6. The effect of futures markets, as a marketing channel, on cotton forward contracting.

7. A comparison between forward contracting and spot markets as two distinct marketing channels available to cotton producers.

CHAPTER 2

CHARACTERISTICS OF THE DATA ON FORWARD CONTRACTING AND DEVELOPMENT OF HYPOTHESES

Data in the Sample

This study is based on a sample of 2975 contracts which covered a period of six cropping seasons (1974-1979). All the contracts have a contracting date and a specified price per pound of lint cotton. In addition, each contract reveals the following information:

1. The season in which the contracted crop is grown.
2. The acreage of cotton included in the contract.
3. The number of bales contracted except when a buyer agrees to accept whatever cotton is produced but not previously contracted from the acreage.
4. The number of bales contracted previously from the same acreage.
5. The variety of cotton contracted, that is to say whether it is Pima or upland.
6. The cotton contracted that has been harvested from the ground.

Based on the information in each contract, the 2975 contracts were grouped into the following six categories: First, Additional, Balance, Acreage, Pima and Ground Contracts. The grouping will become very clear when we look into the characteristics of each group of contracts.

Characteristics of the Grouped Contracts

Grouping the contracts into six contract categories revealed the following statistics in terms of the number of contracts (Table 1). The First and the Additional contracts accounted for the larger portion of the total number of contracts during the six cropping seasons under study. In addition, they were the only two groups of contracts that continued consistently throughout the six cropping seasons.

A contract was defined as a First contract when there was a specification of the number of bales to be delivered on that particular contract and no bales had been contracted from the same acreage on previous contracts for the same crop year.

A contract was defined as an Additional contract when there was a specification of the number of bales to be delivered on that particular contract and a specified number of bales had previously been contracted from the same acreage. Both the First and the Additional contracts show the number of bales contracted and therefore a bale is used as the contracting unit.

A contract was defined as a Balance contract when there was no specification of the number of bales to be delivered on that contract and a specified number of bales had previously been contracted from that same acreage. On the other hand, a contract was defined as an Acreage contract when there was no specification of the number of bales to be delivered on that contract and no previous contracts had been written on that acreage. Both the Balance and the Acreage contracts were written in acre unit rather than bale unit.

Table 1. Number of contracts in the sample, by contract type, 1974-1979.

Season	First 1	Additional 2	Balance 3	Acreage 4	Pima 5	Ground 6	Season Total 7
1974	202	67	13	37	-	-	319
1975	185	35	-	-	-	-	220
1976	302	152	169	12	-	133	768
1977	370	88	-	18	39	15	530
1978	343	222	35	7	26	-	633
1979	344	118	18	1	24	-	505
Total	1746	682	235	75	89	148	2975

Source: Compiled from the sample data.

A contract was defined as a Pima contract when there was a specification of the Pima variety in that contract. A Pima contract could be written in bale or acre units.

A contract was defined as a Ground contract when there was a specification of the number of ground harvested cotton bales to be delivered on that contract from a specified acreage. Although they were in the sample, Pima and Ground contracts were excluded from the final analysis due to the fact that they did not have a significant share in the cotton markets. The final analysis, therefore, included First, Additional, Balance and Acreage contracts. However there was no mention of specific lint qualities in those contracts, it was generally understood that lint cotton should meet certain qualitative and quantitative standards at the time of delivery. The prices of the four types of contracts included in the final analysis were based on a lint length of 11/16 inches and a grade of strict low middling. Shorter fiber and lower grades were accepted for delivery on the contracts at discounts from the contracted price.

By the basic definition of Additional and Balance contracts, these contracts can only come into existence after a First contract has been established on a particular acreage of cotton. Therefore, First contracts should be the predominant type early in the contracting period and Additional and Balance contracts might be the predominant contracts established later in the contracting period. A review of the data shows that Additional contracts tend to be written later in the contracting period than First contracts, and Balance contracts tend to be written later in the contracting period than Additional contracts. Acreage contracts tend to be written in about the same time period as Balance contracts; this is

to be expected since these two types of contracts differ only because the Balance contract has previous bales contracted off the particular acreage while the Acreage contracts have no bales contracted off the particular acreage. The Balance and the Acreage contracts are generally initiated only in those years when the contract price has risen substantially from beginning to end of the contracting period. Because the different contract types predominate at different time periods and because the general level of contract prices varies substantially from one part of the contracting period to another, simple comparison of average prices from one contract type to another will not indicate if one contract type really has a higher price than the other after adjustment for variation in the level of prices.

First contracts typically specify a number of bales from the specified acreage that is equal to or less than the total number of cotton acres grown by a farmer. Additional contracts typically raise the total bales contracted from the specified acres to no more than two bales per acre unless past performance indicates that the particular farm produces substantially more than two bales per acre. The four counties included in the study have county-wide average production exceeding two bales per acres.

The buyers on forward contract normally hedge their contracts by selling futures contracts for approximately the same number of bales except that futures contracts cannot be bought or sold in smaller quantities than 100 bales units. Other buyers may have forward contract sales of goods they plan to manufacture from the cotton purchased from farmers on forward contract.

The forward contract price is usually based on the December futures contract price at the time the contract is offered by a buyer. The price of the manufactured cotton goods sold on forward contract must also be tied to the December futures prices at the time the contract is established. The buyer of cotton on forward contract has very little price risk when the number of bales delivered on forward contract is exactly equal to the number of bales hedged by sale of futures contracts or sale of manufactured goods on forward contracts. In general, there should be less uncertainty about the exact number of bales that will be delivered on First contracts than on Additional contracts and less uncertainty with Additional contracts than Balance or Acreage contracts. This suggests that a rational economic basis should exist for higher prices for First contracts than Additional contracts and higher prices for Additional contracts than Balance or Acreage contracts.

Farmers are frequently advised that when the forward contract price exceeds the cost of producing the cotton they should contract at least one bale per acre at or prior to planting time. This suggests that there would be little or no contracting when the offered price is low. This is counteracted to some extent by lending institutions which frequently require the forward contracting of at least part of the expected production before production loans are made. It seems logical that farmers would be more willing to sell on forward contract when the offered price is unusually high and want to harvest their crop before fixing the price when the forward contract price is unusually low. In a year when the forward contract price trends upward continuously throughout the contracting period farmers who forward contract will receive lower

average prices than farmers who do not forward contract. Years with rising prices will show forward contracting to be an inferior strategy. Over a period of years this system of decision making should show the gains from forward contracting rather than simple spot sale after harvest exceeding the reduced revenue resulting from forward contracting.

Setting of Hypotheses

With regard to the first four contract types (Table 1), a number of hypotheses were formulated and a number of analytical procedures were applied to the data to verify these hypotheses.

We assumed that cotton producers in Arizona reacted to the level of prices offered by the ginning firms which were the agents of the buyers of all the forward contracted cotton in this study. The farmers' reaction to forward contract prices was reflected by the total number of bales and acres contracted in a particular day. Because there was little or no difference between the prices of the four contract types written on the same day, a weekly average price is used instead to study the difference between the prices of the four contract types. The following hypotheses were formulated:

1. The weekly average price of the First contracts was higher than the weekly average price of the Additional contracts.
2. The weekly average price of the First contracts was higher than the weekly average price of the Balance contracts.
3. The weekly average price of the First contracts was higher than the weekly average price of the Acreage contracts.

4. The weekly average price of the Additional contracts was higher than the weekly average price of the Balance contracts.
5. The weekly average price of the Additional contracts was higher than the weekly average price of the Acreage contracts.
6. The weekly average price of the Balance contracts was higher than the weekly average price of the Acreage contracts.
7. Forward contracting increased farmers' gross revenues from cotton sale above the level that would have resulted if the cotton had instead been sold at the spot price that occurred in the first week of December for each of the six cropping seasons included in the study.

CHAPTER 3

TABULATION AND PRELIMINARY ANALYSIS

Cotton Production in the Four Counties

Cotton production was a very important farm activity in Arizona during the six cropping seasons of 1974-1979. Arizona Agricultural Statistics reports showed an overall increase in the cotton acreage from 426,700 in 1974 to 642,800 acres in 1979. Upland cotton constituted a very high percentage of the total area grown with cotton each season and was therefore considered by Arizona farmers to be among the best alternatives available for farm business. The four counties included in this study contributed a high percentage of the total cotton production in Arizona throughout 1974-1979 seasons (Table 2, Column 6). Although the total number of bales produced in the four counties (Column 5) had decreased in the 1975 season, total cotton production had increased continuously since then indicating either an increase in the acreage alloted to cotton or an increase in cotton yield or both.

Cotton yield per acre varied from season to season as well as from county to county. Maricopa and Yuma had higher yield per acre than Pima and Pinal counties. However the yield per acre for the four counties averaged 2.07 bales/acre with a standard error of $\pm$ 0.19.

Table 2. Average yield and total production of Upland cotton by county 1974-1979.

Season	Maricopa 1	Pima 2	Pinal 3	Yuma 4	Total 5	Column 5 as % of Arizona 6	Yield/Acre[b] 7
	1000 Bales					%	Bales
1974	426	40	322	159	948	95.3	2.36
1975	267	21	178	87	553	96.5	1.96
1976	386	26	264	122	798	95.7	2.24
1977	498	34	273	195	1000	93.5	1.96
1978	508	25	272	203	1008	94.4	1.85
1979[a]	587	35	350	250	1222	90.5	2.09
Mean						94.3	2.07
Standard deviation							+0.19

Source: Compiled from Arizona Agricultural Statistics by Arizona Crop and Livestock Reporting Service, 1979

[a]Data for 1979 are preliminary estimates

[b]Yield per acre is the overall average for the four counties

A Preliminary Analysis of the Data

The Length of the Contracting Period

An initial step in measuring the length of a contracting period in a particular cropping season was to arrange the contracts in each contract type according to the date the contract was initiated. Then the contracting period was divided into weeks which would begin on Monday. The last week of contracting would always be the first week of December of the same crop year and was designated as week number one. The week preceeding week number one was numbered number two, and this pattern was continued until the earliest week of contracting had the highest week number.

Table 3 shows the length of the contracting period throughout the six cropping seasons together with the high and low prices attained and the price range for each season. The contracting period, therefore, measures the elapse of time in weeks between the dates when the first contract was written and the first week of December of the year the crop was grown. The length of the contracting period had varied from season to season with a mean length of 68.8 weeks. The number of weeks with active contracting had also varied from season to season with a mean length of 42.5 weeks. Although it was closely related to cotton trade on December futures, forward contracting could be initiated before or after the initial date on which futures trade would usually start.[1] The earliest date of contracting was April 1973 for 1974 crop, that was two months

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1. December futures for next year's crop would usually start mid June of this year.

Table 3. Length of the contracting period, the seasonal high and low prices and the price range 1974-1979.

Season	Contracting Period		Price		Price Range
	Length (1)	Active[a] (2)	High (3)	Low (4)	(5)
	weeks		cents/lb.		
1974	82	40	70.25	38.00	32.25
1975	57	21	54.00	47.50	6.50
1976	58	39	81.00	51.00	30.00
1977	72	50	69.50	50.60	18.90
1978	80	49	67.00	53.00	14.00
1979	64	56	66.00	61.50	4.50
Mean	68.8	42.5			

[a]An active contracting period refers to the number of weeks in which cotton contracting was active.

before the December futures had started trading, and the latest starting date was September 1975 for 1976 crop, three months after the December futures for that season had started trading. Although the price range for the 1974 crop was the highest of the six seasons and was associated with the longest contracting period, a positive relationship did not seem to exist between the price range and the length of the contracting period during the six seasons.

Contracting Period and Bales Contracted

The number of bales contracted reflected the willingness of the farmer to sell that much of his expected cotton output at the specified price on that date. The customary practice by cotton producers was to contract for part of their expected output and wait for sometime before they would contract for all or part of the remaining output. Such a practice could be looked at as seeking an average price or as speculating on the level of contract prices in the future. Because of farmers' expectations on the level of contract prices and the levels of their cotton production, it is expected that a farmer would forward contract part of his expected output or acreage on a number of contracts at different periods. Such practice of forward contracting cannot be without risk since the price level could drop sharply from one period to the other. But if the price level increased from one period to the other then the farmer would benefit from such a practice. To calculate the percentage of bales contracted for in a particular season, the number of bales contracted in a week was divided by the total number of bales available for contracting in that season in the four counties. The total

number of bales available for forward contracting in a season was obtained by starting with the total number of bales that was ginned by the cooperative ginning companies and subtracting the bales delivered to and sold through cooperatives. The number of bales contracted, on the other hand, was obtained by adding the number of bales contracted on all contract types in a week. When the contract types included Balance and or Acreage contracts, the total number of bales contracted would also include an estimate for the number of bales contracted on Balance and or Acreage contracts. An estimated number of bales on these two contracts was obtained by subtracting the number of bales previously contracted from the total production of the same acreage based on average yield in each season.

Figures 1 through 6 show the cumulative percentage of the total production contracted in the six seasons as a function of the contracting period. To help identify those periods in which forward contracting was relatively high, the percentage of total production contracted was calculated on a four-month period (Table 4) rather than on a weekly period. Because the length of the contracting period varied from season to season, the percentage of total production contracted on a four-month period also varied from season to season. The variation might be due to the fact that cotton forward contracting did not commence at the same date each season. The April-August period (Column 1) would either have a low or no contracting activities and the latest contracting period (Column 5) was the harvest period and had therefore light forward contracting activities. No particular sub-period of the contracting period in a season had a high percentage of contracting throughout the six cropping seasons. However,

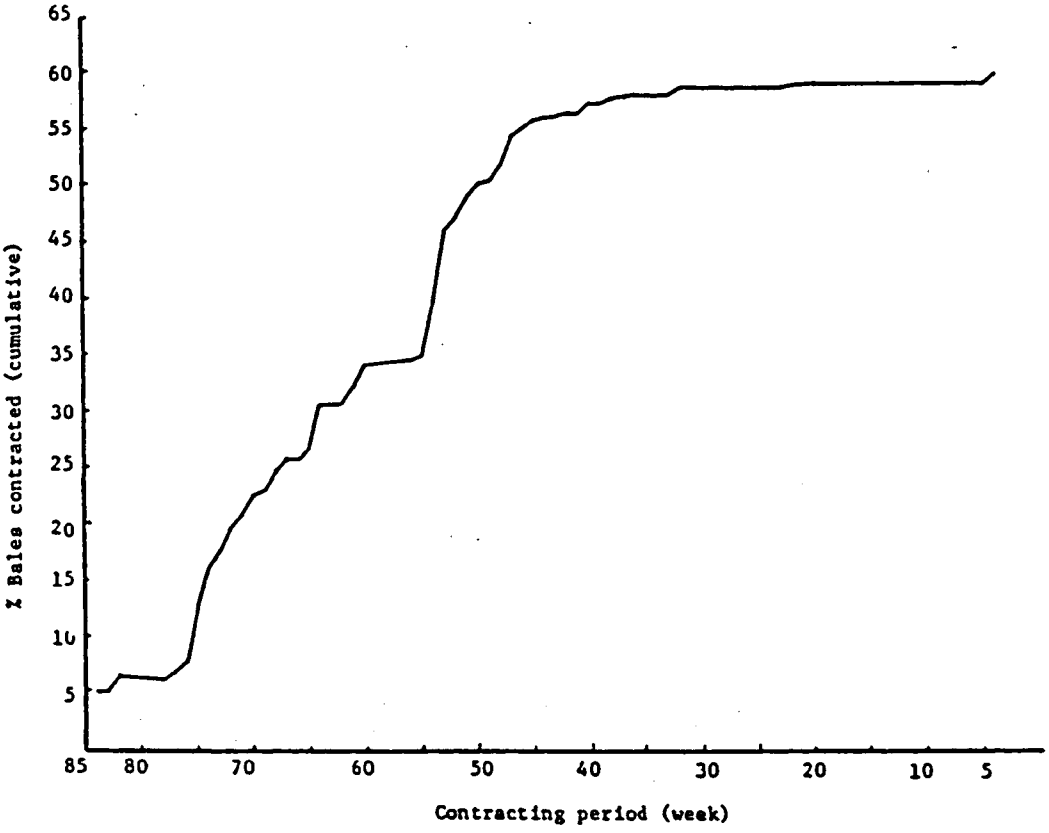

Figure 1. Cumulative percentage of total production contracted 1974.

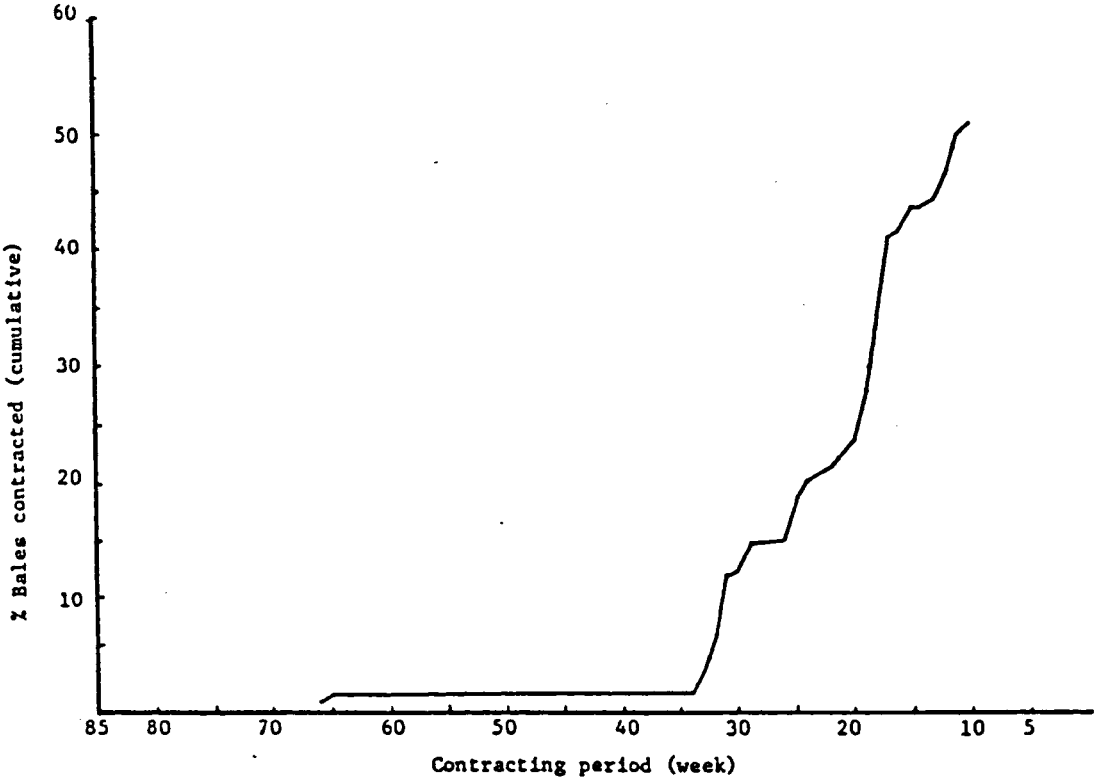

Figure 2. Cumulative percentage of total production contracted 1975.

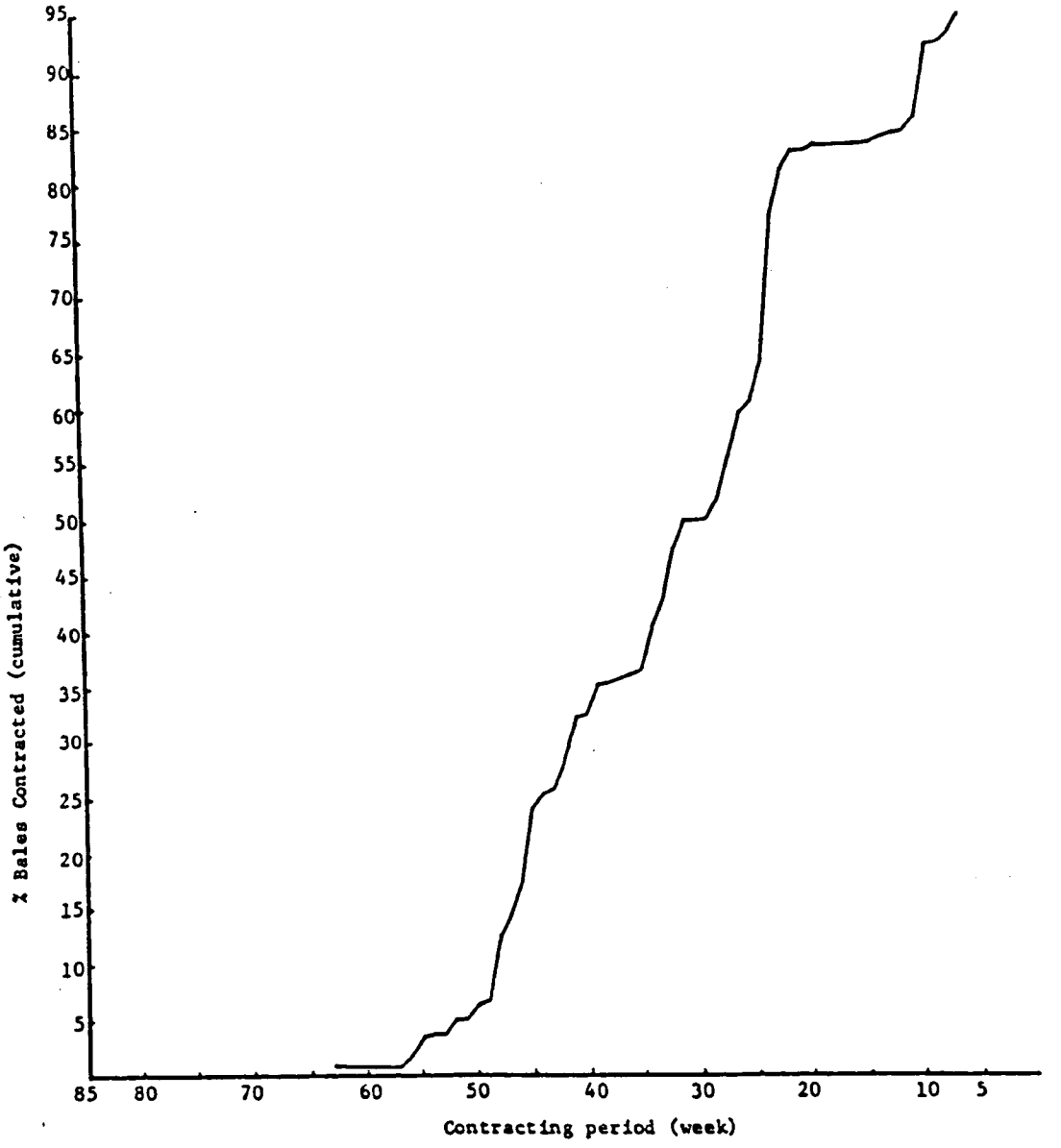

Figure 3. Cumulative percentage of total production contracted 1976.

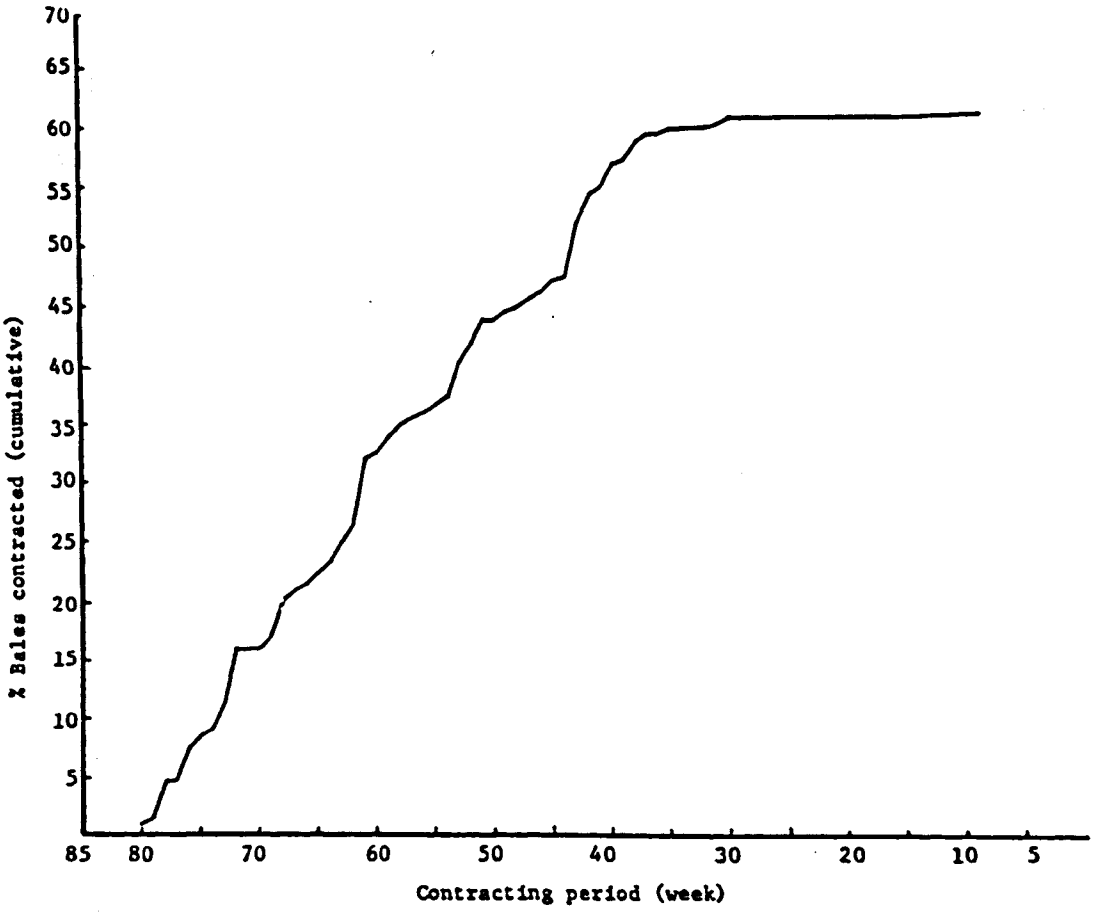

Figure 4. Cumulative percentage of total production contracted 1977.

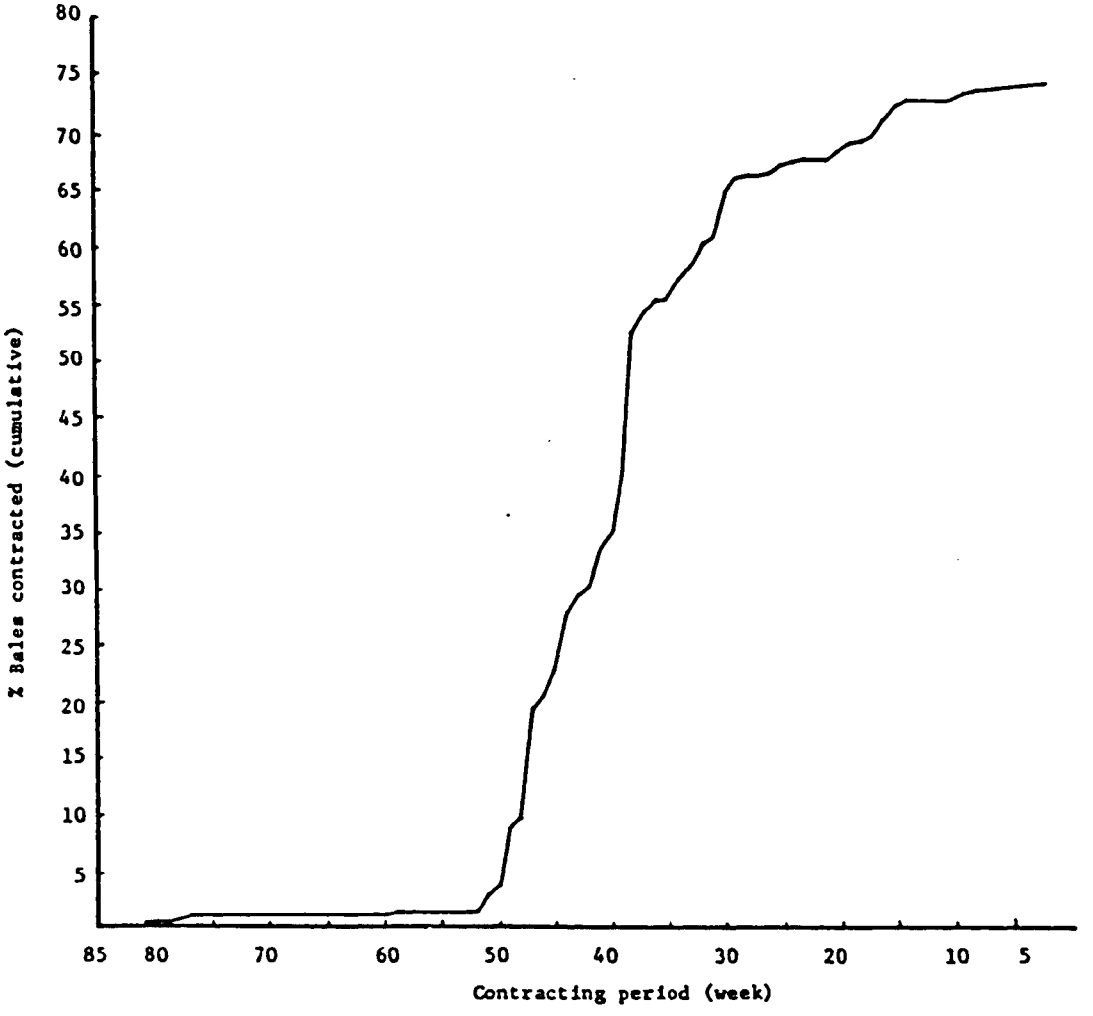

Figure 5. Cumulative percentage of total production contracted 1978.

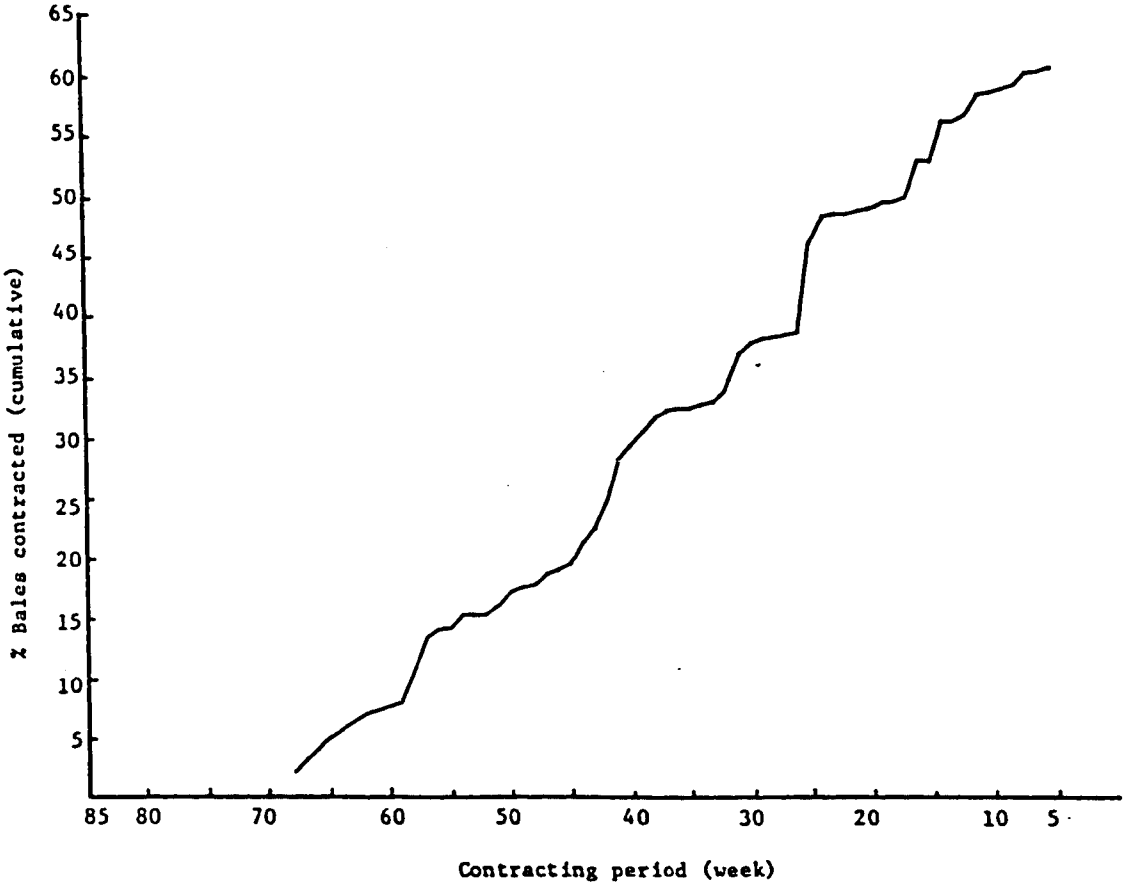

Figure 6. Cumulative percentage of total production contracted 1979.

Table 4. Percentage of cotton contracted 1974-1979 by four month period.

Crop Year	Contracting Period (weeks preceeding December 10) Apr.-Aug. (85-67) (1)	Spt.-Dec. (66-50) (2)	Jan.-Apr. (49-32) (3)	May-Aug. (31-16) (4)	Spt.-Dec. (15-1) (5)	Season Total (6)
	%					
1974	26.0	24.9	7.8	1.0	0.6	60.3
1975		1.4	5.7	36.7	7.3	51.1
1976		6.5	41.1	36.2	11.9	95.7
1977	20.3	22.8	16.9	1.0	*	61.0
1978	1.1	2.9	56.7	10.8	2.9	74.4
1979	3.0	14.5	16.5	19.0	7.5	60.5
Mean	12.6	12.2	24.1	17.4	5.0	67.0

*Less than .5%

there was a likelihood that a comparatively higher percentage would be contracted during January-April and May-August periods. The January-April period (Column 3) could be looked at as the preplanting period in which the farmers are still deciding on how much cotton acreage they will grow. The May-August subperiod, on the other hand, could be looked at as the period in which cotton planting is complete except cotton planted after grain crops are harvested. At this period, farmers are more certain about their expected cotton output, and are more willing to make a decision on forward contracting. Apart from the above observations, the percentage of cotton contracted does not show a regular pattern throughout the six seasons.

The Price Level and Price Variation

The price level in a contracting period would depend on external factors that neither the cotton producers as sellers nor the ginning firms as buyers had any control over. Among these external factors are, the world supply and demand for cotton, the effect of synthetic fibers and other substitutes on cotton prices, changes in technology used in cotton production and manufacturing and changes in consumers' taste and income. Therefore the direction in which the contract prices would move during a particular contracting period would not be easy to predict by either one of the contracting parties.

Since the data were grouped into weekly observations, a weekly weighted average price was used to reflect the prices of each of the four contract types in each week that had contracting. The weighed average prices of the contract types were compared to the corresponding

weekly average price of December futures to see if there was any relationship between the two prices. The difference between the weighted average price of a contract type and the average price of December futures was plotted against the corresponding weeks on which the contracts were written (Figures 7 through 12). Except for the 1974 season, the weekly average futures prices were generally higher than the corresponding weighted average prices of any of the contract types. The prices offered on forward contracting were expected to be less than the futures prices of the previous day by a margin that would cover the transportation cost to the point at which delivery could be made on the futures contract.

Because of the close relationship between the forward contract price and the December futures price, cotton producers might take a close look at trends of previous December futures prices and the possible factors that might have contributed to those price trends before they make any contract commitments. Based on the farmers' analysis of the trends of previous futures prices and their expectations on the level of future prices for a particular season, cotton producers could make better decisions on whether or not to contract part or all of their expected output at a particular date. Both futures and contract prices during the six cropping seasons tended to be relatively high towards the middle of the contracting period when the percentage of cotton contracted was likely to be relatively high indicating a rational decision by a number of cotton producers.

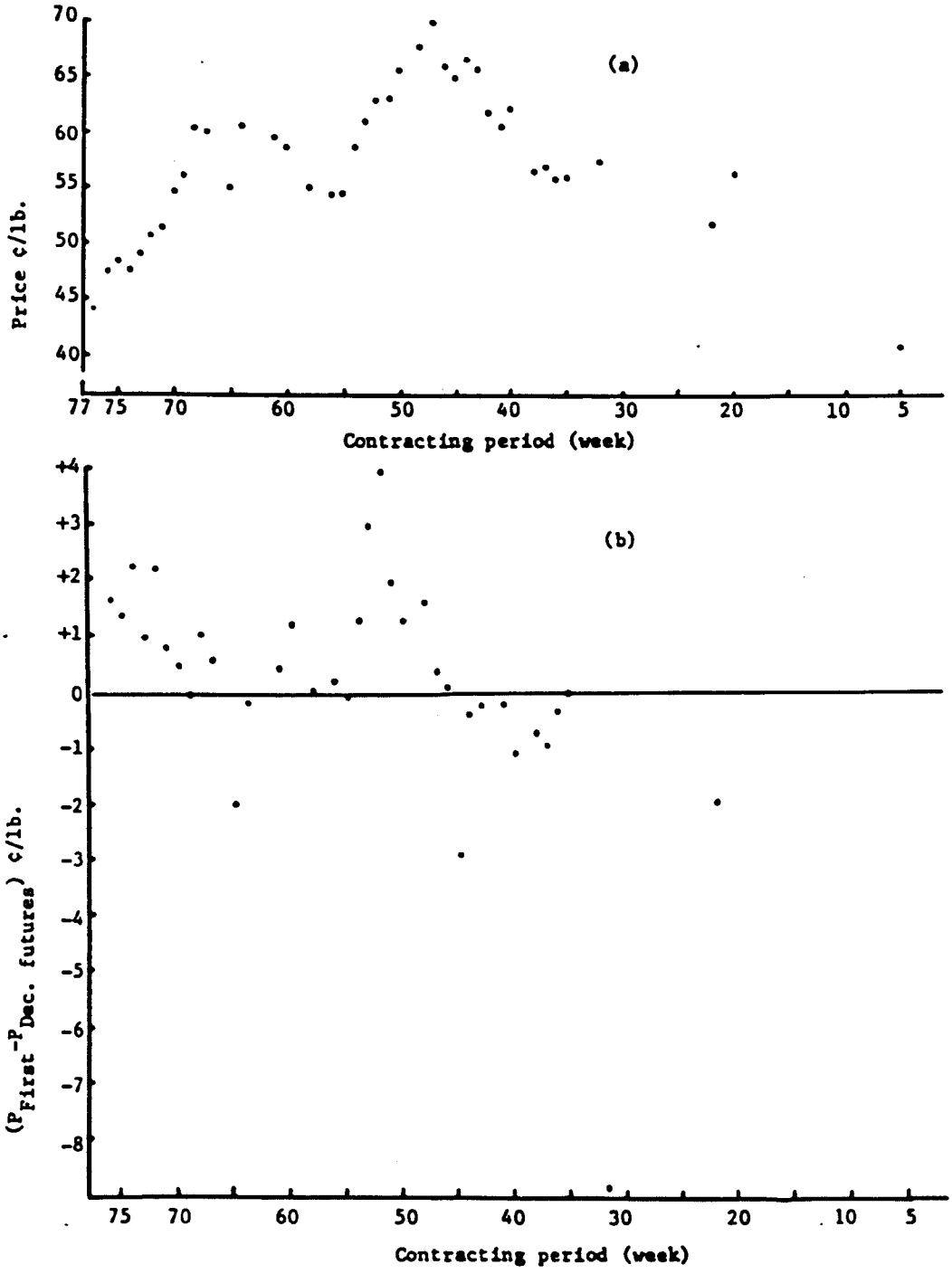

Figure 7. (a) weekly average December Futures prices 1974 crop.
(b) basis (First contract price - December futures prices) 1974 crop.

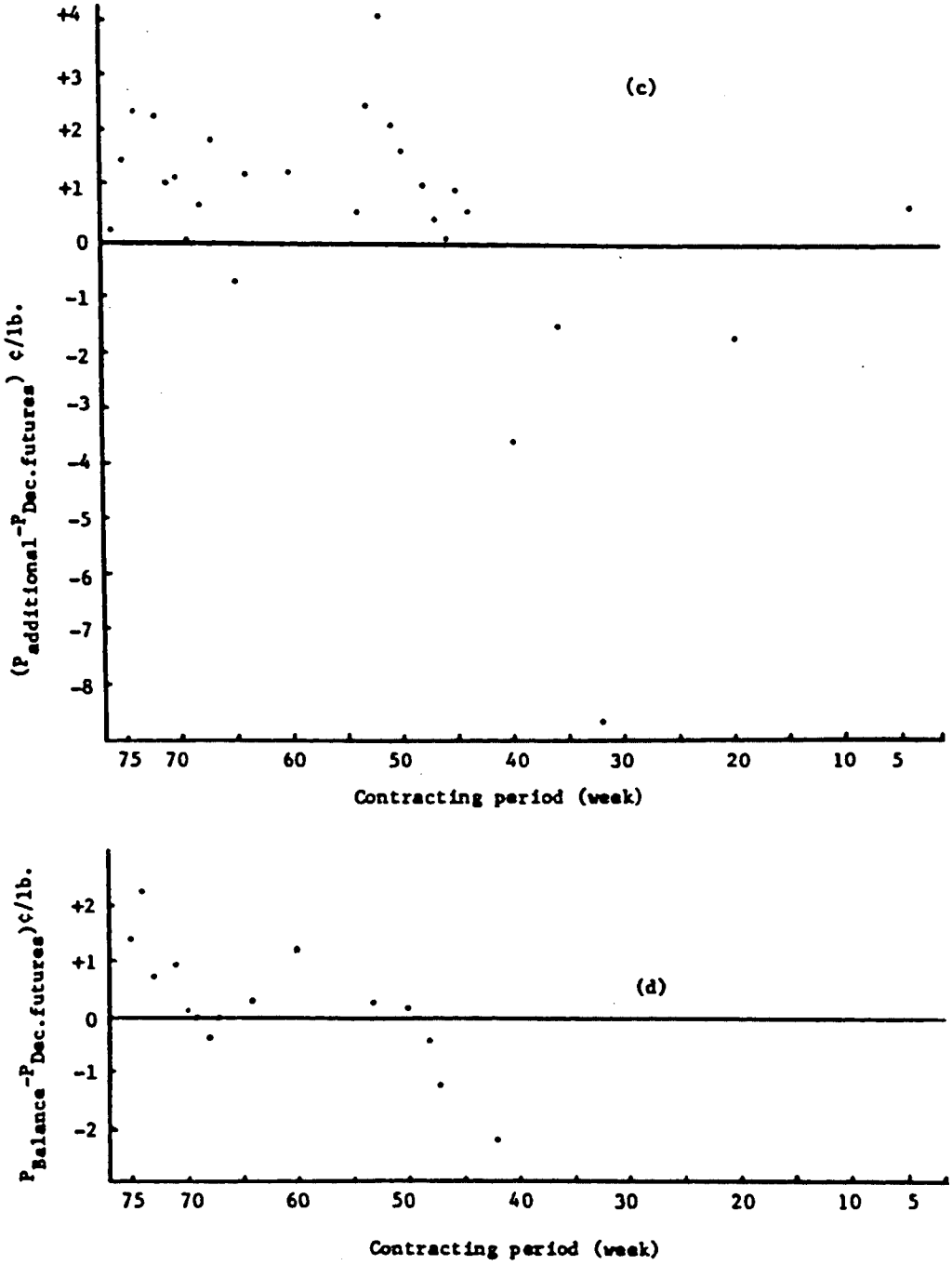

Figure 7. (c) basis (Additional contract price - December futures price) 1974 crop.
(d) basis (Balance contract price - December futures price) 1974 crop.

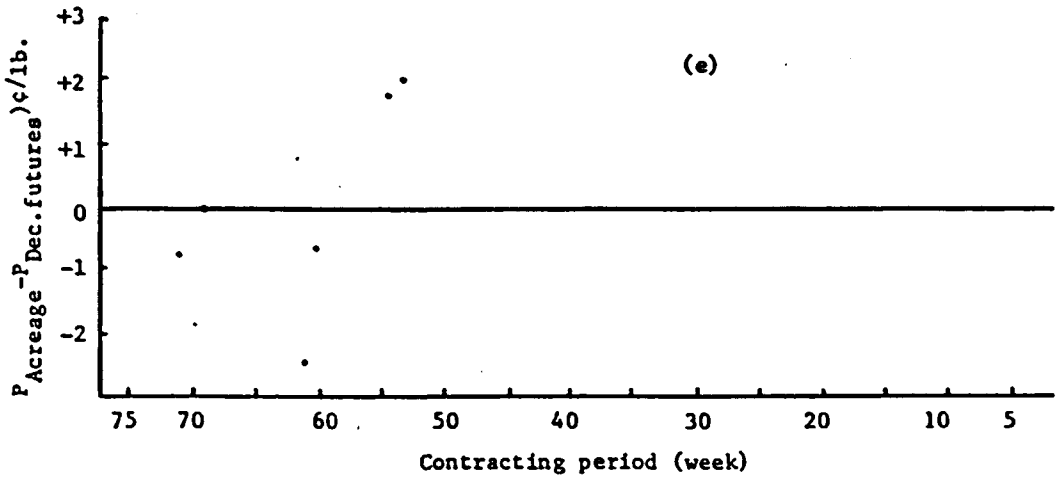

Figure 7. (e) basis (acreage contract price - December futures price) 1974 crop.

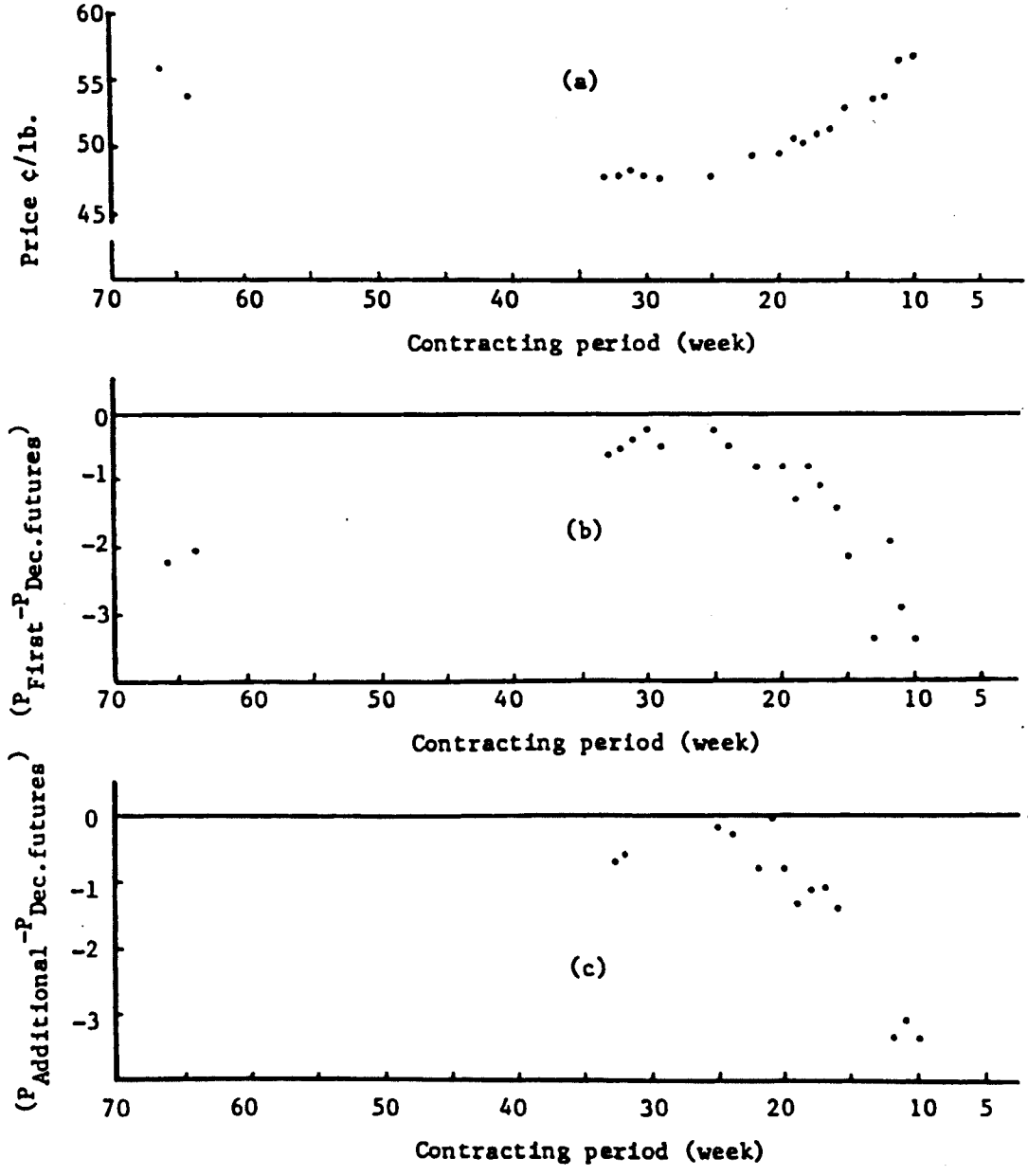

Figure 8. (a) weekly average December futures prices 1975 crop.
(b) basis (first contract price - December futures price) 1975 crop.
(c) basis (additional contract price - December futures price) 1975 crop.

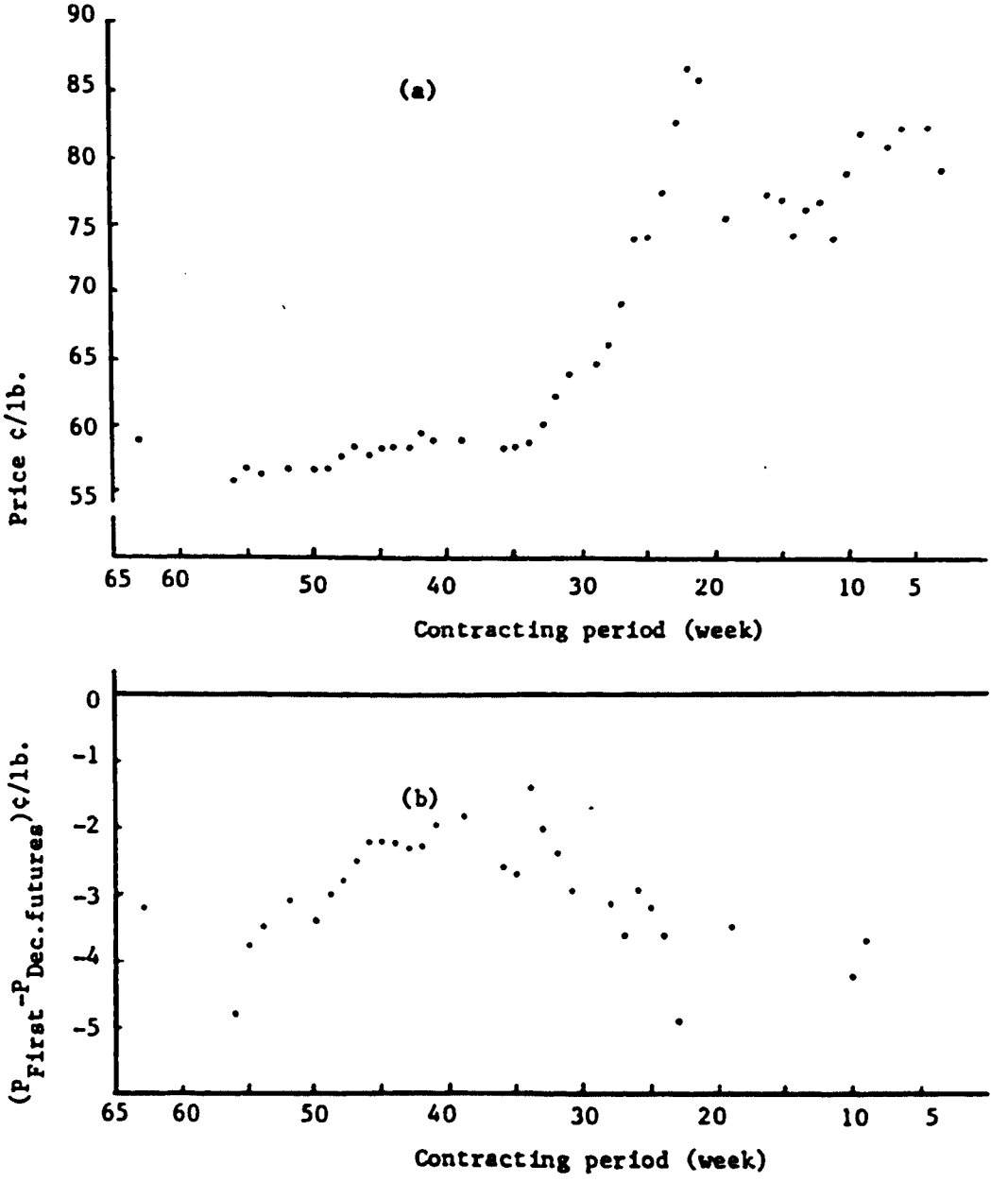

Figure 9 (a) weekly average December futures prices 1976 crop.
(b) basis (first contract price - December futures price) 1976 crop.

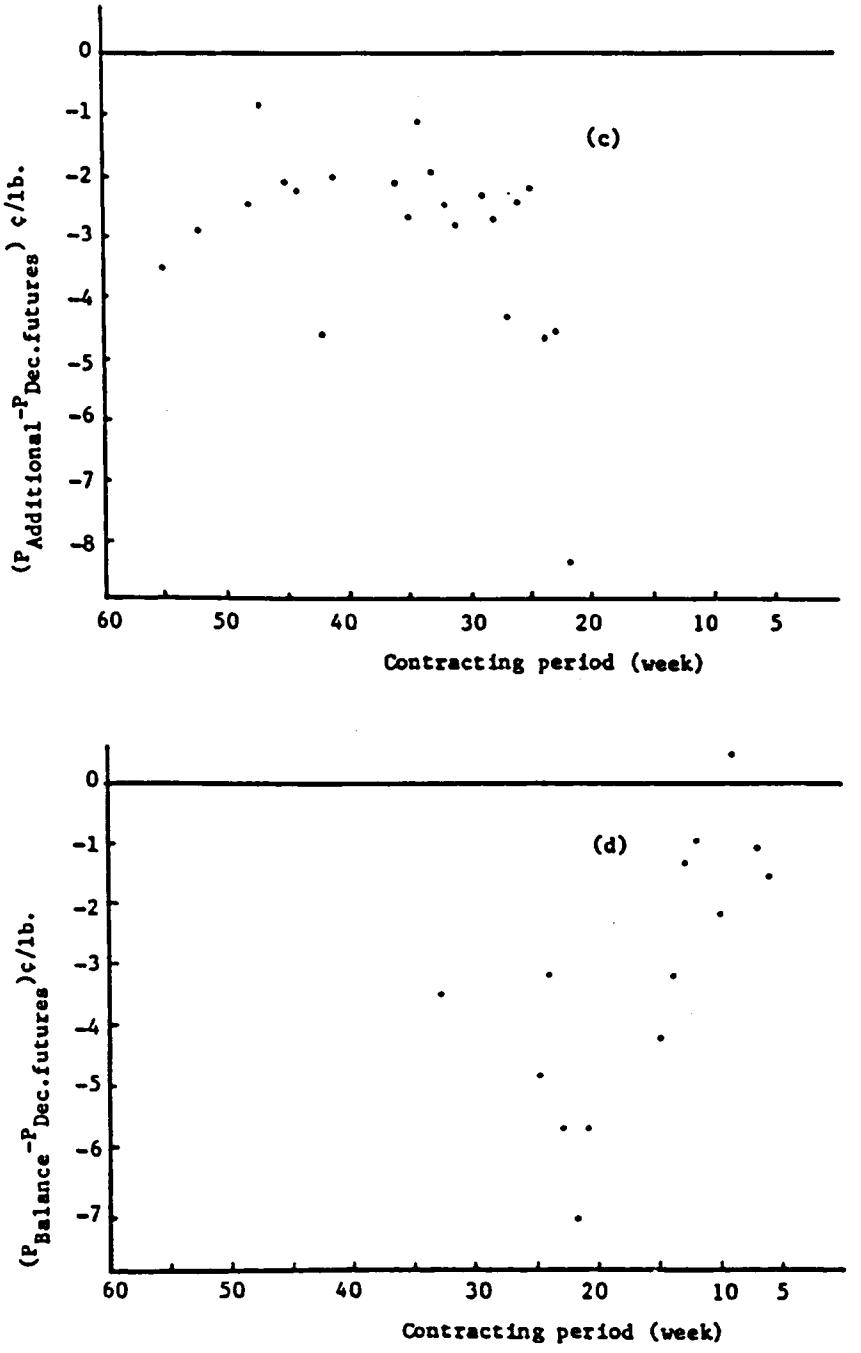

Figure 9. (c) basis (additional contract price - December futures price) 1976 crop.
(d) basis (balance contract price - December futures price) 1976 crop.

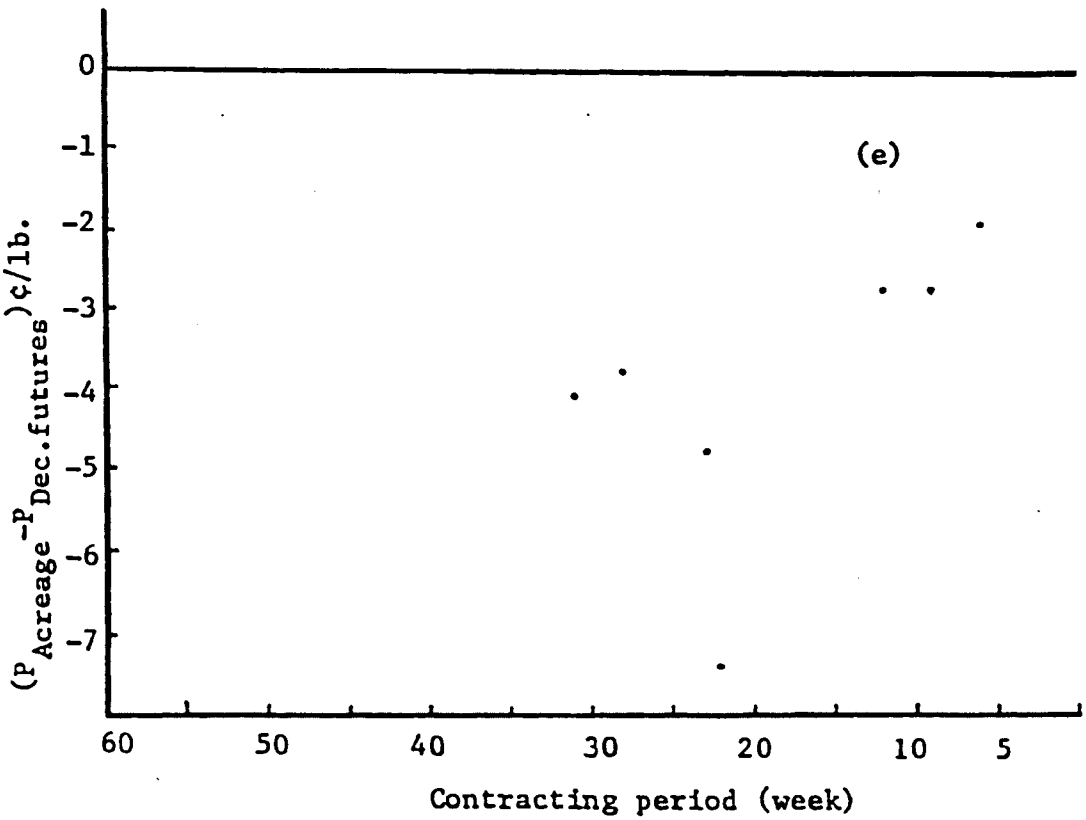

Figure 9 (e) basis (acreage contract price - December futures price) 1976 crop.

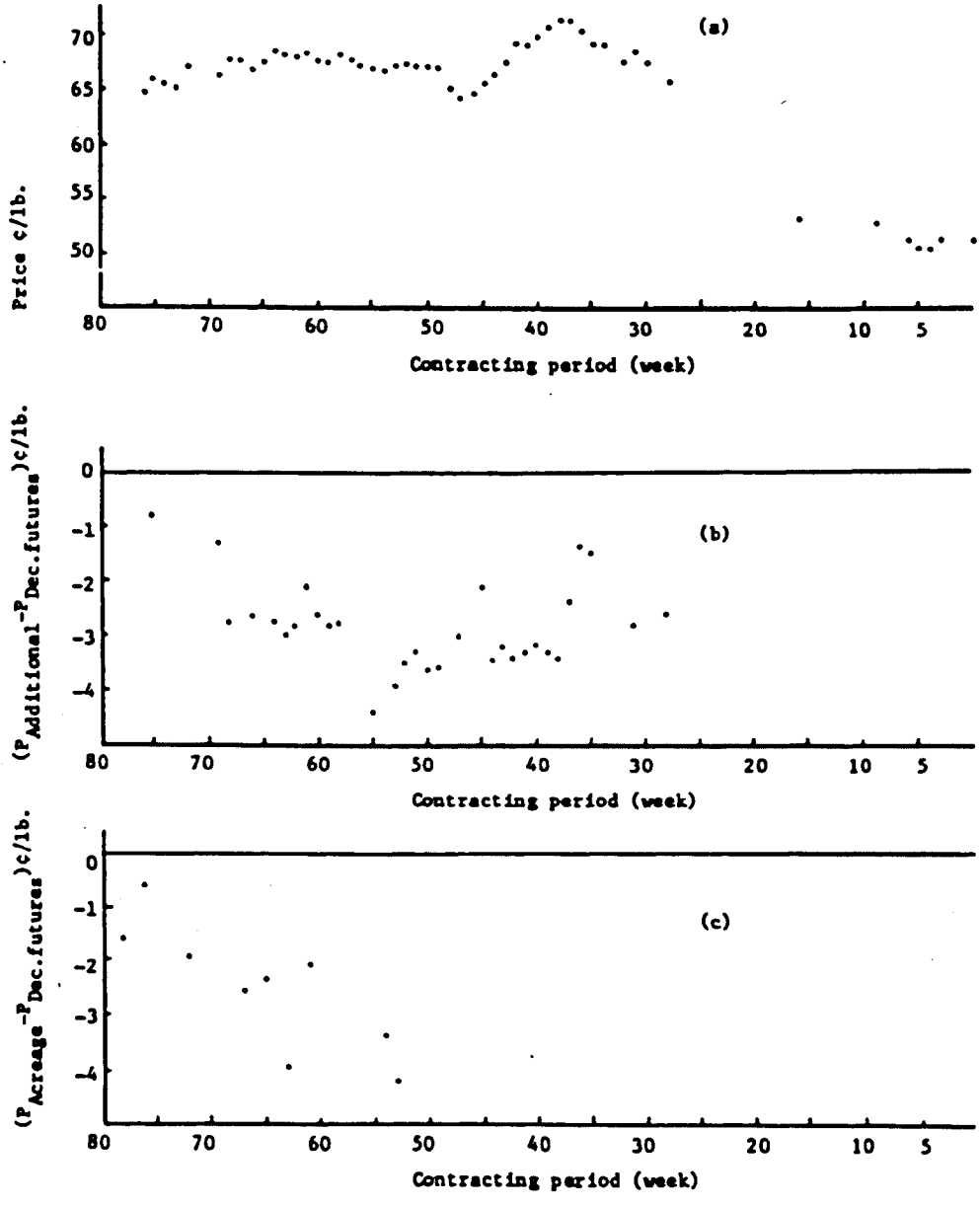

Figure 10 (a) Weekly average December futures prices 1977 crop.
(b) Basis (Additional contract price - December futures price) 1977 crop.
(c) Basis (Acreage contract price - December futures price) 1977 crop.

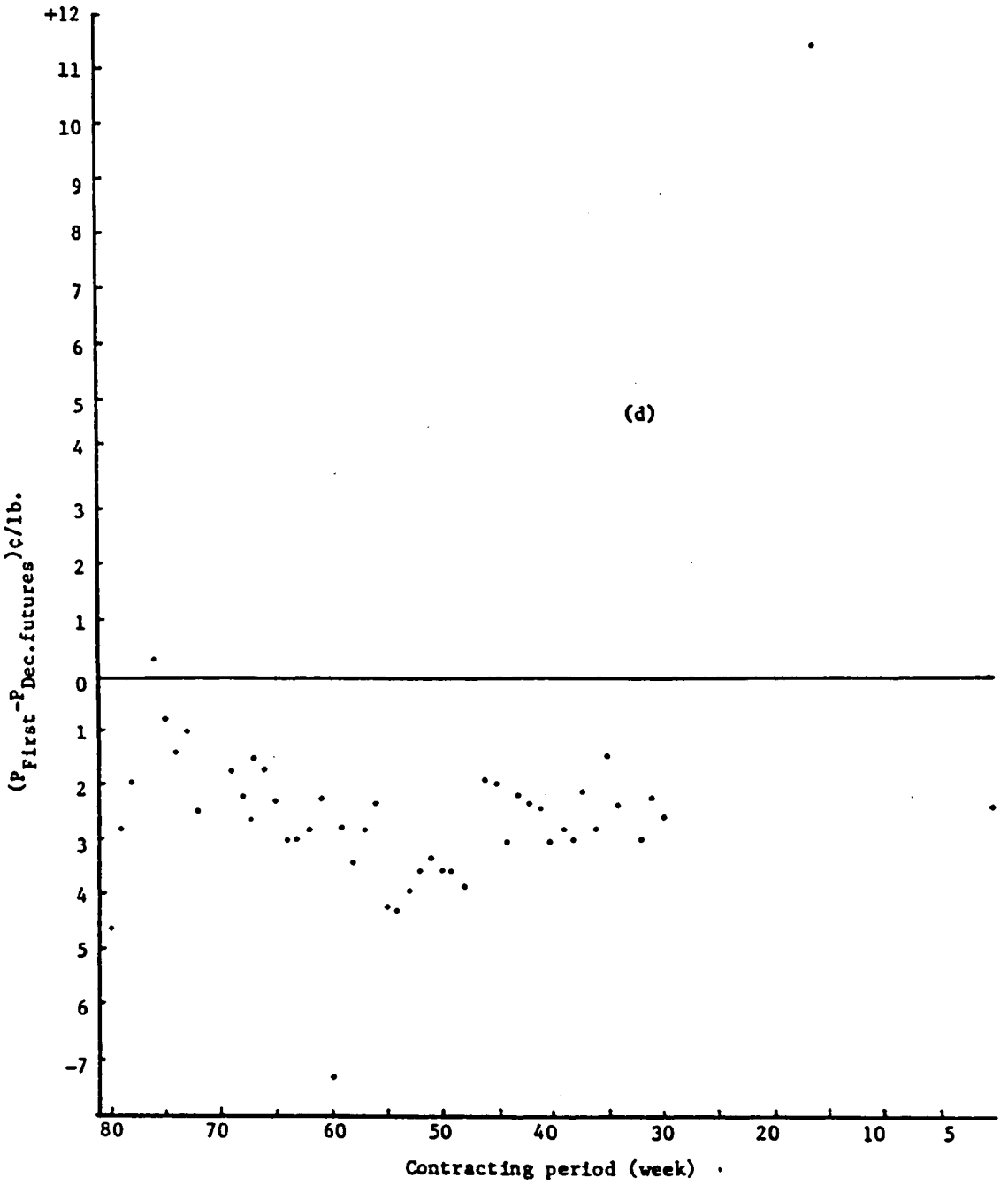

Figure 10. (d) Basis (First contract price - December futures price) 1977 crop.

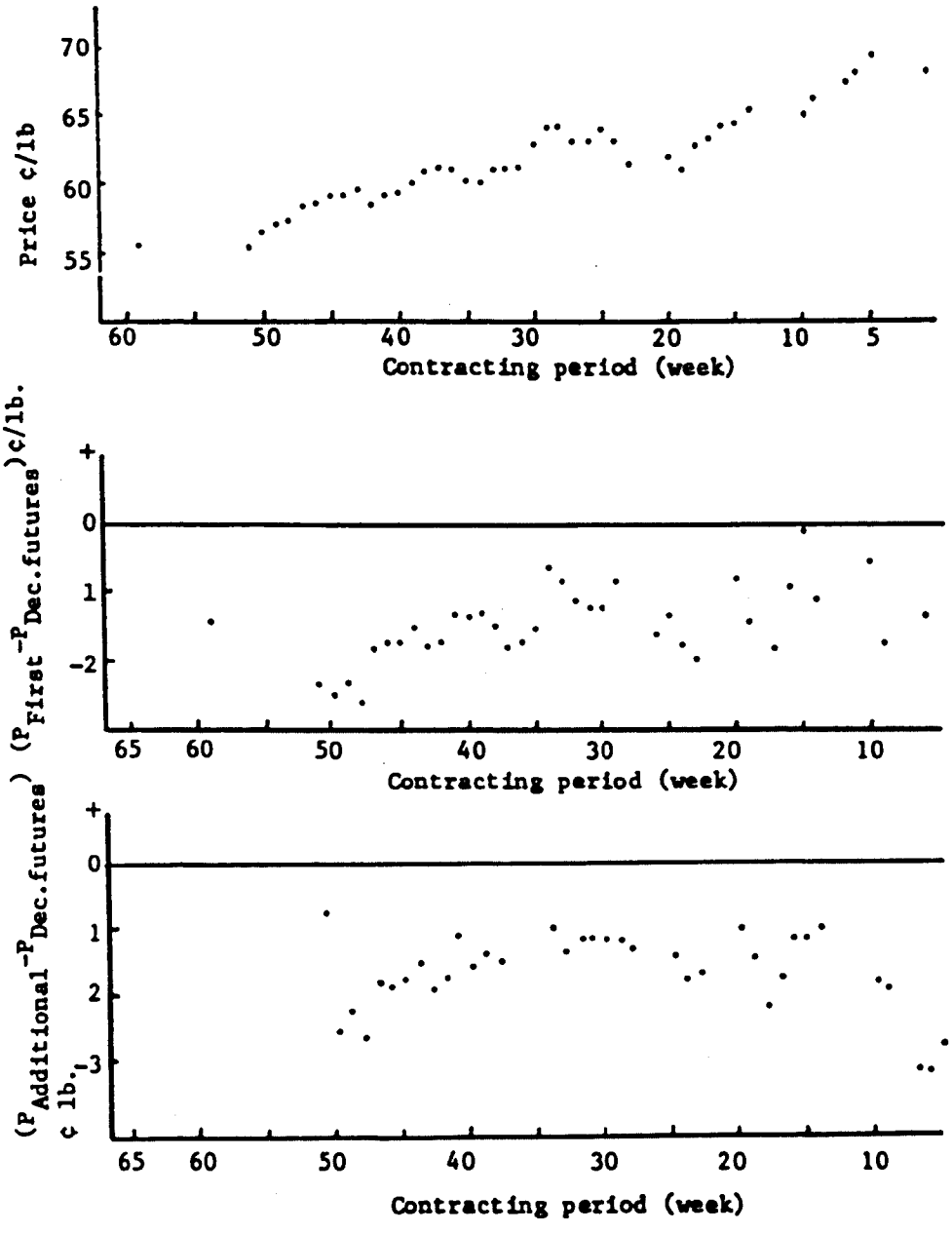

Figure 11 (a) Weekly average December futures prices 1978 crop.
(b) Basis (First contract price - December futures price) 1978 crop.
(c) Basis (Additional contract price - December futures price) 1978 crop.

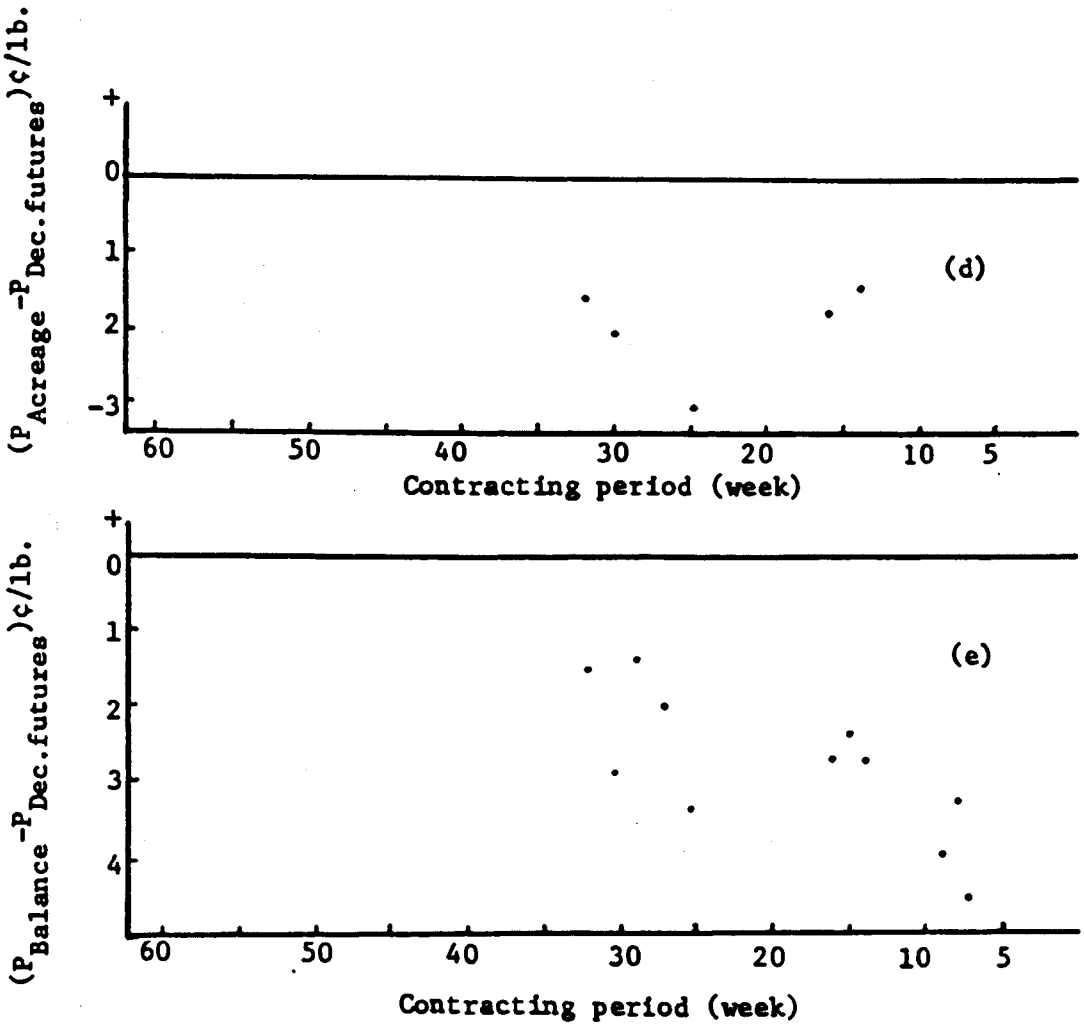

Figure 11 (d) Basis (Acreage contract price - December futures price) 1978 crop.
(e) Basis (Balance contract price - December futures price) 1978 crop.

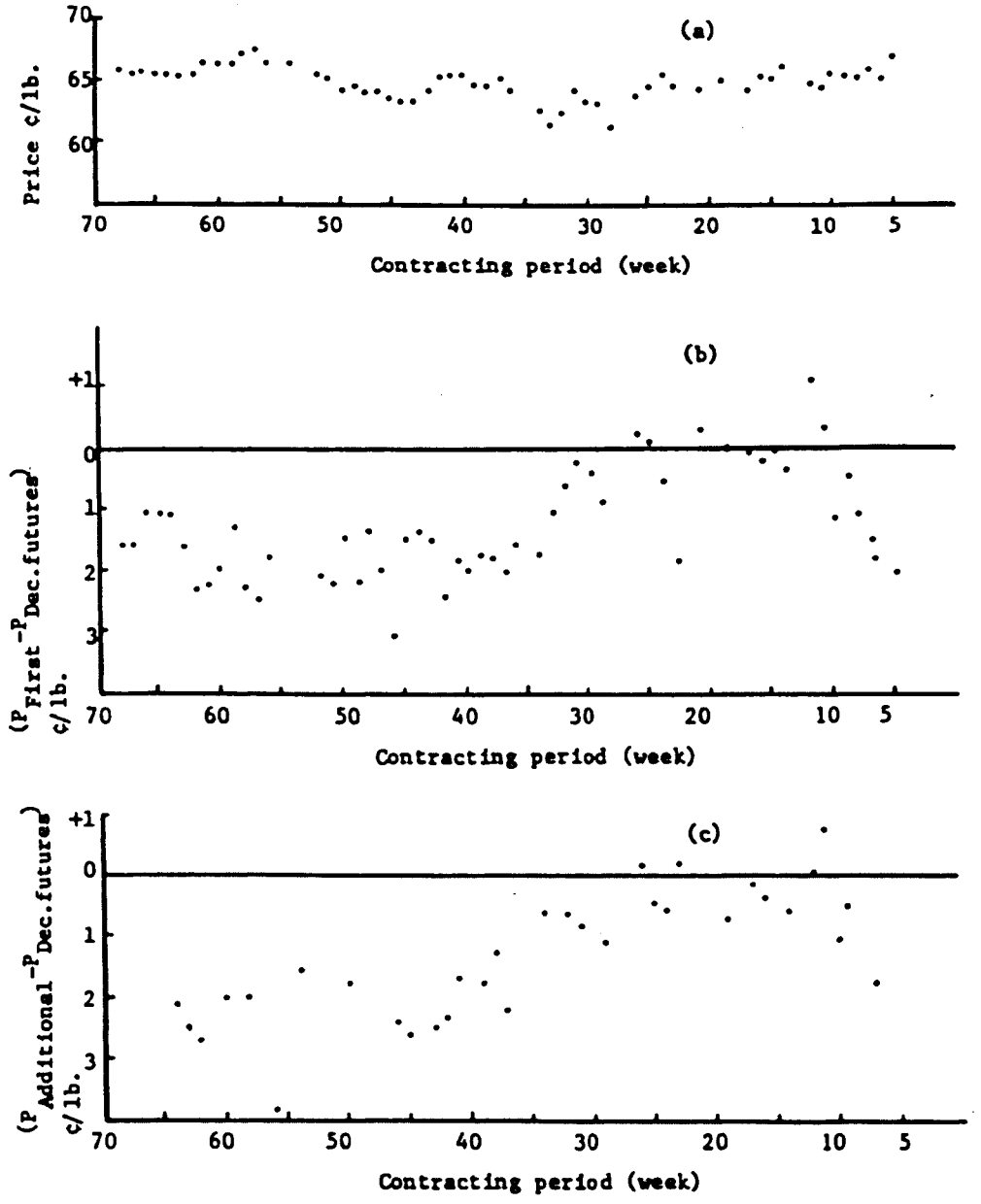

Figure 12 (a) Weekly average December futures prices 1979 crop.
(b) Basis (First contract price - December futures price) 1979 crop.
(c) Basis (Additional contract price - December futures price) 1979 crop.

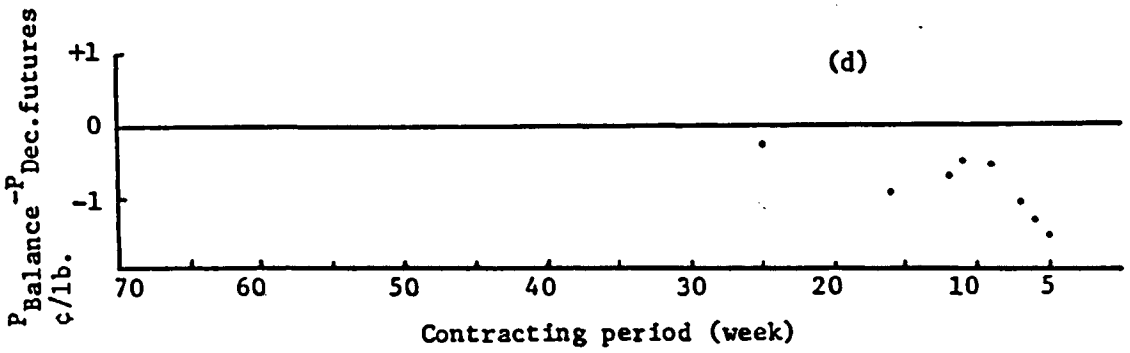

Figure 12 (d) Basis (Balance contract price - December futures price) 1979 crop.

Forward Contract Versus Spot Market

We assume that cotton producers would usually sell their product directly after ginning to avoid storage and insurance costs. In Arizona ginning of upland cotton would usually start in October and end in late January, but the bulk of the ginning operations would be completed by the end of November. The first week of December was selected as a time when most of the cotton crop would be ready for sale in the spot market. A comparison of the gross returns from selling through forward contracting and selling through spot market was made, and the average prices at Phoenix spot market on the first week of December were taken as a reference for the comparison. An average price per bale for the first week of December at Phoenix spot market was compared to the weekly weighted average prices of each contract type in a season, and the weekly difference was multiplied by the number of bales contracted each week. Appendix C shows the value in dollars of this difference as gross gain (+) or gross loss (-) for each season and by type of contract. In 1974 and the 1977 seasons, the forward contract prices were higher than Phoenix spot market price on the first week of December. In 1975, 1976 and 1978 seasons, the forward contract prices were lower than the spot market price with the exception of late contracting in 1976 season. In the 1979 season the contract prices were higher than the spot price at the beginning and toward the end of the contracting period. Therefore, forward contracting was not constantly better or worse than selling on spot market in terms of gross returns per bale or total gross returns per week (Appendix C). Table 6 shows the total dollars gained (+) or

Table 5. Number of bales and percentage of potential contracting by type of contract 1974-1979.

Season	First		Additional		Balance		Acreage		Total		Az.[1]
	Bales	%	Bales	%	Bales	%	Bales	%	Bales	%	%
	1	2	3	4	5	6	7	8	9	10	
1974	55501	32	17760	10	3791	2	27157	16	104209	60	40
1975	44244	40	12300	11	-	-	-	-	56544	51	23
1976	66187	41	35878	22	48511	30	2573	2	153149	96	77
1977	102656	43	31459	13	-	-	15979	7	150094	63	45
1978	101633	45	58661	26	5063	2	2740	1	168097	74	35
1979	111084	43	33008	13	10096	4	468	*	154656	60	30
Mean	80218	41	31511	16	16190	9.5	9783	5	131125	67	42

Source: Compiled from the sample data

[1] U.S.D.A. estimates

*Less than .5%

Table 6. The difference in gross returns between forward contracting and spot market sales, by contract type 1974-1979.

Season	Total dollars gained (+) or Lost (-)				
	First (1)	Additional (2)	Balance (3)	Acreage (4)	Season Total (5)
1974	+5,474,918	+1,699,468	+ 441,994	+2,317,294	+9,933,674
1975	- 624,063	- 170,893	-	-	- 794,956
1976	-4,880,712	-1,842,257	+ 980,324	- 7,010	-5,749,655
1974-76 Sub-Total	- 29,857	- 313,682	+1,422,318	+2,310,284	+3,389,063
1977	+8,269,501	+2,633,652	-	+1,295,927	+12,199,080
1978	-5,737,100	-1,852,402	- 237,741	- 116,063	-8,943,306
1979	- 45,293	+ 69,534	+ 18,243	+ 5,552	+ 48,036
1977-79 Sub-Total	+2,487,108	- 149,216	+ 219,498	+1,185,416	+3,303,810
Total	+2,457,251	- 462,898	+1,202,821	+3,495,700	+6,692,874

Source: Appendix C.

lost (-) from forward contracting rather than selling on the spot market in the first week of December.

Table 7 shows the dollar gain or loss in gross revenue per bale of 480 pounds net weight. Cotton producers made an average gain of 5.11 dollars/bale on the first contracts and a loss of 2.45 dollars/bale on the Additional contracts. The dollar gain in gross revenue/bale on the Balance and the Acreage contracts averaged 17.83 and 71.46 dollars respectively. Since cotton producers spread their contracts over time the average gain in gross revenue/bale for the six cropping seasons (Column 5) can be looked at as an advantage of forward contracting over spot market sales on the first week of December. In the 1975, 1976 and 1978 seasons the loss in gross revenue per bale on the First and the Additional contracts was more than the loss on the Balance and the Acreage contracts. As a result the seasonal average losses in gross returns per bale were less than they would have been on contracting at the beginning of the contracting periods in those seasons. Therefore, by spreading their cotton contracts over time cotton producers had minimized their gross losses. In the 1974, the 1977 and the 1979 seasons when forward contracting had increased the farmer's gross revenue per bale over the gross revenue that would have resulted from selling on the spot market, the Balance and the Acreage contracts had increased the farmer's gross revenues for the entire contracting periods in those seasons (Column 5).

The first three seasons had higher average gain in gross revenue/bale than the last three seasons (10.80 and 6.99 dollars/bale respectively).

Table 7. The difference in gross returns per bale between forward contracting and spot market sales, by type of contract 1974-1979.

Season	Dollars gained (+) or Lost (-) per bale				
	First (1)	Additional (2)	Balance (3)	Acreage (4)	Season Total (5)
1974	+98.64	+95.69	+116.59	+85.33	+95.32
1975	-14.11	-13.89	-	-	-14.06
1976	-73.74	-51.35	+ 20.21	- 2.72	-37.54
1974-76 Average	- 0.18	- 4.76	+ 27.19	+77.71	+10.80
1977	+80.56	+83.72	-	+81.10	+81.28
1978	-56.45	-48.63	- 46.96	-42.36	-53.20
1979	- 0.41	+ 2.11	+ 1.81	+11.86	+ 0.31
1977-79 Average	+ 7.89	- 1.21	- 14.48	+61.78	+ 6.99
Average[1]	+ 5.11	- 2.45	+ 17.83	+71.46	+ 8.51

Source: Compiled from Tables 5 and 6

[1]Average for the six seasons.

The number of ginning firms providing data on forward contracting was less in the first three seasons than in the last three seasons. For this reason, the totals for Table 6 for the 1974-1976 seasons are not directly comparable with totals for the 1977-79 seasons. Table 7 is presented in values per bales and therefore there is no obvious problem in comparability between the two three-year periods.

CHAPTER 4

STATISTICAL ANALYSIS

Statistical Methods and Procedures Used

This study was mainly intended to find out whether or not there was a difference between the prices of the four contract types, First, Additional, Balance and Acreage throughout the six cropping seasons. Analysis of variance was used as the method of analysis. The Statistical Package for the Social Sciences (SPSS) was used as the main procedure for the analysis of variance. In addition, The Least Significant Difference Test (LSD) was used as an analytical procedure only when the analysis of variance did not show a significant difference between the prices of paired observations. A 5% level of significance was arbitrarily chosen for this test.

$$LSD_{.05} = t_{\alpha,d.f.} \; S\sqrt{(\frac{1}{n_1} + \frac{1}{n_2})}$$

where

α = Level of Significance

d.f. = Degrees of freedom

t = tabulated t value

S^2 = mean square error

n_1, n_2 = number of paired weekly observations (contracts)

A significant difference would exist when the absolute difference between the prices of the paired observations for a particular week was equal to or greater than the LSD value.

$$\left|\bar{X}_1 - \bar{X}_2\right| > LSD_{.05}$$

To carry out the analysis, the weekly grouped data of the First and the Additional contracts were arranged in paired observations according to the weeks in which the contracts were written. The paired observations were then arranged in rank order by assigning consecutive numbers to the weekly paired observations. This arrangement resulted in 154 paired observations of weekly grouped First and Additional contracts. The same procedure was followed when pairing the data of First and Balance, First and Acreage, Additional and Balance, Additional and Acreage, and Balance and Acreage contracts (Appendix D).

The Analysis of Variance Results

Pairing the weekly grouped data of the four types of contracts result in six groups of paired observations that can be analysed separately. The analysis results for each group of paired observations are shown in the ANOVA Tables (8-13). The results of the analysis refer to those paired observations only and, therefore, special attention should be paid when drawing any concluding remarks about the original sample data from these results. There are three sources of variation in the level of cotton prices during the period under study: The week to week variation, variation between the prices of the contract types and the variation due to the interaction between weeks

Table 8. First and Additional contracts. A two-way ANOVA.

Source of Variation	Sum of Square	Degrees of Freedom	Mean Square	F	Significance of F
Weeks	.67894E+09[a]	153	.443E+07	960.393	.001[b]
Contract type	1529.875	1	1529.875	.331	.565
2-way interaction	1275748.396	153	8393.080	1.816	.001
Residual	8515648.793	1847	4620.537		
Total	.71045E+09	2154			

[a] .67894E+09 = $.67894 \times 10^9$ that is to say the decimal point should be moved to nine places to the right.

[b] .01 or less indicates that the computed F level is significantly different.

Table 9. Balance and Acreage contracts. A two-way ANOVA.

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Square	F	Significance of F
Weeks	94484709.8	13	.726E+07	481.59	.001
Contract type	32795.82	1	32795.82	2.17	0.142
2-way interaction	248375.18	13	19105.78	1.27	0.239
Residual	2429787.98	161	15091.85		
Total	.12385E+09	188			

Table 10. First and Balance contracts. A two-way ANOVA.

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Squares	F	Signifi-cance of F
Weeks	.13242E+09	27	.490E+07	401.55	.001
Contract type	398632.39	1	398632.39	32.64	.001
2-way inter-action	386914.22	27	14330.16	1.17	.256
Residual	3945350.14	323	12214.71		
Total	.20518E+09	378			

Table 11. First and Acreage. A two-way ANOVA.

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Squares	F	Significance of F
Weeks	9034036.38	32	.282E+07	311.90	.001
Contract type	131277.88	1	131277.88	14.50	.001
2-way interaction	460390	32	14387.21	1.59	.028
Residual	2190431.42	242	9051.37		
Total	93184544.81	307			

Table 12. Additional and Balance contracts. A two-way ANOVA.

Source of Variation	Sum of Squares	Days of Freedom	Mean Square	F	Significance of F
Weeks	.13117E+09	25	.524E+07	401.39	.001
Contract type	443739.24	1	443739.24	33.96	.001
2-way Interaction	215036.64	25	8601.47	.60	.893
Residual	3044348.61	233	13065.87		
Total	.15116E+09	284			

Table 13. Additional and Acreage contracts.

Source of Variation	Sum of Squares	Days of Freedom	Mean Square	F	Significance of F
Weeks	69602853.13	24	.390E+07	572.74	.001
Contract type	33299.98	1	33299.98	6.58	.012
2-way interaction	179291.13	24	7470.47	1.48	.088
Residual	648010.42	126	5063.58		
Total	73905098.72	175			

and contract type. The sum of the above variations (explained variation) constitutes the contribution of these sources to the total price variation. The residual (unexplained), on the other hand, shows the contribution to the total price variation of other factors which were not accounted for in the analysis. The last column in each of the ANOVA Tables shows the probability at which the computed F ratios are significant. The level of significance in this analysis was determined by the computer and was not chosen arbitrarily as in the LSD test. The ANOVA Tables show the following results:

1. The First and the Additional Contracts included in the analysis had mean weekly prices that averaged 60.80 and 60.78 cents/lb., respectively. Mean weekly prices were computed for those weeks that had contracts of both types by first computing an average of the prices for each of those weeks and then taking a simple average of the individual week averages. Although the mean weekly prices of the First contracts had higher overall average than the mean weekly prices of the Additional contracts, there was no significant difference between the weekly average prices of the two contract types ($F = 0.331$ at 56.5% level). The main source of variation in the mean weekly prices was due to the week to week variation during the period under study. The period extended from 1973 through 1979; a period long enough to have a substantial effect on the levels of cotton prices ($F = 960.393$ at .1% level). There was a significant variation in prices due to the interaction between the number of weeks (154) and the contract type (Table 8).

2. The ANOVA results (Table 9) show that there was no significant difference between the weekly average prices of the Balance and the Acreage contracts (F = 2.17 at 14.2% level). But the overall average prices computed on the averages of the weekly prices of the Acreage contracts included in the analysis was higher than the overall average price of the Balance contracts (66.93 and 66.47 cent/lb., respectively). Again the week to week variation in prices accounted for most of the total prices variation. The interaction between weeks and contract type was not significant.

3. A significant difference existed between the prices of the First and the Balance contracts included in the analysis (F = 32.64 at .1% level). The overall average of the mean weekly prices of the First contracts was higher than the overall average price of the Balance contracts (65.05 and 64.04 cent/lb., respectively). The interaction between week and contract type was not significant (F = 1.17 at 25.6% level). Table 10 shows that the week to week variation was highly significant (F = 401.55 at .1% level).

4. There was a significant difference between the weekly average prices of the First and the Acreage contracts (Table 11). The statistical test showed a high F ratio of 14.50 at .1% level. In addition, the overall average of the mean weekly prices of the First contracts included in the analysis was higher than the overall average price of the Acreage contracts (62.64 and 61.89 cent/lb., respectively). The week to week variation in the price of the contracts included in the analysis was also significant (F = 311.90 at .1% level). There was a significant difference

due to the interaction between week and contract type (F = 1.59 at 2.8% Level).

5. The paired observations of the Additional and the Balance contracts included in the analysis had significantly different weekly average prices (F = 33.96 at .1% level). The overall average of the mean weekly prices of the Additional contracts was higher than the overall average prices of the Balance contracts (64.87 and 63.8 cent/Lb, respectively). There was a significant difference in price from week to week for the number of observations included in the analysis. Despite the highly significant variation between the prices of the two contract types and between the level of prices from week to week, the interaction between week and contract type was not significant (Table 12).

6. There was a significant difference in price from week to week (Table 13) for the Additional and the Acreage contracts included in the analysis (F = 6.58 at 1.2% level). The overall average of the mean weekly prices of the Additional contracts was higher than the overall average price of the Acreage contracts (62.57 and 62.07 cent/lb., respectively). The variation in price due to the interaction between week and contract type was significant (1.48 at 8.8% level).

The Least Significant Difference Test

Since the analysis of variance results did not show any significant difference between the prices of the First and the Additional, the Balance and the Acreage contracts, it would be convenient to apply the LSD test to the weekly average prices of the above two paired contract types to find out the particular weeks in which the prices of the two

contract types compared were significantly different. A significant difference in the price would exist when the absolute difference between the average prices of the two contract types compared for a particular week was found to be equal to or higher than the LSD value at 5% level. Table 14 shows the LSD results for the First and the Additional contracts. There were twenty weeks out of the 154 weeks that had significant differences in the weekly average prices of First and the Additional contracts. Columns 6-8 show the type of contract with the higher price and the date on which the contracts were written. In the six cropping seasons included in the study only two seasons 1975 and 1977 had no significant difference between the prices of the First and the Additional contracts. When the LSD test was applied to the Balance and the Acreage contracts, only two weeks showed significantly different prices of the two types of contracts (Table 15). Those contracts were written in July of the 1976 cropping season.

Table 14. The least significant difference between First and Additional contracts.

Week Number	# of Observations n_1	# of Observations n_2	Mean Difference $(\bar{X}_1 - \bar{X}_2)$	$LSD_{(.05)}$	Contract Type with Higher Price	Contract Date Month	Contract Date Year
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
2	5	1	171.60	145.95	First	6	73
5	5	1	215.00	145.95	Additional	7	73
17	12	1	68.18	67.62	First	12	73
22	4	3	233.38	101.76	Additional	1	74
24	2	1	250.00	163.17	First	3	74
26	1	1	250.00	188.42	Additional	3	74
46	5	3	240.00	97.30	First	2	76
49	4	7	153.57	83.50	Additional	4	76
50	17	4	97.06	74.04	Additional	4	76
51	10	5	131.50	72.97	Additional	4	76
52	18	10	125.56	52.55	Additional	4	76
55	14	24	50.00	44.80	First	6	76
57	11	5	116.36	71.86	Additional	7	76
100	18	13	52.88	48.49	Additional	2	78
110	9	13	60.04	57.77	First	5	78
116	2	8	113.75	105.33	Additional	8	78
118	5	4	108.5	89.37	First	8	78
130	4	2	431.25	115.38	Additional	1	79
140	24	14	502.90	44.80	First	4	79
145	1	1	200.00	188.42	Additional	6	79

Table 15. The least significant difference between Balance and Acreage contracts.

Week Number (1)	# of Observations n_3 (2)	# of Observations n_4 (3)	Mean Difference $(\bar{X}_3-\bar{X}_4)$ (4)	$LSD_{(.05)}$ (5)	Contract with Higher Price (6)	Contract Date Month (7)	Contract Date Year (8)
4	4	3	241.70	183.90	Balance	4	76
5	60	2	200.80	173.1	Acreage	7	76

CHAPTER 5

TESTS OF HYPOTHESES

The statistical analysis for this study is designed to determine whether the price of one type of contract was significantly higher, lower or the same as the price of another contract type.

The first hypothesis stated that the prices of the First contracts were higher than the corresponding prices of the Additional contracts. The statistical results (Table 8) did not support the hypothesis because there was not a significant difference between the weekly average prices of the two contract types for the number of weekly observations included in the analysis. When the LSD test was applied to the weekly grouped observations of First and Additional contracts, only twenty out of the 154 weeks showed a significant difference between the two prices, but neither of the two prices dominated as a significantly higher price throughout the twenty weeks (Table 15). Two possible reasons might be given to explain why the prices of the First and the Additional contracts did not differ significantly during most of the weeks included in the analysis: First, both contract types were written on a specified number of bales and therefore the unit of contracting was the same for both types of contracts. Second, when a significant difference did exist between the prices of the First and the Additional contracts, as shown in Table 15, the difference was possibly due to the fact that the two contract

types were written on different days during that week resulting in a significantly different price between the beginning and the end of the week. Therefore, a significant difference between the price of the First and the Additional contracts reflects the difference between the prices within a week and not the difference between the prices of the two contract types written on the same week.

The second hypothesis states that the price of the First contracts was higher than the price of the Balance contracts. Although the analysis results showed that a significant difference did exist between the prices of the two contract types, the price of the Balance contracts was significantly higher than the price of the First contracts (Appendix D). This is contrary to the second hypothesis. A difference between the price of the First and the Balance contracts is possibly due to a difference in prices within a week in which the two contract types were written on different days.

The third hypothesis states that the price of the First contracts was higher than the price of the Acreage contracts. It has been shown statistically that the prices of the two contract types were significantly different, and the First contracts had a significantly higher mean price than the Acreage contracts. The analysis results show that the hypothesis is supported by the data.

The fourth hypothesis states that the price of the Additional contracts was higher than the price of the Balance contracts. In spite of the significant difference between the prices of the two contract types, the mean price of the Balance contracts was higher than the mean price of the Additional contracts. The data contradict the fourth hypothesis.

The fifth hypothesis states that the price of the Additional contracts was higher than the price of the Acreage contracts. Although there was a significant difference between the prices of the two contract types, the mean price of the Acreage contracts was higher than the mean price of the Additional contracts. Therefore, the statistical results do not support the hypothesis.

The sixth hypothesis states that the price of the Balance contracts was higher than the price of the Acreage contracts. The difference between the two prices was not significant in spite of a higher mean price of the Balance contracts included in the analysis. The LSD results showed that only two weeks out of the 14 weeks included in the analysis had a significant difference between the two prices (Table 9). The use of the acre as the unit of contracting in both contract types suggests that the prices offered on both contract types written on the same day would not differ significantly. The data did not support the sixth hypothesis.

The analysis results showed a highly significant price variation among weeks within each contract type. This variation is attributed to the spread of the sample data over a time period that extended from April 1973 through November 1979. That is why the number of weeks included in the analysis accounted for most of the variation (Tables 8-13).

The seventh hypothesis states that forward contracting increased farmer's gross returns from cotton sales above the level that would have resulted if the cotton had instead been sold on the spot market during the first week of December of the year it was grown. When the gross returns from forward contracting were compared to the gross returns from

selling the same amount of cotton at the average spot market price that had prevailed on the first week of December, the gross returns from forward contracting were higher than the gross returns from selling at the spot market price throughout the contracting periods of the 1974 and 1977 seasons (Appendix C). In the 1975 and the 1978 seasons cotton producers would have made more gross returns by selling their crop on the spot market than by forward contracting. In the 1976 season the gross returns from selling on the spot market would have been higher than the gross returns from selling on forward contracting during most of the contracting season. Toward the latest weeks of the contracting period, however, the gross returns from spot market sales would have been less than the gross returns from forward contracting. Cotton producers who forward contracted at the earliest and the latest weeks of the contracting period for the 1979 crop had made the correct decision by forward contracting and had earned higher gross returns above the level that would have resulted if the cotton had instead been sold on the spot market.

Selling on forward contracting throughout the six seasons had provided cotton producers with extra gross returns that more than to offset for the losses in those seasons when the spot market would have been a better option. Except for the Additional contracts, selling on forward contracting showed a positive increase in farmer's gross returns over the six seasons indicating that the increase in gross returns from forward contract sales more than covered losses in seasons when forward contracting reduced total revenue (Tables 6 and 7). The positive net gain in farmer's gross returns over the entire six years period (Column 5) would provide a basis for accepting the hypothesis that forward

contracting raises gross receipts for cotton producers. Setting the price early in the season through forward contracting would help cotton producers reduce risk associated with determining the level of their expected gross returns.

CHAPTER 6

CONCLUSIONS

As a marketing option, cotton forward contracting accounted for a considerable portion of the total cotton production in Arizona (Table 5). The percentage of cotton bales include in the sample (Column 10) averaged 67% of the total. The U.S.D.A. estimates for forward contracting in Arizona for the same period of the study averaged 42% (Column 11). The primary difference between columns 10 and 11 is that the U.S.D.A. estimates (Column 11) include cotton marketed through cooperatives and column 10 excludes the cooperative cotton. Although the percentage of forward contracting varied from season to season in the six cropping seasons, the mean percentage for all Arizona production and the sample of this study indicate that forward contracting has become an important marketing method for cotton producers in Arizona. A breakdown of forward contracting in a season into the four contract types (Table 5) showed that the First contracts accounted for a higher percentage followed by the Additional, the Balance and the Acreage contracts. When forward contracting is looked at on the basis of units of contracting (bale and acre), contracting on bale basis (First and Additional) accounted for a higher percentage of the total production included in the sample. The percentages of total production forward contracted on bale basis (First and Additional) and acre basis (Balance and Acreage) for the six cropping seasons averaged 56% and 11% respectively. The high percentages of

forward contracting on the First and the Additional contract would reflect the preference of cotton buyers of contracts on bale basis rather than on acre basis. Two reasons might be given to explain the preference of cotton buyers: First, it is easier for the ginning firms as agents for cotton buyers to keep their purchase accounts when they contract on bale basis than on acre basis. Second, the cotton buyers would be able to hedge the exact volume of cotton when forward contracting is written on bale basis than on acre basis.

A previous study by the Texas Agricultural Market Research and Development Center in 1975 indicated that cotton producers in the Far West region (Arizona, California and New Mexico) prefered forward contracting on acre basis to forward contracting on bale basis to avoid any legal involvement with the other contracting party in case he could not meet his obligation due to a crop failure. This is less important in Arizona where cotton producers would estimate their total production more accurately due to the less variability in cotton yield than in other cotton producing regions. Despite the contrast in the contracting parties' preferences for the units of forward contracting (bale and acre), it is expected that forward contracting on bale basis will continue to account for a high percent of total cotton production in Arizona in the future.

Cotton Prices and Contract Types

Contract type did not contribute much to the total variation in cotton prices during the six cropping seasons. Although the statistical analysis showed significant differences between the First and

the Balance, the First and the Acreage, the Additional and the Balance and the Additional and the Acreage contract prices, these price differences are relatively small compared to the price differences from week to week. Therefore, it is expected that cotton producers face less risk in chosing the contract type than in deciding when to forward contract.

The farmer's decision on when to forward contract is a very important decision that would determine the level of gross returns he receives from his expected cotton production. Because the level of gross returns depends on the level of forward contract prices which are closely related to the level of cotton prices on futures contracts, cotton producers have to take into account the effects of the two prices on the level of their gross returns when they decide to forward contract.

Why forward contracting? Perhaps, the most important benefit to cotton producers in Arizona from forward contracting during the six cropping seasons would be the positive increase in gross returns as compared to gross returns from selling on the spot market on the first week of December of the year in which the crop was grown. A farmer would know before hand the level of gross returns he will receive at the time the cotton is delivered on the contracts. The level of gross returns from selling on the spot market on the first week of December can not be known until the cotton is sold on the spot market. Forward contracting, therefore, reduced the level of uncertainty and risk associated with cotton prices on the spot market. Cotton producers would be more certain about their gross returns from forward contracting than from spot market sales after harvest. In addition, forward contracting provides the farmer

with the basis for making a decision on how much cotton acreage to grow and what alternative crop to produce when the cotton contract prices seem to not cover the cost of production.

Making the right decision on when to forward contract remains a very important decision on which a farmer's level of gross returns depends. Spreading contracts over time helps a farmer to fix an average gross return from forward contracted cotton. While in some years forward contracting reduced gross returns -- over several years it raised gross returns, and that shows farmers had made rather good decisions on when to contract.

Throughout the six seasons covered by this study, the prices of cotton on forward contracting did not seem to vary with the type of contract in a way that would involve greater risk for cotton producers in Arizona. The use of forward contracting has reduced the level of uncertainty associated with cotton prices by allowing the farmer to establish the level of gross returns he can expect at the time of delivery.

APPENDIX A

BALES CONTRACTED AND WEEKLY WEIGHTED AVERAGE PRICES

Table 1-A. Bales contracted and weekly weighted average prices by type of contract 1974.

Week #	First		Additional		Balance		Acreage	
	Quantity Bales	Price/ Bale ¢	Quantity Bales	Price/ Bale ¢	Quantity Bales	Price/ Bale ¢	Quantity Bales	Price/ Bale ¢
85	2500	38.50						
84	5000	39.00	2000	38.00				
82							2124	39.00
77	312	44.00						
76	1585	44.98	250	47.53				
75	1425	49.85	250	50.00			7906	50.00
74	2310	50.00	1200	50.00			1888	50.00
73	650	50.17					1652	50.00
72	2900	53.38	750	52.30				
71	1200	52.38	300	52.75	476	51.00	472	52.65
70	1365	55.33	250	56.00			708	55.00
69	250	56.00	50	56.00			354	56.00
68	1767	61.47	150	61.00			708	60.00
67	980	60.67	50	62.00	204	60.00	1058	60.00
65	1580	52.72	250	54.00				
64	300	60.50	250	61.00			5782	60.46
61	2871	59.85			306	57.00		
60	2430	60.00	120	60.00	272	58.00	1079	60.00
58	200	55.00						
56	250	55.00						
55	500	54.75						
54	5975	59.98	1400	59.18	1866	60.50		
53	7200	64.12	1350	63.63	667	63.27	1208	60.84
52	1395	66.89	125	67.00				
51	2155	65.10	1230	65.27				
50	1950	67.15	275	67.45			177	66.00
48	350	69.00	310	68.35			1758	67.00

Table 1-A, Continued.

Week #	First		Additional		Balance		Acreage	
	Quantity Bales	Price/ Bale ¢	Quantity Bales	Price/ Bale ¢	Quantity Bales	Price/ Bale ¢	Quantity Bales	Price/ Bale ¢
47	1735	70.14	2600	70.12			165	68.50
46	1140	66.00	200	66.00				
45	525	62.71	700	65.86				
44	215	66.00	300	67.00				
43	70	65.50						
42							118	60.00
41	430	60.20						
40	280	61.00	1000	58.50				
38	550	56.00						
37	550	56.00						
36	55	56.00	400	55.00				
35	115	56.00						
32	136	49.00	500	49.25				
22	300	50.00						
21			500	55.00				
4			1000	42.00				

Table 2-A. Bales contracted and the weekly weighted average prices by type of contract 1975.

Week Number	First		Additional	
	Quantity	Price/Bale	Quantity	Price/Bale
	bales	cents	bales	cents
66	1000	54.00		
64	500	52.00		
33	2200	47.50	500	47.50
32	2080	47.73	1500	47.83
31	5740	47.98		
30	250	48.00		
29	2721	48.00		
25	3660	47.99	230	47.50
24	1548	48.44	300	48.50
22	717	48.50	1000	48.50
21			1000	48.50
20	575	48.65	850	48.65
19	2000	49.50	2700	49.50
18	7045	49.83	50	49.50
17	6659	49.97	550	50.00
16	525	50.00	400	50.00
15	2165	51.00		
13	300	50.00		
12	2420	51.48	400	51.00
11	1854	53.64	2070	53.19
10	285	54.00	750	54.00

Table 3-A. Bales contracted and the weekly weighted average price by contract type 1976.

Week Number	First		Additional		Balance		Acreage	
	Quantity	Price/Lb.	Quantity	Price/Lb.	Quantity	Price/Lb.	Quantity	Price/Lb.
	bales	cents	bales	cents	bales	cents	bales	cents
63	1500	56.00						
56	1220	51.25						
55	2540	53.12	500	53.50				
54	150	53.20						
52	1375	53.80	1000	54.05				
50	2145	53.55						
49	500	53.50						
48	7085	54.79	2140	54.77				
47	1800	56.00	1100	55.68				
46	4595	55.55						
45	9096	56.17	1750	56.07				
44	2036	56.23	150	56.00				
43	472	56.14						
42	2100	56.98	2160	54.71				
41	5430	57.07	550	57.00				
39	5000	57.00						
36	725	56.00	900	55.50				
35	565	56.00	200	56.00				
34	3050	57.32	3100	57.55				
33	3012	58.42	570	58.50	412	57.00		
32	3375	59.82	3900	59.80				
31	1700	61.21	1517	61.20			672	60.25
29			200	62.00				
28	250	63.00	2730	63.40			134	62.50
27	2043	65.53	3840	64.85				
26	2588	71.31	3795	71.84				
25	345	71.09	865	72.12	169	69.50		

Table 3-A, Continued.

Week Number	First		Additional		Balance		Acreage	
	Quantity	Price/Lb.	Quantity	Price/Lb.	Quantity	Price/Lb.	Quantity	Price/Lb.
	bales	cents	bales	cents	bales	cents	bales	cents
24	110	74.00	2676	72.98	2852	74.49		
23	215	78.00	2135	78.26	18466	77.26	392	78.17
22			100	80.00	6241	80.14	38	80.00
21					2869	80.00		
19	1000	73.00						
15					46	73.00		
14					198	71.25		
13					83	75.00	336	74.00
12					918	75.82		
10	140	75.00			1751	77.12		
9	25	79.00			10716	79.48	732	80.00
7					1818	80.00		
6					1972	80.06	269	80.71

Table 4-A. Bales contracted and the weekly weighted average price by contract type 1977.

Week Number	First		Additional		Balance		Acreage	
	Quantity	Price/Lb.	Quantity	Price/Lb.	Quantity	Price/Lb.	Quantity	Price/Lb.
	bales	cents	bales	cents	bales	cents	bales	cents
80	2050	59.99						
79	1800	61.74						
78	6550	62.63					965	63.00
76	6695	64.86					965	64.00
75	2150	65.00	300	65.00				
74	700	65.00						
73	5775	64.00						
72	7950	64.43					2895	65.00
69	2630	64.42	600	65.00				
68	7087	65.24	250	65.00				
67	1960	65.97					521	65.00
66	260	65.00	675	65.00				
65	450	65.00					1862	65.00
64	2125	65.22	400	65.50				
63	1265	65.00	1850	64.97			154	64.00
62	4172	65.00	250	65.00				
61	3610	65.89	4050	65.99			5143	66.00
60	900	65.28	550	65.00				
59	585	65.00	2550	65.00				
58	1890	65.42	825	65.36				
57	1158	65.00						
56	1500	65.00						
55	800	62.69	750	62.50				
54	70	62.50					1544	63.00
53	4495	63.27	450	63.33			1930	63.00
52	2812	63.95	685	64.00				
51	3835	63.96	865	64.00				
50	150	63.50	275	63.50				

Table 4-A, Continued.

Week Number	First		Additional		Balance		Acreage	
	Quantity	Price/Lb.	Quantity	Price/Lb.	Quantity	Price/Lb.	Quantity	Price/Lb.
	bales	cents	bales	cents	bales	cents	bales	cents
49	1500	63.50	100	63.50				
48	500	61.50						
47			2000	61.00				
46	775	61.83						
45	1902	63.60	930	63.50				
44	872	63.29	200	63.00				
43	7766	64.47	2730	64.48				
42	3095	66.41	3449	66.28				
41	1645	66.83	200	66.00				
40	1880	66.93	2920	66.73				
39	550	68.17	450	67.75				
38	2182	68.39	1480	68.03				
37	1252	69.44	775	69.19				
36	200	67.50	100	69.00				
35	40	68.00	500	68.00				
34	130	67.00						
32	525	65.00						
31	1055	66.50	150	65.00				
30	400	65.00						
28			150	65.00				
16	500	65.00						
9	500	65.00						

Table 5-A. Bales contracted and the weekly weighted average prices by contract type 1978.

Week Number	First		Additional		Balance		Acreage	
	Quantity	Price/Lb.	Quantity	Price/Lb.	Quantity	Price/Lb.	Quantity	Price/Lb.
	bales	cents	bales	cents	bales	cents	bales	cents
81	500	63.00						
78	500	62.00						
77	1350	62.00	150	62.00				
59	1000	53.00						
51	3248	53.00	600	53.00				
50	1150	54.00	550	54.00				
49	10410	54.93	1350	55.00				
48	1570	55.04	300	55.00				
47	14145	56.68	8025	56.82				
46	2080	57.06	900	57.00				
45	3635	57.44	1225	57.46				
44	9418	57.77	2525	57.74				
43	1615	57.96	1500	58.06				
42	725	57.00	1500	57.00				
41	3671	58.07	3260	58.30				
40	3070	58.24	550	58.00				
39	5525	58.78	6455	58.83				
38	20267	59.83	7065	59.74				
37	1825	60.88	3075	60.70				
36	1540	60.65						
35	515	59.00						
34	990	59.83	2995	59.70				
33	1729	60.66	965	60.00				
32	1825	60.46	670	60.40	913	60.00	1386	60.00
31	720	60.46	175	60.50				
30	1606	61.88	4650	61.63	2266	60.29	494	61.07
29	1430	63.78	1640	63.45	126	62.25		
28			550	63.50				

Table 5-A, Continued.

Week Number	First		Additional		Balance		Acreage	
	Quantity	Price/Lb.	Quantity	Price/Lb.	Quantity	Price/Lb.	Quantity	Price/Lb.
	bales	cents	bales	cents	bales	cents	bales	cents
27					188	61.32		
26	150	62.00						
25	352	63.00	1215	63.00	318	61.00	296	61.25
24	50	62.00	150	62.00				
23	300	59.90	156	60.25				
20	900	61.50	500	61.25				
19	110	60.00	1000	60.00				
18			600	61.00				
17	213	62.06	1120	62.03				
16	1405	63.82	1035	63.64	894	62.00	85	63.00
15	1608	64.87	795	63.87	215	62.62		
14	130	64.81	250	64.90	297	63.20	477	64.50
10	10	65.00	230	63.75				
9	300	65.00	625	64.88	358	62.75		
8					235	63.50		
7			53	65.00	110	63.50		
6	40	67.00	157	65.25				
5			100	67.00	595	69.00		

Table 6-A. Bales contracted and weekly weighted average prices by type of contract 1979.

Week Number	First		Additional		Balance		Acreage	
	Quantity	Price/Lb.	Quantity	Price/Lb.	Quantity	Price/Lb.	Quantity	Price/Lb.
	bales	cents	bales	cents	bales	cents	bales	cents
68	6250	64.18						
67	1465	64.00						
66	3400	64.75						
65	1950	64.55						
64	1000	63.50	1000	63.50				
63	600	63.88	500	63.00				
62	1700	63.38	500	63.00				
61	450	64.00						
60	250	64.40	600	64.41				
59	300	65.00					468	64.00
58	9625	64.92	250	65.25				
57	3971	64.96						
56	1525	65.00	250	65.00				
54			3600	64.92				
52	90	63.50						
51	1200	63.00						
50	3300	62.93	600	62.62				
49	500	62.50						
48	200	63.00						
47	1310	62.26	1077	61.86				
46	400	60.50						
45	4235	61.07	100	61.00				
44	1455	61.06						
43	2461	61.80	550	61.86				
42	5990	62.92	215	63.08				
41	7547	63.79	1119	63.96				
40	2850	63.57						
39	1461	63.19	975	63.14				

Table 6-A, Continued.

Week Number	First		Additional		Balance		Acreage	
	Quantity	Price/Lb.	Quantity	Price/Lb.	Quantity	Price/Lb.	Quantity	Price/Lb.
	bales	cents	bales	cents	bales	cents	bales	cents
38	3385	62.92	680	63.50				
37	825	63.14	60	63.00				
36	500	62.50						
34	535	62.11	850	62.29				
33	100	60.25						
32	2700	62.00	130	62.00				
31	5090	63.89	2422	63.33				
30	150	63.00						
29	200	62.50	30	62.50				
26	3440	64.00	1040	64.00				
25	13371	64.92	3495	64.64	1687	64.60		
24	3608	65.22	2870	65.22				
23	300	63.00	200	65.00				
21	500	65.00						
19	1420	64.96	515	64.90				
17	30	64.00	370	64.00				
16	3750	65.13	3500	65.01	454	64.50		
15	100	65.00						
14	3400	66.18	3520	66.01	1292	64.50		
12	800	66.00	100	65.00	336	64.25		
11	635	65.03	400	65.50	3770	64.25		
10	100	64.50	190	64.63	269	64.00		
9	150	65.00	300	65.00	71	65.00		
8	290	65.50						
7	80	64.50	1000	64.30	1802	65.00		
6					415	64.00		
5	230	65.00						

Table 7-A. Weekly average prices of cotton for December futures 1974-1979.

Week Number	1974	1975	1976	1977	1978	1979
	cents					
77	44.00					
76	47.30			64.58		
75	48.51			65.80		
74	47.70			65.42		
73	49.20			65.03		
72	50.95			66.95		
71	51.65					
70	54.83					
69	56.00			66.27		
68	60.34			67.75		65.78
67	60.09			67.49		65.60
66		56.20		66.63		65.87
65	54.74			67.33		65.61
64	60.74	54.07		68.25		65.62
63			59.20	68.00		65.47
62				67.85		65.66
61	59.39			68.12		66.25
60	58.75			67.63		66.38
59				67.81	55.40	66.35
58	54.90			68.13		67.24
57				67.80		67.40
56	54.80		55.63	67.30		66.80
55	54.80		57.01	66.90		
54	58.61		57.70	66.70		66.42
53	61.16			67.20		
52	62.87		56.93	67.55		65.60
51	63.10			67.26	55.29	65.27
50	65.78		57.00	67.07	56.48	64.35
49			57.05	67.07	57.22	64.77
48	67.40		57.55	65.35	57.63	64.35
47	69.73		58.48	64.07	58.51	64.27
46	65.90		57.73	64.74	58.80	63.56
45	64.90		58.35	65.61	59.19	63.61
44	66.44		58.43	64.47	59.29	63.47
43	65.75		58.40	67.67	59.88	64.35
42	62.20		59.30	69.69	59.68	65.36
41	60.45		59.03	69.25	59.35	65.63
40	62.10			69.90	59.56	65.58
39			58.87	70.90	60.19	64.90
38	56.75			71.42	61.28	64.75
37	56.90			71.54	61.66	65.19

Table 7-A, Continued.

Week Number	1974	1975	1976	1977	1978	1979
	cents					
36	56.36		58.60	70.37	61.31	64.12
35	55.93		58.72	69.45	60.52	
34			58.71	69.30	60.42	62.88
33		48.14	60.45		61.30	61.32
32	57.85	48.31	62.25	67.97	61.54	62.62
31		48.34	64.14	68.70	61.63	64.13
30		48.25		67.85	63.07	63.40
29		47.68	64.35		64.61	63.37
28			66.15	66.10	64.72	61.18
27			69.15		63.30	
26			74.23		63.61	63.81
25		47.74	74.30		64.27	64.89
24		48.93	77.64		63.75	65.78
23			82.92		61.85	64.79
22	52.00	49.29	87.36			
21		48.50	85.65			64.71
20	56.72	49.45			62.24	
19		50.84	76.47		61.41	65.40
18		50.65			63.09	
17		51.09			63.86	64.17
16		51.42	77.82		64.75	65.40
15		53.18	77.22		65.00	65.14
14			74.50		65.88	66.59
13		53.45	76.27			
12		54.36	76.70			64.98
11		56.53	73.95			64.74
10		57.39	79.27		65.50	65.70
9			82.75	53.00	66.72	65.50
8					67.00	65.40
7			81.04		68.04	66.07
6			82.59	51.65	68.35	65.33
5				50.68	69.65	67.12
4	41.40		82.55	50.51		
3			79.10	51.57		
2					68.10	
1				51.51		

APPENDIX B

FORWARD CONTRACTING OF UPLAND COTTON BY REGIONS

Table 1-B. Forward contracting of Upland cotton by regions and the United States 1974-1979.

Season	Cotton Regions				United States
	Far West	Southwestern	South Central	Southeastern	
	%				
1974	48	6	30	10	21
1975	30	1	15	5	10
1976	68	26	75	53	50
1977	32	18	20	12	20
1978	52	11	39	16	25
1979	29	16	35	23	22
Region Average	43.16	13.00	35.66	19.83	24.66

Source: Compiled from reports by the Crop Reporting Board, Economics and Statistics Service, U.S.D.A.

APPENDIX C

FORWARD CONTRACTING VERSUS SPOT MARKET

Table 1-C. Differences between forward contracts and spot market sales, by week and by type of contract 1974.

Week Number	Gross Gains (+) or Losses (-)			
	First	Additional	Balance	Acreage
	dollars			
85	+ 25320			
84	+ 62640	+ 15600		
82				+ 26763
77	+ 11396			
76	+ 95803	+ 13350		
75	+ 92082	+ 16350		+517052
74	+150907	+ 78480	+ 33414	+123475
73	+ 43015			+108041
72	+233551	+ 57330		
71	+ 91990	+ 23580		+ 36873
70	+124081	+ 23532		+ 63295
69	+ 23532	+ 4706		+ 33347
68	+212141	+ 17730		+ 80287
67	+114230	+ 6150	+ 23134	+119901
65	+123858	+ 21150		
64	+ 34718	+ 29550		+668565
61	+323242		+ 30294	
60	+275387	+ 13608	+ 28234	+122359
58	+ 17866			
56	+ 22332			
55	+ 44064			
54	+866727	+153480	+238474	
53	+922943	+176610	+ 88444	+106959
52	+239777	+ 18375		
51	+297002	+170497		
50	+287950	+ 41006		+ 25170
48	+ 54785	+ 47564		+258426
47	+281085	+399360		+ 25443
46	+162026	+ 28440		
45	+ 66338	+ 99060		
44	+ 30558	+ 44100		
43	+ 9781			
42				+ 1338
41	+ 49144			
40	+ 33076	+106200		
38	+ 51771			
37	+ 51771			
36	+ 5177	+ 35760		
35	+ 10825			
32	+ 8232	+ 30900		
22	+ 19598			
4		+ 27000		

Table 2-C. Differences between forward contracts and spot market sales by week and by type of contract 1975.

Week Number	Gross Gains (+) or Losses (-)			
	First	Additional	Balance	Acreage
	dollars			
66	+ 8256			
64	- 672			
33	- 50477	- 11472		
32	- 45386	- 32016		
31	-118402			
30	- 5136			
29	- 55901			
25	- 75371	- 5205		
24	- 28556	- 5443		
22	- 13009	- 18144		
21		- 18144		
20	- 10013	- 14822		
19	- 26688	- 36029		
18	- 82957	- 667		
17	- 73624	- 6019		
16	- 5746	- 4378		
15	- 13302			
13	- 3283			
12	- 9300	- 2458		
11	- 12143	- 9904		
10	- 2353	- 6192		

Table 3-C. Differences between forward contracts and spot market sales by week and by type of contract 1976.

Week Number	Gross Gains (+) or Loss (-)			
	First	Additional	Balance	Acreage
	dollars			
62	-126072			
56	-130379	- 48024		
55	-245498			
54	- 14623			
52	-130086	- 93408		
50	-129595			
49	- 48024			
48	-636641	-192535		
47	-151286	- 94133		
46	-314406			
45	-756874	-146484		
44	-168871	- 12607		
43	- 39345			
42	-166661	-194936		
41	-420604	- 43586		
39	-396240			
36	- 60935	- 77803		
35	- 47487	- 16810		
34	-237002	-237509		
33	-218209	- 41067	- 32650	
32	-221850	-256650		
31	-100402	- 89652		- 42772
29		- 11050		
28	- 12612	-132466		- 7082
27	- 78258	-159929		
26	- 28844	- 30977		
25	- 4013	- 5790	- 3253	
24	+ 259	- 6809	+ 13437	
23	+ 4634	+ 48653	+332105	+ 8774
22		+ 3115	+198279	+ 1184
21			+ 8937	
19	- 2448			
16				
15			- 113	
14			- 2148	
13			+ 594	+ 790
12			+ 10170	
10	+ 1001		+ 29227	
9	+ 659		+306854	+ 22803
7			+ 56634	
6			+ 62025	+ 9293

Table 4-C. Differences between forward contracts and spot market sales, by week and by type of contract 1977.

Week Number	Gross Gains (+) or Losses (-)			
	First	Additional	Balance	Acreage
	dollars			
80	+119928			
79	+121848			
78	+467568			+ 70406
76	+548419			+ 75038
75	+177504	+ 24768		
74	+ 57792			
73	+449064			
72	+634512			+239011
69	+209789	+ 49536		
68	+593143	+ 20640		
67	+170938			+ 43014
66	+ 21466	+ 55728		
65	+ 37152			+153727
64	+177720	+ 33984		
63	+104438	+152256		+ 11975
62	+316610	+ 20640		
61	+341320	+353568		+449292
60	+ 74544	+ 45408		
59	+ 48298	+210528		
58	+159830	+ 68112		
57	+ 95603			
56	+123840			
55	+ 57408	+ 52920		
54	+ 4939			+112651
53	+333032	+ 33552		+140813
52	+218002	+ 14386		
51	+315286	+106142		
50	+ 11304	+ 20724		
49	+113040	+ 7536		
48	+ 32880			
47		+126720		
46	+ 52176			
45	+144775	+ 70085		
44	+ 64851	+ 14592		
43	+621460	+214402		
42	+276403	+305865		
41	+150254	+ 17472		
40	+172613	+265267		
39	+ 53784	+ 43032		
38	+215903	+143861		
37	+126230	+ 79584		
36	+ 18912	+ 10176		

Table 4-C, Continued.

Week Number	Gross Gains (+) or Losses (-)			
	First	Additional	Balance	Acreage
	dollars			
35	+ 3878	+ 48480		
34	+ 11981			
32	+ 43344			
31	+ 94696	+ 12384		
30	+ 33024			
28		+ 11304		
16	+ 41280			
10	+ 6720			

Table 5-C. Differences between forward contracts and spot market sales by week and by type of contract 1978.

Week Number	Gross Gains (+) or Losses (-)			
	First	Additional	Balance	Acreage
	dollars			
81	- 16872			
78	- 19272			
77	- 52034	- 5782		
59	- 81744			
51	-265505	- 49046		
50	- 88486	- 42319		
49	-754739	- 97394		
48	-112978	- 21643		
47	-919011	-508936		
46	-129492	- 55929		
45	-223123	- 73916		
44	-554604	-148984		
43	- 91591	- 86196		
42	- 45344	- 93816		
41	-210715	-183530		
40	-173734	- 31759		
39	-298275	-346938		
38	-990301	-348802		
37	- 80116	-137629		
36	- 69606			
35	- 27266			
34	- 48479			
33	- 77721	- 46459		
32	- 83807	- 30960	- 43955	- 66824
31	- 33055	- 8005		
30	- 64301	-187456	- 89322	- 21234
29	- 41341	- 52759	- 4705	
28		- 17239		
27	- 11878		- 7861	
25	- 11878	- 40999	- 13784	- 12475
24	- 1927	- 5782		
23	- 14587	- 7398		
20	- 36850	- 21072		
19	- 5296	- 21072		
18		- 48144		
17	- 8147	- 24278		
16	- 41896	- 41561	- 34459	- 2868
15	- 39831	- 6156	- 7652	
14	- 3259	- 6156	- 9737	- 12662
10	- 214	- 6897		

Table 5-C, Continued.

Week Number	Gross Gains (+) or Losses (-)			
	First	Additional	Balance	Acreage
	dollars			
9	- 1243	- 15451	- 12510	
8			- 7366	
7		- 1280	- 3448	
6	- 582	- 3603		
5		- 1454		
2			- 2942	

Table 6-C. Difference between forward contracts and spot market sales, by week and by type of contract 1979.

Week Number	Gross Gains (+) or Losses (-)			
	First	Additional	Balance	Acreage
	dollars			
68	+ 5700			
67	+ 70			
66	+ 12403			
65	+ 2352			
64	+ 2352	+ 2352		
63	+ 821	+ 2376		
62	+ 4959	+ 2376		
61	+ 22	+ 1229		
60	+ 492			
59	+ 1454			+ 5552
58	+ 43062	+ 1512		
57	+ 18579			
56	+ 7393	+ 1212		
54		+ 16013		
52	- 212			
51	- 5702			
50	- 16762	+ 3932		
49	- 3576			
48	- 950			
47	- 10869	+ 11029		
46	- 6701			
45	- 59305	- 1435		
44	- 20455			
43	- 25891	- 5614		
42	- 30672	- 939		
41	- 16959	- 150		
40	- 5695			
39	- 6589	- 2020		
38	- 17427	- 3553		
37	- 3344	- 285		
36	- 3576			
34	- 4822	- 6919		
33	- 1795			
32	- 28210	- 1250		
31	- 713	- 7755		
30	- 1430			
29		- 215		
26	+ 165	+ 50		
25	+ 59510	+ 10943		
24	+ 21427	+ 18630		

Table 6-C, Continued.

Week Number	Gross Gains (+) or Losses (-)			
	First	Additional	Balance	Acreage
	dollars			
23	- 1426	+ 970		
21	+ 2424			
19	+ 6644	+ 2257		
17	+ 1	+ 18		
16	+ 20965	+ 17088	+ 1111	
15	+ 485			
14	+ 3583	+ 34177	+ 7419	
12	+ 7718		+ 419	
11	+ 3175		+ 181	
10	+ 245	+ 585	+ 13	
9	+ 727	+ 1454	+ 344	
8	+ 2101			
7	+ 196	+ 1388	+ 8736	
6			+ 20	
5	+ 1115			

APPENDIX D

ANALYSIS OF VARIANCE DATA

Table 1-D. Number of contracts ( ) and average prices by weeks and by type of paired contracts.[1]

Week Number	First	Addi-tional	Week Number	First	Addi-tional	Week Number	First	Addi-tional	Week Number	First	Addi-tional
	3900	3800		6400	6366		4798	4750		5600	5550
1	(1)	(1)	15	(25)	(6)	29	(16)	(2)	43	(5)	(3)
	4925	4753		6688	6700		4842	4850		5608	5608
2	(5)	(1)	16	(12)	(1)	30	(12)	(2)	44	(35)	(3)
	4902	5000		6518	6450		4850	4850		5619	5600
3	(5)	(1)	17	(11)	(6)	31	(4)	(1)	45	(13)	(2)
	5000	5000		6770	6700		4875	4867		5690	5450
4	(7)	(3)	18	(5)	(2)	32	(4)	(3)	46	(5)	(3)
	5015	5230		6900	6833		4950	4950		5704	5700
5	(5)	(1)	19	(2)	(3)	33	(4)	(1)	47	(29)	(6)
	5230	5275		7021	7017		4979	4950		5600	5575
6	(4)	(1)	20	(13)	(12)	34	(32)	(1)	48	(2)	(2)
	5538	5600		6600	6600		4996	5000		5600	5754
7	(10)	(1)	21	(7)	(2)	35	(28)	(3)	49	(4)	(7)
	5600	5600		6350	6583		5000	5000		5753	5850
8	(1)	(1)	22	(4)	(3)	36	(3)	(3)	50	(17)	(4)
	6225	6100		6600	6700		5136	5100		5840	5972
9	(10)	(1)	23	(2)	(3)	37	(11)	(3)	51	(5)	(10)
	6117	6200		6100	5850		5350	5305		5984	6110
10	(3)	(1)	24	(1)	(2)	38	(13)	(9)	52	(18)	(10)
	5375	5400		5600	5500		5400	5400		6123	6200
11	(4)	(1)	25	(1)	(2)	39	(4)	(2)	53	(13)	(1)
	6050	6100		4900	4925		5317	5350		6283	6331
12	(1)	(1)	26	(1)	(1)	40	(8)	(1)	54	(3)	(13)
	6000	6000		4750	4750		5373	5405		6550	6500
13	(11)	(2)	27	(6)	(1)	41	(7)	(2)	55	(14)	(24)
	5994	6025		4764	4775		5477	5480		7192	7200
14	(18)	(6)	28	(7)	(2)	42	(26)	(5)	56	(24)	(13)

Table 1-D, Continued.

Week Number	First	Addi-tional	Week Number	First	Addi-tional	Week Number	First	Addi-tional	Week Number	First	Addi-tional
	7120	7236		6322	6317		6800	6800		5875	5881
57	(5)	(11)	72	(15)	(3)	87	(1)	(2)	102	(28)	(16)
	7400	7336		6378	6400		6650	6500		5975	5977
58	(2)	(18)	73	(9)	(2)	88	(2)	(1)	103	(68)	(32)
	7800	7796		6392	6400		6200	6200		6073	6076
59	(3)	(13)	74	(12)	(4)	89	(6)	(1)	104	(11)	(17)
	6500	6500		6350	6350		5300	5300		5967	5972
60	(7)	(1)	75	(1)	(2)	90	(11)	(1)	105	(6)	(9)
	6450	6500		6350	6350		5400	5400		6030	6000
61	(10)	(2)	76	(9)	(1)	91	(3)	(2)	106	(5)	(5)
	6514	6500		6336	6350		5490	5500		6057	6050
62	(16)	(1)	77	(7)	(3)	92	(22)	(3)	107	(9)	(3)
	6500	6500		6340	6300		5508	5500		6044	6050
63	(2)	(4)	78	(5)	(1)	93	(6)	(1)	108	(4)	(2)
	6567	6550		6447	6455		5654	5655		6183	6161
64	(6)	(1)	79	(57)	(11)	94	(56)	(15)	109	(6)	(20)
	6500	6475		6650	6612		5703	5708		6389	6329
65	(4)	(4)	80	(12)	(21)	95	(10)	(3)	110	(9)	(13)
	6500	6500		6646	6600		5742	5736		6300	6300
66	(10)	(1)	81	(8)	(2)	96	(15)	(7)	111	(1)	(6)
	6581	6580		6675	6686		5776	5780		6200	6200
67	(16)	(5)	82	(10)	(7)	97	(31)	(10)	112	(1)	(1)
	6520	6500		6810	6775		5822	5808		5990	6015
68	(5)	(2)	83	(2)	(2)	98	(8)	(6)	113	(1)	(1)
	6500	6500		6830	6814		5700	5700		6150	6125
69	(3)	(4)	84	(11)	(7)	99	(5)	(2)	114	(1)	(1)
	6550	6517		6920	6913		5813	5865		6000	6000
70	(7)	(6)	85	(10)	(4)	100	(18)	(13)	115	(1)	(1)
	6263	6250		6750	6900		5815	5792		6213	6326
71	(2)	(1)	86	(1)	(1)	101	(5)	(3)	116	(2)	(8)

Table 1-D, Continued.

Week Number	First	Addi-tional	Week Number	First	Addi-tional	Week Number	First	Addi-tional	Week Number	First	Addi-tional
117	6389	6375	127	6500	6525	137	6319	6300	147	6400	6400
	(11)	(5)		(14)	(1)		(4)	(1)		(1)	(2)
118	6486	6378	128	6500	6500	138	6210	6217	148	6511	6504
	(5)	(4)		(5)	(1)		(5)	(3)		(13)	(6)
119	6475	6475	129	6275	6263	139	6200	6200	149	6588	6593
	(2)	(2)		(3)	(2)		(13)	(1)		(7)	(12)
120	6500	6375	130	6231	5800	140	6380	6329	150	6600	6500
	(1)	(2)		(4)	(2)		(24)	(14)		(2)	(1)
121	6500	6475	131	6116	6100	141	6250	6250	151	6506	6550
	(1)	(6)		(8)	(1)		(1)	(1)		(4)	(1)
122	6700	6525	132	6171	6167	142	6400	6400	152	6450	6475
	(1)	(2)		(6)	(3)		(16)	(5)		(1)	(2)
123	6350	6350	133	6292	6000	143	6492	6473	153	6500	6500
	(1)	(1)		(24)	(3)		(41)	(13)		(1)	(1)
124	6413	6300	134	6385	6376	144	6527	6535	154	6450	6466
	(2)	(1)		(29)	(5)		(15)	(17)		(1)	(3)
125	6344	6300	135	6310	6313	145	6300	6500	Mean	6035	6250
	(4)	(1)		(5)	(4)		(1)	(1)		(1457)	(689)
126	6425	6438	136	6292	6350	146	6493	6488			
	(2)	(4)		(12)	(3)		(7)	(4)			

Table 1-D, Continued.

Week Number	First	Balance	Week Number	First	Balance	Week Number	First	Acreage	Week Number	First	Acreage
	5230	5100		6300	6100		4875	5000		6283	6250
1	(4)	(1)	16	(2)	(1)	1	(4)	(5)	16	(3)	(1)
	6117	6000		6389	6200		5000	5000		7800	7900
2	(3)	(1)	17	(11)	(4)	2	(7)	(5)	17	(3)	(2)
	5964	5700		6486	6250		5015	5000		7900	8000
3	(11)	(2)	18	(5)	(5)	3	(5)	(1)	18	(1)	(2)
	6000	5800		6475	6320		5230	5265		6294	6300
4	(11)	(1)	19	(2)	(4)	4	(4)	(1)	19	(9)	(2)
	5994	6050		6500	6275		5538	5500		6480	6400
5	(18)	(5)	20	(1)	(2)	5	(10)	(1)	20	(15)	(1)
	6400	6367		6492	6460		5600	5600		6458	6500
6	(25)	(3)	21	(41)	(1)	6	(1)	(1)	21	(12)	(1)
	5840	5700		6511	6450		6225	6000		6585	6500
7	(5)	(1)	22	(13)	(1)	7	(10)	(1)	22	(7)	(2)
	7120	6950		6588	6516		6117	6000		6544	6500
8	(5)	(1)	23	(7)	(9)	8	(3)	(4)	23	(9)	(3)
	7400	7333		6600	6425		6050	6058		6500	6400
9	(2)	(6)	24	(2)	(1)	9	(1)	(3)	24	(4)	(1)
	7800	7699		6506	6425		6000	6000		6581	6600
10	(3)	(60)	25	(4)	(1)	10	(11)	(7)	25	(16)	(7)
	7500	7589		6450	6400		6400	6125		6250	6300
11	(2)	(9)	26	(1)	(1)	11	(25)	(4)	26	(1)	(1)
	7900	7945		6500	6500		6770	6600		6322	6300
12	(1)	(38)	27	(1)	(1)	12	(5)	(1)	27	(15)	(1)
	6057	6000		6450	6500		6900	6700		6057	6000
13	(9)	(3)	28	(1)	(2)	13	(2)	(3)	28	(9)	(1)
	6183	6028		6361	7214		7021	6025		6183	6125
14	(6)	(9)	Mean	(205)	(174)	14	(13)	(3)	29	(6)	(2)
	6389	6225					6123	6025		6300	6125
15	(9)	(1)				15	(13)	(3)	30	(2)	(1)

Table 1-D, Continued.

Week Number	First	Acreage	Week Number	Addi-tional	Balance	Week Number	Addi-tional	Balance	Week Number	Addi-tional	Acreage
	6388	6300		5275	5100		6375	6200		5000	5000
31	(11)	(2)	1	(1)	(1)	15	(5)	(4)	1	(1)	(5)
	6475	6450		6200	6000		6378	6256		5000	5000
32	(2)	(1)	2	(1)	(1)	16	(4)	(5)	2	(3)	(1)
	6450	6400		6000	5800		6475	6320		5275	5265
33		(1)	3	(2)	(1)	17	(2)	(4)	3	(1)	(1)
	6273	6212		6090	6008		6475	6275		5600	5500
Mean	(24)	(68)	4	(5)	(6)	18	(6)	(2)	4	(1)	(1)
				6367	6367		6500	6350		5600	5600
			5	(6)	(3)	19	(1)	(2)	5	(1)	(1)
				5850	5700		6471	6460		6100	6000
			6	(4)	(1)	20	(14)	(1)	6	(1)	(1)
				7236	6950		6504	6450		6200	6000
			7	(11)	(1)	21	(6)	(1)	7	(1)	(4)
				7336	7333		6500	6425		6100	6058
			8	(18)	(6)	22	(1)	(1)	8	(1)	(3)
				7796	7699		6550	6425		6000	6000
			9	(13)	(60)	23	(1)	(1)	9	(2)	(7)
				8000	8020		6475	6400		6025	6125
			10	(1)	(15)	24	(2)	(1)	10	(6)	(4)
				6050	6000		6500	6500		6700	6600
			11	(3)	(3)	25	(1)	(1)	11	(2)	(1)
				6161	6028		6467	6500		6833	6700
			12	(20)	(9)	26	(3)	(2)	12	(3)	(3)
				6326	6225		6632	7118		7017	6850
			13	(14)	(1)	Mean	(151)	(134)	13	(12)	(1)
				6300	6100					6110	6025
			14	(6)	(1)				14	(10)	(3)

Table 1-D, Continued.

Week Number	Additional	Acreage	Week Number	Balance	Acreage
	6331	6250		5100	5265
15	(13)	(1)	1	(1)	(1)
	7796	7900		6000	6000
16	(13)	(2)	2	(1)	(4)
	8000	8000		5800	6000
17	(1)	(1)	3	(1)	(7)
	6475	6400		6366	6125
18	(4)	(1)	4	(3)	(4)
	6580	6600		7699	7900
19	(5)	(1)	5	(60)	(2)
	6317	6300		8013	8000
20	(3)	(1)	6	(23)	(1)
	6050	6000		7500	7400
21	(3)	(1)	7	(1)	(1)
	6161	6125		7945	8000
22	(20)	(2)	8	(38)	(2)
	6300	6125		7989	8013
23	(6)	(1)	9	(9)	(2)
	6375	6300		6000	6000
24	(5)	(8)	10	(3)	(1)
	6475	6450		6028	6125
25	(2)	(1)	11	(9)	(2)
	6464	6161		6100	6125
Mean	(120)	(56)	12	(1)	(1)
				6200	6300
			13	(4)	(2)
				6320	6450
			14	(4)	(1)
				7544	6530
			Mean	(158)	(31)

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