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CASH - FUTURES PRICE RELATIONSHIPS
Guides to Corn Marketing

by

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# CASH - FUTURES PRICE RELATIONSHIPS
Guides to Corn Marketing

Nicholas Karlson, Brad Anderson and Reynold Dahl*

## OVERVIEW

This study analyzes the role of futures markets in corn marketing decisions. Besides price discovery and price-risk management, hedging in the futures market facilitates a return to corn storage. First, the seasonality in corn marketings and prices is examined. Second, the seasonality of the difference between cash and futures prices, the basis, is analyzed. Understanding the basis is important because it is a useful guide for decisions on corn storage and sale. Finally, several corn marketing strategies are developed and analyzed. Cash corn prices at Clarkfield, Minnesota, and futures prices on the Chicago Board of Trade are used in the analysis.

## FUTURES MARKETS SERVE IMPORTANT ECONOMIC FUNCTIONS

Futures exchanges such as the Chicago Board of Trade (CBOT) provide price discovery and a mechanism for price-risk management in a market economy. Hedging in futures markets also facilitates a return to storage to be locked-in by a corn marketer. Price discovery takes place in the trading pits of an exchange. Buyers and sellers form a competitive market through open bidding on futures contracts. This competitive market establishes a price which reflects the available supply and demand information on future prices of a commodity that is being traded.

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*Nicholas Karlson is research assistant, Brad Anderson is former research assistant and Reynold Dahl is professor, Department of Agricultural and Applied Economics, University of Minnesota.

Futures markets do not set prices. Prices are determined by free market forces that can assimilate new information quickly. Prices are fair in the sense that they are acceptable to both buyer and seller. Futures prices efficiently reflect current information about a commodity.

Hedging in the corn futures market allows a return to storage to be locked-in. The key to successful hedging is understanding the basis, or the price relationship between cash and futures prices. Two types of trading are involved in grain marketing. First, cash or spot trading involves the sale and receipt of grain for immediate delivery, or forward delivery at some specified time and place. The cash market is highly decentralized with cash transactions widely dispersed geographically. This is facilitated by our excellent communications system. Buyers and sellers of grain often make cash transactions by telephone with follow-up written documentation of the trades. Second, futures trading occurs through the trading of standardized futures contracts. This trading is highly centralized and occurs only on an organized commodity market. Futures prices, as derived from the trading of futures contracts, are central to the entire grain pricing and marketing mechanism.

## SEASONALITY IN CORN MARKETINGS

Corn is one of Minnesota's most important crops both in value and quantity. In 1991 6.6 million acres were planted to corn yielding 720 million bushels. In 1991 the farm value of corn production was $1.62 billion. Nationwide, Minnesota ranked fourth among corn producing states in 1991.

Perhaps the most distinctive feature of the corn market is its seasonality. The corn marketing year begins on September 1 and ends on August 31. Typically, the bulk of Minnesota's

corn harvest is in October. After harvest there is usually a large amount of corn in storage. Although supply is at its peak in the fall, and dwindles as the marketing year progresses, the demand for corn is relatively constant. For allocative efficiency, the economy wants the supply of corn to equal the demand for corn, over time. In a market economy this is accomplished through cash prices and futures prices. Why not cash prices alone?

To even out supply over the marketing year there must be an incentive to hold corn, i.e., a return to storage. Although this return can be obtained from cash price increases, this is unreliable due to the volatility of the general price level of corn. Futures prices allow for a storage return to be locked-in over the marketing year. This storage return comes from basis appreciation on hedged corn stocks. This will be discussed in more detail later. Figure 1 shows how corn supply is evened out over the marketing year. It gives the percent of total annual corn marketings by farmers by month over the marketing year in Minnesota. Farm marketings are highest after harvest in the fall. However, there are significant farm marketings throughout the crop year which act to smooth out corn supply.

Figure 2 graphs the same data with a different scale for the vertical axis. This accentuates the marketing behavior of Minnesota corn farmers. In October and November the percentage of annual corn marketings is relatively high at 9 and 12 percent. Some farmers sell at harvest for cash flow purposes and others may have insufficient farm storage. During this time of year, grain can be easily transported by barge on the Mississippi river to points of demand. Truck transportation is also available. During the winter months the rivers freeze over and transporting corn over long distances is done by rail. December, January, February, and March have annual corn marketing percentages

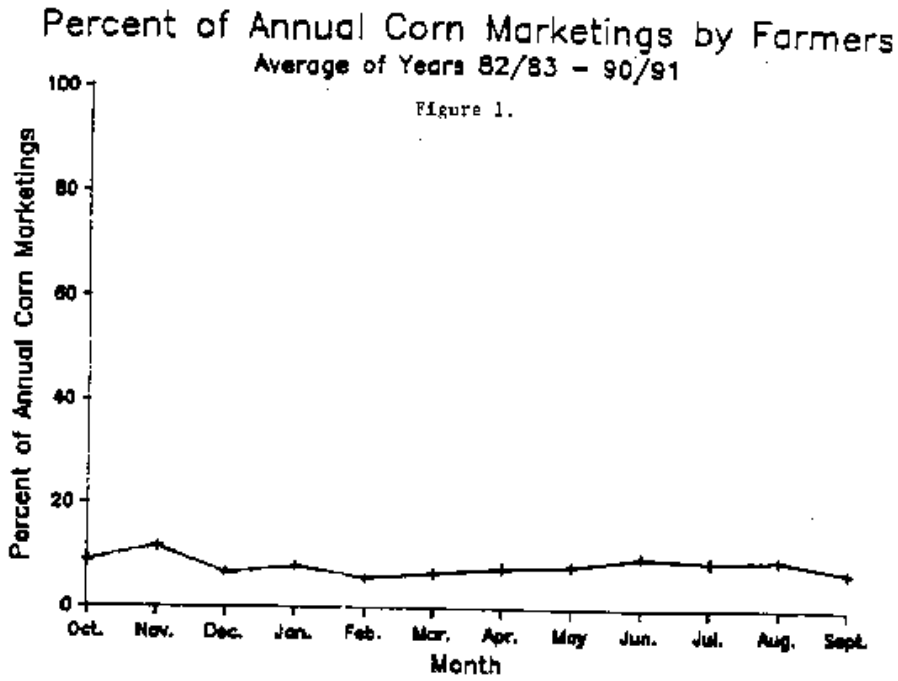



Figure 1.

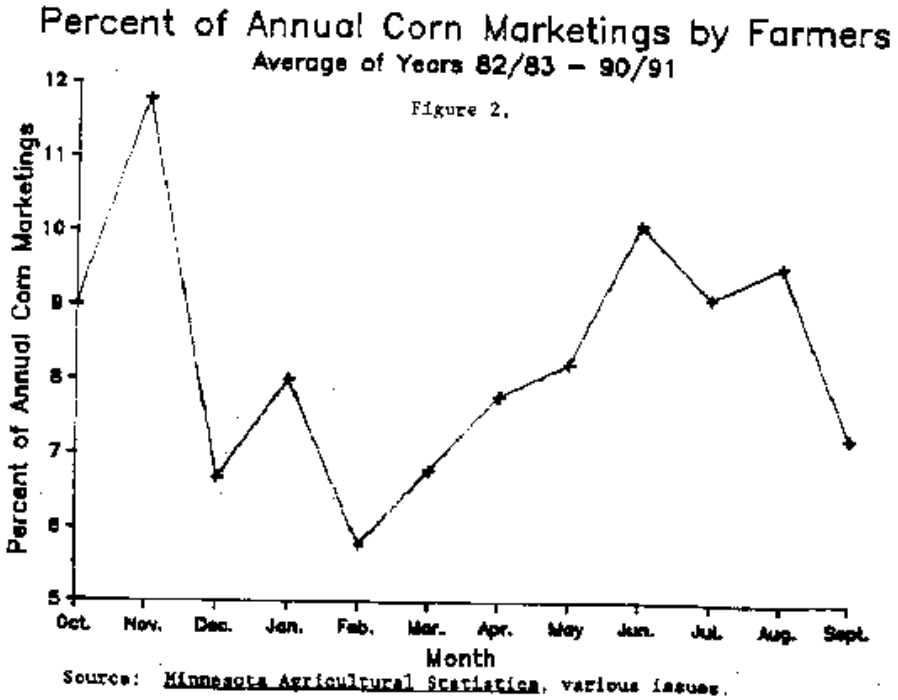



Figure 2.

Source: Minnesota Agricultural Statistics, various issues.

of 7, 8, 6, and 7 percent, respectively. As Spring approaches, marketing channels become more open, the basis usually strengthens and gives corn hedgers a return to storage. Seasonal increases in corn prices also encourage farmers to market more grain. As a result, annual corn marketing percentages rise from March into June.

Many factors, such as cash flow needs, storage availability, profit/risk objectives, the supply/demand situation, and participation in government feed grain programs enter into a farmer's decision on when to market his or her harvest. Expectations of future cash corn prices are central to decisions on the timing of corn sales. Farmers often store corn in anticipation of a seasonal increase in corn prices over the marketing year. So, some knowledge of the seasonality of corn prices is important.

## SEASONALITY IN CASH CORN PRICES

Corn must be stored from the time of production to use. Storage involves costs which include interest on capital invested in the corn, shrinkage, and costs of owning and operating storage facilities. Storage costs are, in part, reflected in the seasonality of corn prices. On average, over the years, there is a tendency for corn prices to rise over the marketing year. However there is considerable variability from year to year. Thus, taking a price rise for granted is risky.

Weekly cash corn prices from Clarkfield, Minnesota are used to show price movements. Clarkfield is a town in Yellow Medicine county located in southwest Minnesota. Local elevator prices for corn are reported in the regional newspaper every week. These data are used by the authors to show cash and futures price relationships and their use in marketing decisions.

Clarkfield corn prices are typical farm prices for corn in southwest Minnesota and are useful for demonstrating marketing principles involving cash and futures price relationships. The marketing years 82/83 through 91/92 will be used to demonstrate recent price behavior. A major factor in price behavior is weather conditions during a marketing year. For this reason the drought years 83/84 and 88/89 will be separated from the "normal" marketing years.

The "normal" years are 82/83, 84/85, 85/86, 86/87, 87/88, 89/90, 90/91 and 91/92. The average weekly cash price plus and minus one standard deviation is shown in Figure 3. Figure 3 shows a seasonal increase in prices on average from the beginning of harvest in October ($1.90) to early June ($2.40). The average increase in price, in part, reflects the costs of storing corn. The average decrease in price during the summer is due to the anticipation of abundant supplies at harvest. Normally, there is ample rain in July and August to produce a good crop. If this is the outlook, prices come down in expectation of a sufficient crop. The higher prices in the beginning of June include an anticipatory component. This is because holders of corn can receive large windfall profits if drought conditions actually occur and prices skyrocket. For example, in 1988 the price of corn in Clarkfield went from $1.92 in the beginning of June to $2.93 in July.

Price charts for drought years 83/84 and 88/89 are shown in Figure 4. In drought years, corn prices often do not increase seasonally. Initially, buyers of grain are locked into business plans and commitments. This relatively fixed demand forces prices up. However, as the marketing year progresses, demand becomes more flexible and prices often decline. For example, in the beginning of October 1988, Clarkfield cash corn was about $2.50 a bushel. Over the marketing year price movement was erratic with a

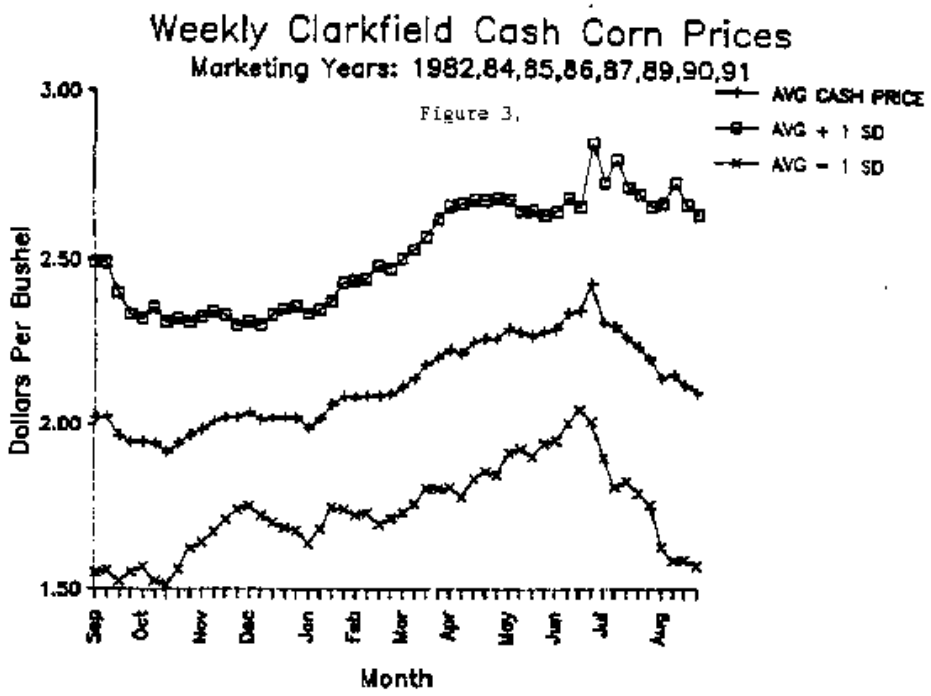



Figure 3.

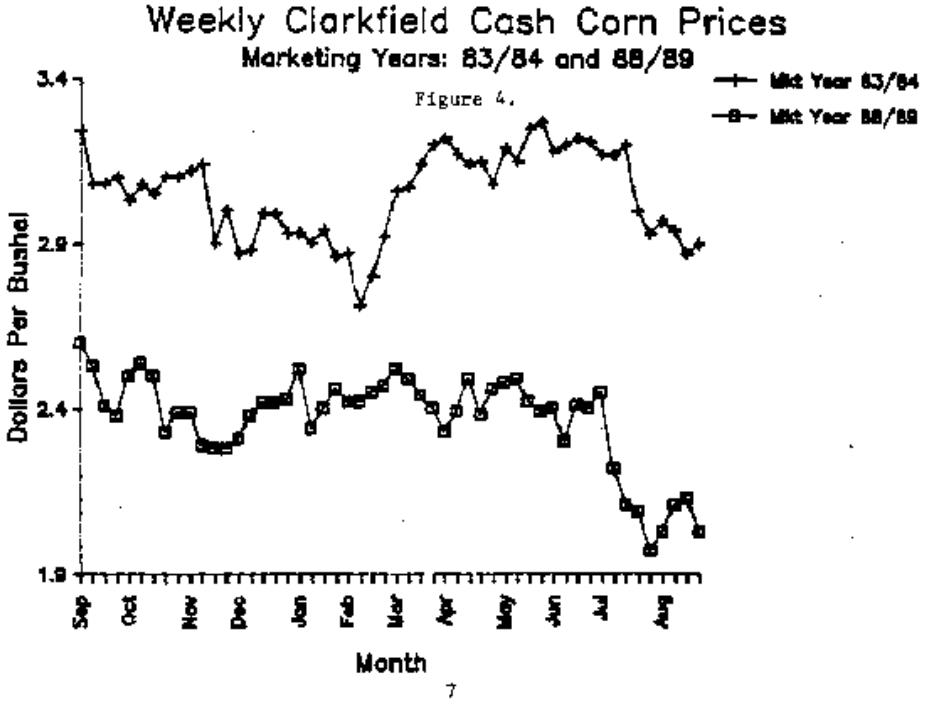



Figure 4.

downward trend. In October of 1983, Clarkfield prices averaged about $3.10/bu. Prices fell in November and did not recover to October levels until March of 1984. Prices then remained flat and then fell again in July.

An alternative to storing corn in anticipation of a seasonal increase in cash corn prices is to store corn and price it through the sale of futures. To use storage hedging profitably, an understanding of cash-futures price relationships is essential.

## CASH AND FUTURES PRICE RELATIONSHIPS--THE BASIS

Corn futures contracts are traded on the Chicago Board of Trade for the delivery months of December, March, May, July, and September. The first future delivery month in the corn marketing year is September. However, since only limited amounts of corn are harvested and available for delivery in September, the September future is usually considered a transitional month between old and new crop corn. December is considered the "new crop" future in corn since harvest is usually completed by December.

The difference between the cash price of corn at a specific location and the futures price is called the basis. The local basis for corn is calculated by subtracting the futures price (usually the near future) from the local cash price as illustrated below for corn prices prevailing in Minneapolis on June 2, 1988.

Cash – Futures (July) = Basis

Suppose on June 2, the Minneapolis corn basis is –$0.18, then the Minneapolis cash corn price is quoted as "18 under," or an 18 cent discount to the July futures price on the Chicago Board of Trade. It is possible for a cash corn

price to be greater than a futures price. The cash corn price is then said to be at a premium to the futures price and the resulting basis is positive.

The basis is important because it is an indicator of how cheap or expensive cash corn is relative to the futures price. Also, if a market participant is hedging so that he or she has positions in both cash and futures markets that are equal and opposite each other, it is a change in the basis that affects revenue rather than a change in the cash price itself. Furthermore, changes in the basis are more predictable than changes in the cash price because cash and futures prices converge and become equal in the delivery month at the delivery point.

When cash prices are at large discounts to futures prices, the basis is said to be "weak." When the difference between cash and futures prices is small or cash prices are at a premium to futures prices, the basis is said to be "strong." For example, in a particular location, suppose that the July corn basis in October is $-0.78. This is weak relative to a July basis in May of $-0.20. A movement in the basis from a weak to a strong position is called a "strengthening" of the basis, while the reverse movement is called a "weakening" of the basis. If the basis for corn changes from 18 under to 15 under, it has achieved a higher level, and has strengthened. If the basis for corn changes from 35 over to 27 over it has achieved a lower level, and has weakened.

In summary, we can think of the basis as the link between the general price level of corn as represented by the futures price and the cash price of a specified quality at a specific location. Futures prices are the product of a considerable volume of trading and are very sensitive to new market information on supply and demand affecting the general level of market prices. Local cash corn prices reflect these changes in the futures price, but they also reflect local economic factors such as transportation costs and availability; local supply and demand conditions; and the availability of local storage.

To get an understanding of the basis at a particular location, the authors calculated the July basis for corn at Clarkfield, Minnesota. The July basis is chosen for analysis because it shows how the basis behaves over the marketing year. The July basis is calculated by subtracting the July futures price from the Clarkfield cash price each week. The Clarkfield July basis tables and figures for the ten marketing years 1982/83 - 1991/92 are shown in the appendix.

## SEASONALITY IN THE JULY BASIS

Figures 5 and 7 are graphs of Clarkfield corn prices and the Chicago Board of Trade July corn futures prices for marketing years 1982/1983 and 1985/86. Figures 6 and 8 depict the July basis derived from Figures 5 and 7. Figures 5 and 7 depict two important relationships between cash and futures prices: 1) their movement together and 2) the convergence of cash and futures prices over time. The Clarkfield July corn basis is the Clarkfield cash price less the July futures price. Figures 5 and 7 show that the Clarkfield July basis is weak in the fall and generally strengthens over the marketing year. This pattern is repeated every year, with the degree of "weakness" and amount of strengthening varying. This relationship determines the return to storage a holder of corn can obtain using the futures market. Figures 5 and 7 also show that cash and futures prices tend to move together, although the movement is varied. It is possible for cash prices to go up and futures prices go down

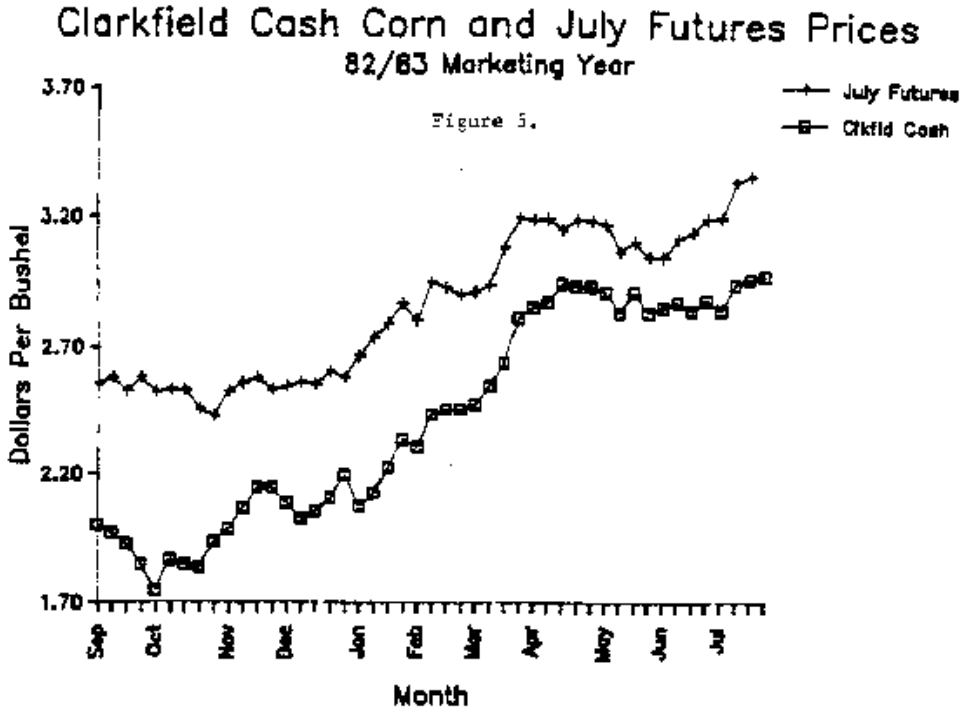



Figure 5.

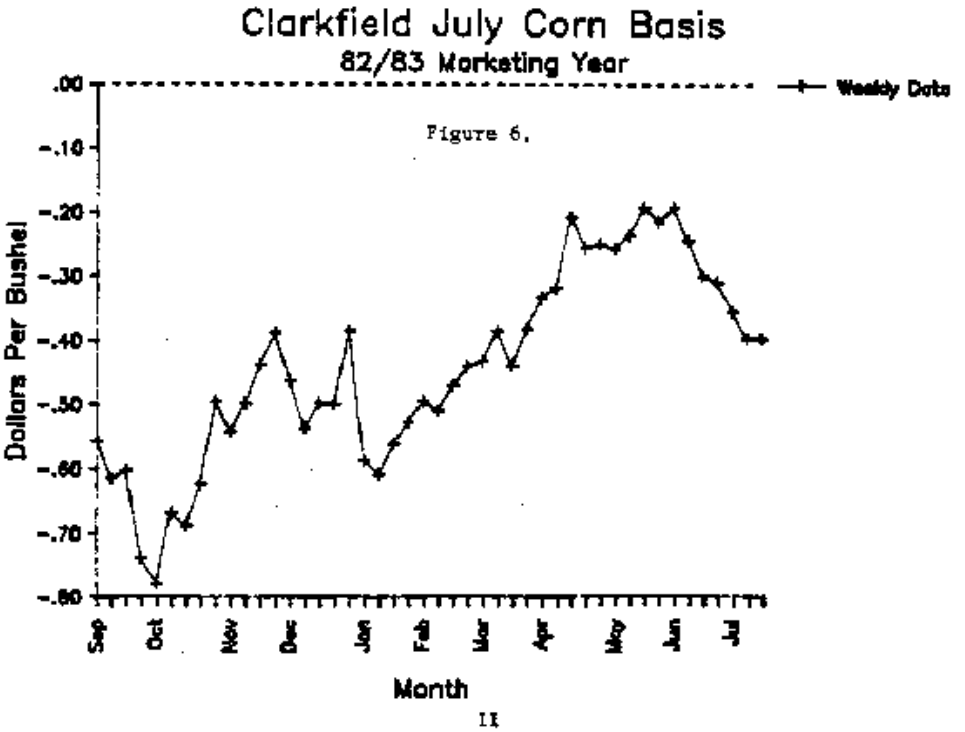



Figure 6.

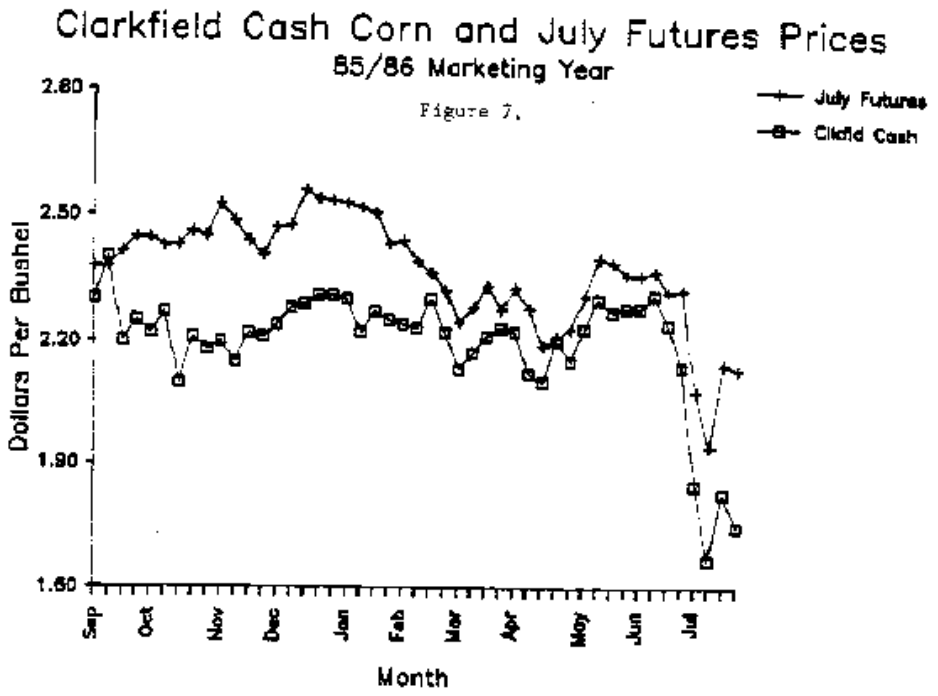



Figure 7.

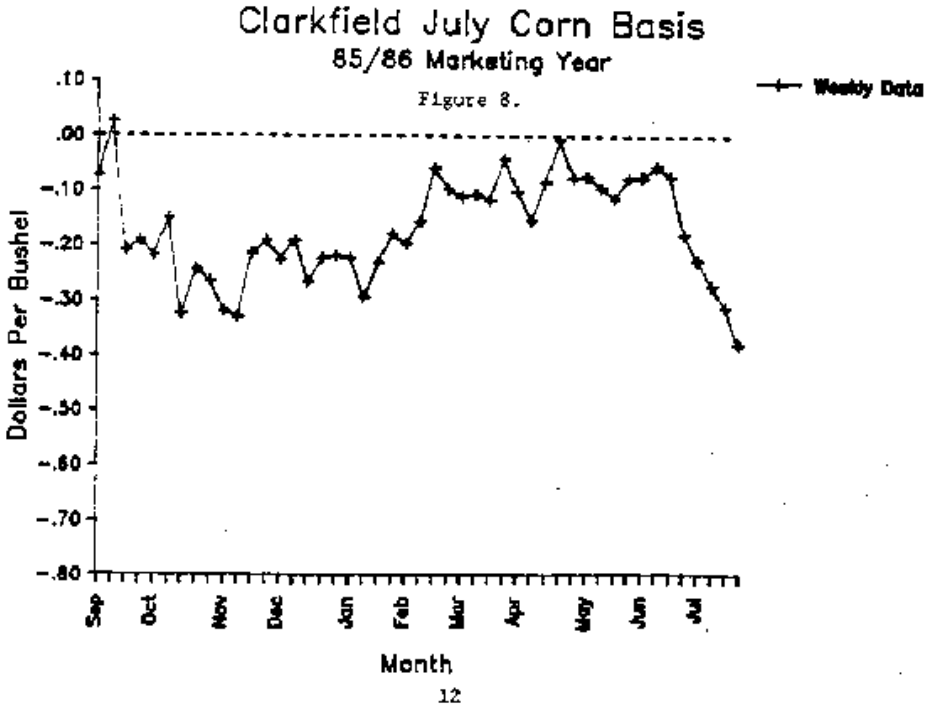



Figure 8.

(e.g. the 1985/86 marketing year). This is because cash prices reflect a given moment's supply and demand situation, whereas a futures price reflects future as well as current supply and demand conditions.

Figures 6 and 8 show that the July basis is relatively weak at harvest in October and November. During the 1982/83 marketing year, the July basis strengthened 59¢/bu. from its weakest point of –78¢ in the first week in October to its peak of –19¢ in May. In the 1985/86 marketing year the July basis is weakest in October at 33 cents under and moves to a stronger position in April of a penny under.

How does the seasonal pattern in the Clarkfield July basis just described compare with other marketing years? The appendix shows that basis appreciation (strengthening) occurs from each harvest to late in the marketing year. This basis appreciation is the storage return needed for the market to smoothen corn sales over the marketing year. The degree of basis appreciation depends on market fundamentals. Because market fundamentals are different from year to year so is the pattern of the July basis.

For example, the prime rate of interest was 12.5% at harvest in 1982. This high rate had a weakening effect on the basis. The basis was weakened because the market had to offer farmers a larger return to the storage of grain to compete with the interest farmers could receive by selling at harvest. Compare this to the stronger July basis in the fall of 1986 when the prime rate at harvest was only 7.5% (see Table 2 on p. 24).

The availability of storage capacity relative to grain supplies has an effect on the basis. If the level of supplies (stocks) is high relative to the amount of storage facilities, there is an upward pressure on the value of storage. As a resource becomes more scarce, its price is bid up. Thus, other things equal, an inverse relationship between the July basis and the stocks to storage

capacity ratio is expected. This is indicated in figure 9. As the basis weakens, the return to a storage hedge increases. So the basis can be viewed as a price of storage.

Another important market fundamental is weather. A drought occurred in the summer of 1983. Clarkfield cash prices were relatively high in October 1983. More importantly, the July basis was relatively strong (see Figures 10 and 11). In essence, the market was encouraging farmers to sell their corn by offering a high price for sale and a low return to storage. 1988 was also a drought year. Prices were relatively high at harvest. However, at times the basis was also relatively weak, indicating that the market was offering a return to storage (through a storage hedge) on top of already good harvest prices (see Figures 12 and 13).

On average the July basis is weak in the fall and then strengthens as the marketing year progresses. This is seen in Figure 14 that depicts a ten year average of the Clarkfield July corn basis. Figure 14 gives a rough indication of the general basis pattern. For any given year, market fundamentals should be considered and the general basis pattern adjusted accordingly. It will be beneficial for a marketer to look at yearly basis patterns to see if any year has market fundamentals similar to the one at hand.

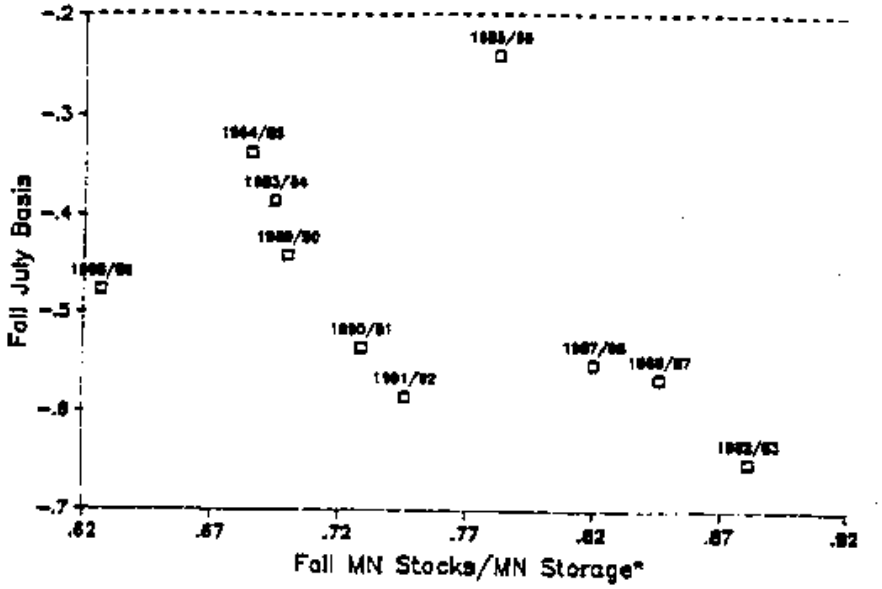
## USING THE BASIS TO EARN RETURNS ON STORED CORN

The "weak in the fall, strong in the spring" pattern of the July basis is typical. The reason is that in the fall, corn supplies are large so elevator and transportation facilities are often pressed to their limits; the

Figure 9.

## Clarkfield July Corn Basis vs. MN Stocks/Storage

Scatter Plot




* Minnesota Sept. 1 stocks, wheat, barley, oats plus production corn and soybeans/Minnesota total grain storage capacity.

Source: Grain Stocks, National Agricultural Statistics Service, various issues.

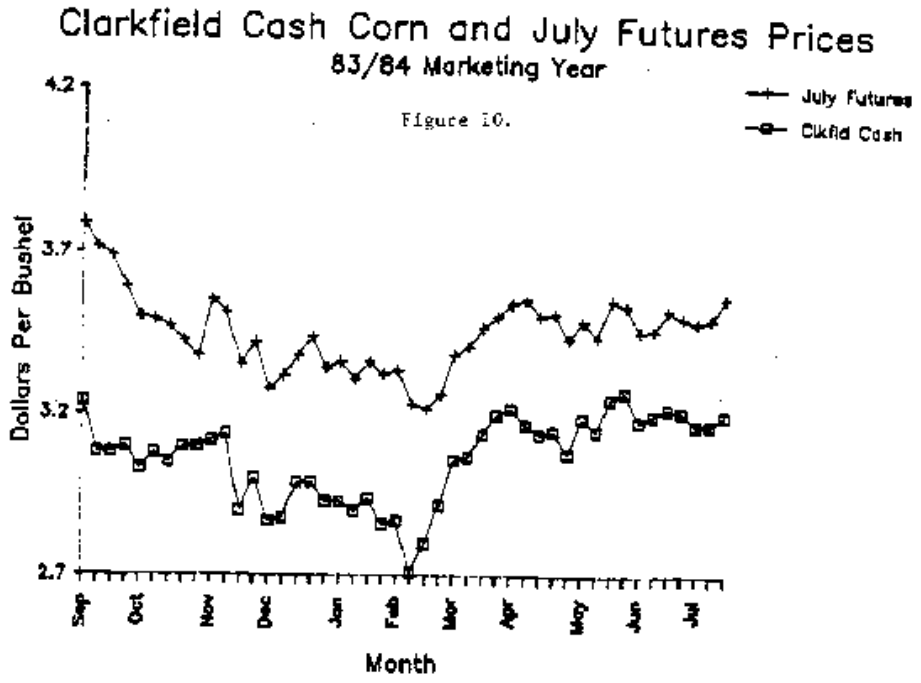



Figure 10.

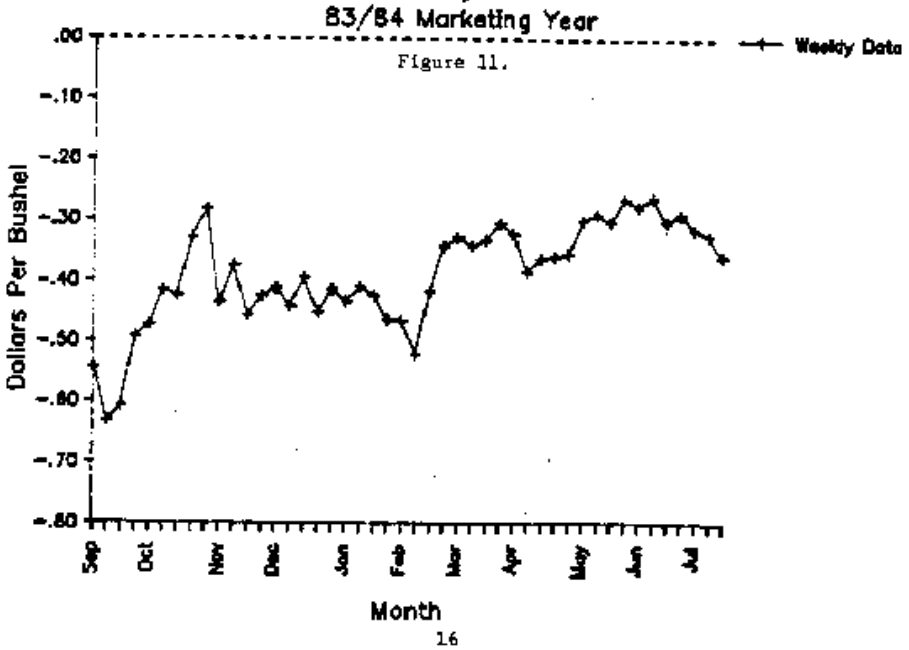



Figure 11.

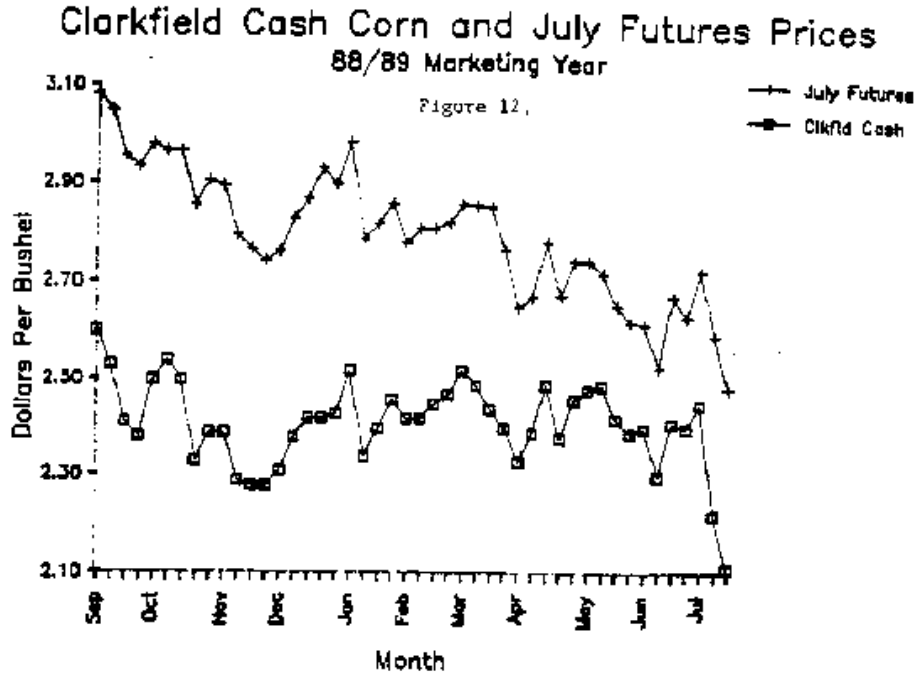



Figure 12.

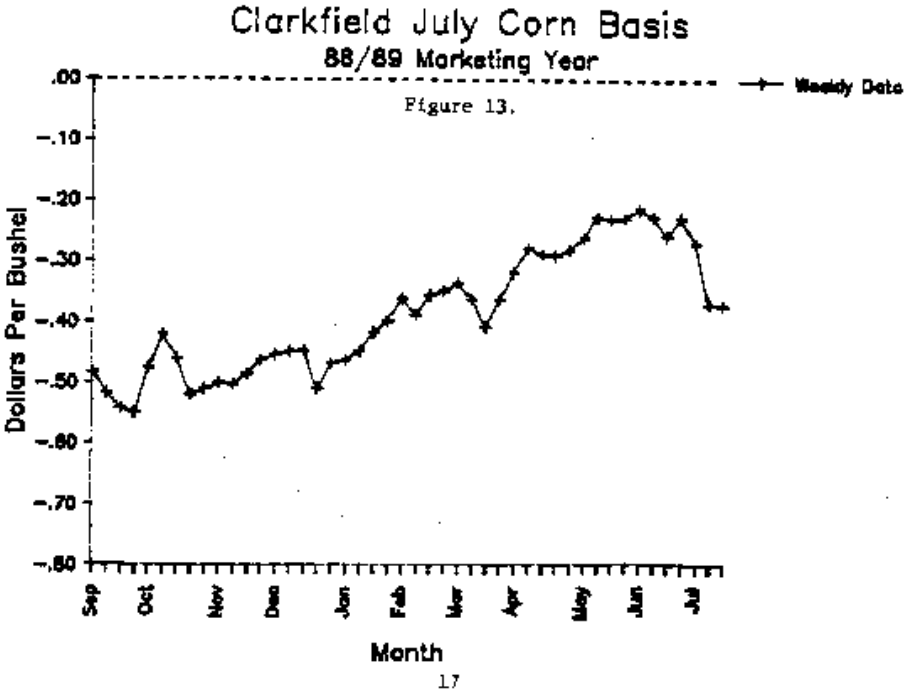
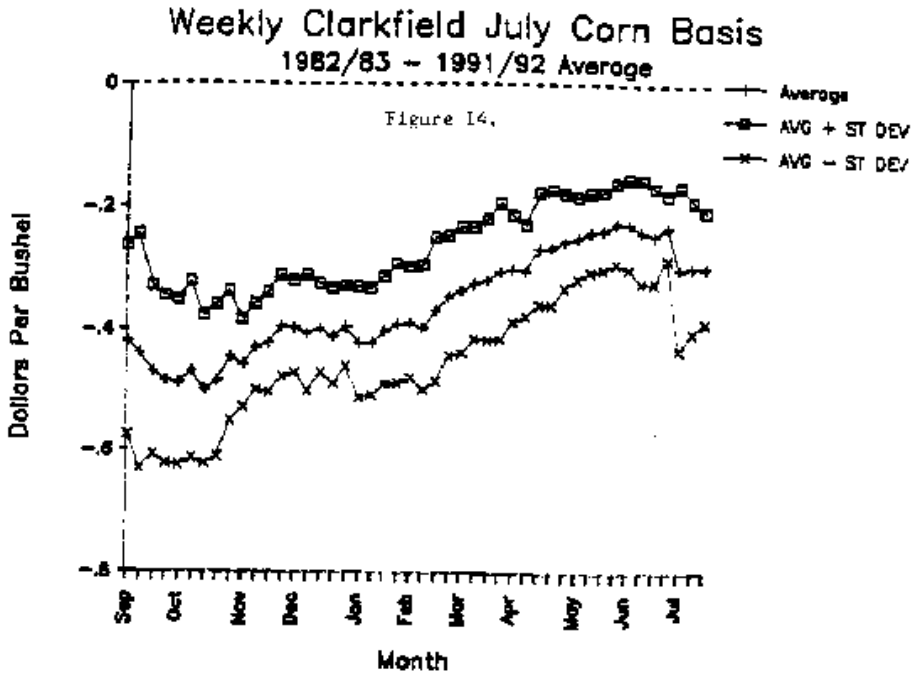



Figure 13.


Weekly Clarkfield July Corn Basis
1982/83 - 1991/92 Average
Figure 14.
Average
AVG + ST DEV
AVG - ST DEV
Dollars Per Bushel
0
-.2
-.4
-.6
-.8
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Month

market typically offers incentives to farmers and marketing firms to store corn to relieve the glutted market. The basis is then weak reflecting favorable returns to storage. Later in the marketing year, as supplies diminish, the basis strengthens and encourages corn to be brought out of storage and into marketing channels.

The basis can be thought of as representing the price the market is willing to pay for storing corn. When the basis is weak (the payment for storage high) in the fall, farmers should consider storing corn and hedging, which is in reality, the pricing of corn through the sale of July corn futures. Later in the marketing year, when the basis has strengthened, the corn is sold out of storage and the July future is bought back. The difference in the basis between the time the hedge was placed and lifted represents the gross return to storage.

Actual prices from the 1991/92 marketing year will be used to explain storage hedging. Whether the market is offering a good return to storage depends on the basis. If the basis is strong, then the market is not offering a good return. If it is weak, then potentially it is offering a good return to storage.

Suppose a farmer near Clarkfield harvested corn the third week of October, 1991. The Clarkfield elevator was bidding $2.13 per bushel on October 22, 1991, the July futures was selling for $2.75: the basis was $.62 under (Table 1). The farmer considered from past experience that this was a relatively weak basis, and that the July basis would strengthen enough to provide a reasonable return to storage. Assume that the farmer stored corn, hedged it through the sale of July futures on October 22, 1991 and sold the corn and lifted the hedge on May 12, 1992. The results appear below.

Table 1

| DATE | CASH MARKET | FUTURES MARKET | BASIS |
|---|---|---|---|
| 10/22/91 | Store 5,000 bu. corn (local cash price is $2.13) | Sell July futures at $2.75 | $–.62 |
| 5/12/92 | Sell 5,000 bu. at $2.34 | Buy July futures at $2.59 | $–.25 |
| | | Change = | $+.37 |

The farmer's gross return to storage from October 22, 1991 to May 12, 1992 was $.37 per bushel, or the amount that the basis strengthened. Another way of looking at the results is through the net price received. If corn had been sold at the Clarkfield elevator on October 22, the price would have been $2.13 per bushel. By storing and hedging, the farmer received $2.34 on 5/12/92 plus 16 cents (from the gain on the futures contract) for a total of $2.50 per bushel. This is 37 cents more than the 10/22/91 price. Note that 37 cents equals the change in basis. Had the farmer stored corn without hedging, the price received on 5/12/92 would have been $2.34 per bushel or 21 cents more than an October 22, 1991 sale. Thus, a storage hedge yielded a better return than simply waiting for a price increase on unhedged corn. While the storage hedge is superior in this example it may not always be. However, storage hedging usually yields consistent returns to corn storage due to the economic need to spread out corn marketings. Thus it should receive careful consideration as a viable marketing strategy, particularly in years when the basis is considered to be very weak. Generally, it is less risky to count on basis appreciation than price appreciation.

To practice storage hedging, a farmer should study basis patterns in his or her local area. Start by constructing a local July basis table. This can be done by hand but ideally should be done on a computer spreadsheet with some graphics capability. For more complete knowledge and tracking of the July basis, it should be separated into its component parts. In reality, the July basis consists of: (1) the cash basis relative to the near future, and (2) the carrying charges (spreads) associated with the near future, July future, and the futures contracts in between.

On October 16, 1986, for example, these were the corn prices:

| | |
|---|---|
| Clarkfield cash price | $1.26 |
| December corn future | $1.63 |
| March corn future | $1.75 |
| May corn future | $1.82 |
| July corn future | $1.85 |

December is the near futures contract on this date, so the near basis is 37 cents under. The carrying charges between December and March, March and May, May and July are 12, 7, and 3 cents respectively. The July basis is the sum of the carrying charges and the near basis. Thus, the Clarkfield July basis is 59 cents under.

From past experience, a Clarkfield storage hedger might consider a July basis of 59 cents under weak enough to provide a good return to storage. To receive this return, the hedger sells the July futures contract. The hedger has another option, however. If, after carefully studying the spreads, the hedger believes that the spread between March and July will widen further (e.g. from 10 to 14 cents), the hedge will originally be placed in the March futures contract. Then, if the spread does widen (e.g. by 4 cents), the hedge can be moved forward to July by buying back the March future and selling the July future. This will, in effect, give the hedger a buying basis of 63

under July on October 16 rather than a buying basis of 59 under July. Many producers may prefer to leave such judgements to more experienced traders. Nevertheless, it is useful to think of the basis relative to the near future plus carrying charges between the near and distant futures. In the grain trade, the basis is usually quoted relative to the near future. Local basis tables should include cash prices and futures prices of several delivery months. Basis figures can be constructed from such tables which chart the basis of the near future as well as carrying charges to distant futures.

## ALTERNATIVE CORN MARKETING STRATEGIES

Corn producers have many different marketing strategies available to them. The producer must decide which plan will perform best under prevailing market conditions. Three of the more common strategies are (1) selling corn at harvest, (2) storing corn at harvest for sale later in the marketing year in anticipation of a seasonal increase in corn prices, and (3) storage hedging, that is, storing corn at harvest and pricing it through the sale of futures. The latter two strategies necessitate storage, so the variable costs of storing corn on the farm must be estimated before the effectiveness of the three marketing strategies can be compared.

Corn farm storage costs. In analyzing the cost of storing corn on the farm the fixed costs of building a storage facility are not considered because these costs are paid regardless of usage. Also, the decision to build farm storage may depend more on considerations such as government loan programs. Only the variable costs of farm storage enter into short run decisions on corn storage. Variable costs of farm corn storage include: (1) the interest costs on the capital invested in corn, and (2) the physical corn loss due to handling and shrinkage. In this study, the authors calculated the interest cost on the market value of corn when placed in storage for the number of

months stored at the harvest prime rate. Farm handling and shrinkage costs were estimated at 1 percent for initial handling and 1/10 of 1 percent per month of storage. Drying costs were not considered because corn is usually dried to 15 percent moisture whether it is sold immediately or stored. Corn with 15 percent moisture can be safely stored with proper aeration and management practices.

Table 2 shows the estimated variable costs of on-farm corn storage for 7 months, October 15 to May 15, over the period 1982/83 through 1991/92. Actual storage costs will vary from producer to producer. When making marketing decisions a farmer should assess costs from the farmer's unique situation. These costs are important and should not be overlooked in the marketing decision.

## MARKETING STRATEGIES COMPARED

Gross and net corn prices received for each of the three marketing strategies just described for the years 1982/83 through 1991/1992 are shown in Table 3. The results assume that the harvest period in which the marketing decision (to sell or to store) is made is between October 1 and October 31 each year. This is when the bulk of Minnesota corn is typically harvested. Stored corn is assumed to be sold between May 1 and May 31 each year. A common date for sale is used here so the three marketing strategies can be compared. This period is chosen because the July basis tends to be at its

Table 2. Clarkfield average cash corn price, prime interest rate, and variable cost of on-farm storage October 15 to May 15, 1982/83 through 1991/92.

| Year | Average Cash price Oct.1-Oct.31 | Average October Fall prime Interest rate** | Variable cost On-farm storage* Oct.15 - May 15 |
|---|---|---|---|
| | $ per bu. | percent | $ per bu. |
| 1982/83 | 1.85 | 12.5 | .17 |
| 1983/84 | 3.07 | 11.0 | .25 |
| 1984/85 | 2.58 | 12.6 | .23 |
| 1985/86 | 2.20 | 9.5 | .16 |
| 1986/87 | 1.32 | 7.5 | .08 |
| 1987/88 | 1.44 | 9.1 | .10 |
| 1988/89 | 2.45 | 10.0 | .18 |
| 1989/90 | 2.07 | 10.5 | .16 |
| 1990/91 | 1.95 | 10.0 | .15 |
| 1991/92 | 2.12 | 8.0 | .13 |

* Interest cost plus 1 percent loss for initial handling and .1 percent loss per month of storage. E.g. the variable cost for 1982/83 is (1.85)(.125)(7/12) + (1.85)(.01) + (1.85)(.001)(7).

** Source: Federal Reserve Bulletin, various issues.

Table 3. Gross and net corn price received for each of the three marketing strategies, Clarkfield, 1982/83 - 1990/91 /bu.

| Year | Sale at Harvest[1] | Store for Seasonal Price Rise[2] | Storage Hedge[3] |
|---|---|---|---|
| | Gross (Net) | Gross (Net) | Gross (Net)[4] |
| 1982/83 | $1.85 (1.85) | $2.87 (2.70) | $2.28 (2.10) |
| 1983/84 | 3.07 (3.07) | 3.22 (2.97) | 3.17 (2.91) |
| 1984/85 | 2.58 (2.58) | 2.55 (2.32) | 2.71 (2.47) |
| 1985/86 | 2.20 (2.20) | 2.27 (2.11) | 2.34 (2.17) |
| 1986/87 | 1.32 (1.32) | 1.68 (1.60) | 1.67 (1.58) |
| 1987/88 | 1.44 (1.44) | 1.83 (1.73) | 1.69 (1.58) |
| 1988/89 | 2.45 (2.45) | 2.45 (2.27) | 2.73 (2.54) |
| 1989/90 | 2.07 (2.07) | 2.50 (2.34) | 2.18 (2.01) |
| 1990/91 | 1.95 (1.95) | 2.24 (2.09) | 2.26 (2.10) |
| 1991/92 | 2.12 (2.12) | 2.31 (2.18) | 2.44 (2.30) |

[1] The harvest price is the average price in October. This is the gross and net price for a sale at harvest strategy.

[2] The spring price is the average price in May. The spring price is the gross price of the store for a seasonal price rise strategy.

[3] The gross price to a storage hedge is the average July basis in May less the average July basis in October plus the average cash price in October.

[4] The net price of corn is given in parentheses next to the gross price of corn for the respective strategies. The net price is the gross price less the variable cost of storage. In the case of a storage hedge an additional $.01/bu futures commission is subtracted.

strongest and prices usually have experienced considerable seasonal increases. This does not mean that in every year a producer should store corn until this period. It may be profitable to sell earlier and avoid extra storage costs or sell later if expected price increases outweigh additional storage costs.

Sale at harvest. Over time, farmers have shown favor to marketing corn at harvest. This appeals to producers for several reasons. First, it does not involve farm storage, so storage costs and problems maintaining corn quality are avoided. Second, the producer can use proceeds from the sale to pay off loans or for reinvestment in other parts of the farm business. Sale at harvest provided the lowest gross price for corn of the three strategies every year. When costs of storage were included, sale at harvest was the best strategy in 1983/84, 1984/85, and 1985/86.

Store for a seasonal increase in corn prices. Many producers store corn at harvest in anticipation of a seasonal increase in corn prices. On average, cash corn prices do rise over the marketing year. However, the variation from year to year is large and a seasonal price increase is not assured every year. So, this marketing strategy may result in high returns in some years, but the risks can also be high. In other years, the seasonal price increase may be insufficient to cover storage costs. An example of this is the 1988/89 marketing year. The store for a seasonal price increase strategy was the most profitable in 1982/83, 1986/87, 1987/88, and 1989/90.

Storage hedging. This marketing alternative involves the pricing of corn in storage through the sale of a futures contract. By using a storage hedge, a producer not only insures against a price decline but can also lock-in a return to storage. The gross return to storage is the basis gain over the storage period. As previously explained, the July corn basis has a seasonal trend. It is typically weak in the fall and then strengthens in the spring. Storage hedging is usually

most profitable when the basis is weaker than normal at harvest due to a large crop or other market factors. The storage hedging strategy was most profitable in 1988/89, 1990/91 and 1991/92.

## USING MARKET FUNDAMENTALS TO CHOOSE A STRATEGY

Marketing grain involves uncertainty. It is easy to look back on a marketing year and pick a strategy that tops the market. However, at the beginning of the year, the luxury of perfect knowledge does not exist. Thus, good marketing at harvest means making the best decision given current information and past experience. What are the market fundamentals that point to one strategy or another?

### Storage Hedge

The gross return to a storage hedge depends on the strengthening of the basis from the time the hedge is placed to the time it is lifted. By evaluating past basis behavior, a marketer can learn normal basis patterns for a particular location. An unusually weak basis in the fall indicates a good return to storage as long as the basis strengthens to its usual position later in the marketing year. In a well functioning futures market, the basis contains two major components. The first is a general market return to storage. The second is a locational discount or premium. The locational component is primarily due to transportation costs, local storage availability, and local supply/demand conditions. The general market component is affected by national crop carryover, harvest size, national demand, and the international export/import situation.

Large stocks at harvest are an indication that a weak basis is signalling a good return to storage. However, a weak basis might also indicate that a locational disadvantage has appeared.

If this disadvantage remains throughout the marketing year, the basis might not strengthen as much as anticipated.

The timing of a storage hedge is more flexible than it appears. For example, suppose in October a farmer confronts a July basis for corn that he considers very weak. His corn is still in the field but in two weeks he will harvest 10,000 bushels of corn that will be hedged. The farmer can start his hedge immediately at the favorable basis instead of waiting two weeks when the basis might not be as favorable. In this situation the farmer should consider the current cash price versus the harvest cash price. This is because the gross price will be the cash price at the time the hedge is placed plus the amount the basis appreciates.

A hedge can also be lifted earlier than planned. Suppose the above farmer usually lifts his hedge in May. However, in the current marketing year, there is an unusually large strengthening of the basis in December. The farmer can take advantage of this by lifting his hedge early to appropriate the good basis return while also saving on further storage costs.

Finally, a storage hedge is good protection from price declines during the marketing year. There are two reasons for this. First, it is likely that a short hedger will make money from his/her futures position as prices drop. This is because cash and futures prices tend to move together. Second, a storage hedger's gross price is the market price at the time the hedge is placed plus the amount that the basis appreciates. Since basis appreciation is virtually guaranteed, the hedger is assured a gross price at least as great as the price at hedge time (harvest).

If market fundamentals indicate that there is not much downside price risk, then a storage hedge might not be appropriate. In this case, storing without hedging may result in greater returns as cash prices rise over the season.

Another consideration is that a short position in the futures can dampen gains from a boom in the market. If this is a concern, then the options market may offer an attractive alternative. A short hedger could buy a put instead of entering the futures market directly. If the hedger buys the put "at the money" this means the hedger has the right to sell a futures contract at the prevailing futures price. However, if the futures price moves against the hedger, no revenues are lost. The only expense is the cost of the put, which can be substantial. The hedger must weigh this cost against his/her belief of a large price increase. There are other options techniques which reduce this cost but they will not be discussed here.

Store for a Seasonal Increase in Corn Prices

This strategy depends on cash prices rising over the crop year. On average this can be expected, although counting on a seasonal price increase can be risky. First, there is no mechanism to lock-in a market return to storage. Second, there is no built in protection from downside price risk. If market prices are above the government loan rate (which acts as a price floor) downside price risk is present. As discussed earlier, high prices at harvest that follow a drought are likely to fall, so unprotected stocks should be avoided.

On the other hand, if prices are at the loan rate, there may be little downside price risk. Also, unhedged stocks can take full advantage of price booms since revenues aren't hurt by a short position in the futures market. In the 1982/83 and 1987/88 crop years the ratio of the loan rate to farm price in corn was close to one. This means that the farm price was close to the minimum price set by government policy. Storing for a seasonal price increase involved little exposure to downside price risk. Furthermore, droughts in both the summers 1983 and 1988 caused prices to boom, making this strategy profitable (see Table 3, p. 25).

Sale at Harvest

This strategy is most effective when costs of storage are high, downside price risk is great, and the market is offering little or nothing for storage (the basis is strong). The 1983/84 crop year is a good example where all of these factors are present. In the fall of 1983, the loan rate for corn was $2.65/bu. The harvest price was $3.09, making the price to loan rate ratio 1.17. As noted before, the basis was also strong (see Figures 10 and 11, p. 16 or appendix). In fact, sale at harvest turned out to be the best strategy (see Table 3, p. 25).

## CONCLUSIONS

This study shows that storage hedging can be a profitable corn marketing strategy. Yet, this marketing alternative may be overlooked by producers. To effectively practice storage hedging, producers must study and understand the basis - the difference between cash and futures prices. The July corn basis shows a seasonal pattern with the weakest point at harvest and the strongest point in the spring. It is possible to forecast movements in the basis over the marketing year and earn returns to corn storage through hedging. Forecasting the movement of cash corn prices, however, is more difficult making the storage of unpriced corn risky.

No single marketing strategy is the best for all years. The producer must recognize the conditions under which each strategy is most effective. This means keeping well-informed about current and projected market conditions and studying the local basis and basis behavior to evaluate the prospects for storage hedging. Storage costs must also be considered. Effective marketing requires work as does producing the crop.

# REFERENCES


Dahl, Reynold P. and Edward Usset. "Earning Returns on Corn Storage Through Hedging," Minnesota Agricultural Economist No. 631, August-September 1981.

Flaskerud, George. "Basis for Selected North Dakota Crops," NDSU Extension Service, North Dakota State University, March 1991.

"Futures: The Realistic Hedge for the Reality of Risk," Chicago Board of Trade, 1988.

Houck, James P. "Seasonal Behavior of Minnesota Farm Prices," Minnesota Agricultural Economist No. 561, November 1974.

"Options on Agricultural Futures, A Home Study Course," Chicago Board of Trade, September 1989.

Senjem, Norman. "To Sell or to Store? Take Expected Basis Changes Into Account When You Make Your Decision," The Farmer, July 1991, pp. 11, 14.

Sogn, Art. "The Benefits of Grain Futures Even if You Don't Trade in Them," Cooperative Extension Service, South Dakota State University, USDA, 1974.

Stevens, Stanley C. "Evidence for a Weather Persistence Effect on the Corn, Wheat, and Soybean Growing Season Price Dynamics," Journal of Futures Markets, Vol. II, No. 1, February 1991.

Stevens, Stanley C. "Weather Markets: U.S. Corn and Soybeans," Staff Paper P88-27, Department of Agricultural and Applied Economics, University of Minnesota, August 1988.

"Understanding Basis, The Economics of Where and When," Chicago Board of Trade.

Usset, Edward C. "An Economic Analysis of Corn Futures Price Relationship on Corn," Plan B Paper, Department of Agricultural and Applied Economics, University of Minnesota, April 1981.

Williams, Jeffrey. The Economic Function of Futures Markets. Cambridge: Cambridge University Press, 1986.

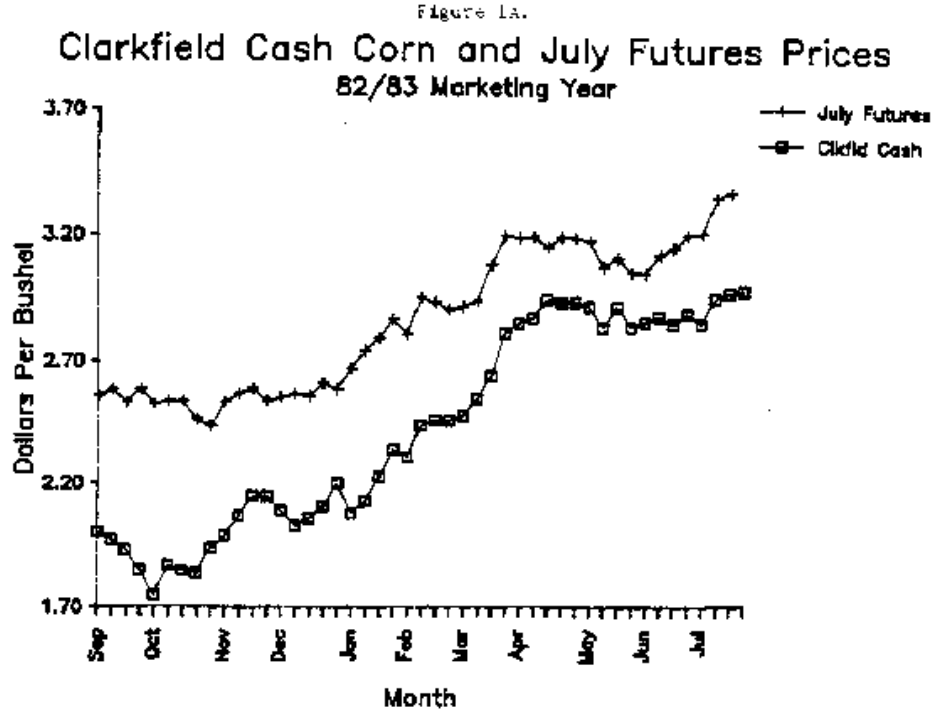
# APPENDIX

Table 1A. Table 2A.

## CLARKFIELD CASH CORN AND JULY FUTURES PRICES

| | 1982/83 | | | 1983/84 | | |
|---|---|---|---|---|---|---|
| | Clarkfield Cash | July Futures Price | Basis | Clarkfield Cash | July Futures Price | Basis |
| Sept. | 2.0000 | 2.5575 | -.5575 | 3.2400 | 3.7850 | -.5450 |
| | 1.9700 | 2.5850 | -.6150 | 3.0800 | 3.7125 | -.6325 |
| | 1.9300 | 2.5325 | -.6025 | 3.0800 | 3.6875 | -.6075 |
| | 1.8500 | 2.5875 | -.7375 | 3.1000 | 3.5925 | -.4925 |
| Oct. | 1.7500 | 2.5275 | -.7775 | 3.0300 | 3.5025 | -.4725 |
| | 1.8700 | 2.5375 | -.6675 | 3.0800 | 3.4950 | -.4150 |
| | 1.8500 | 2.5375 | -.6875 | 3.0500 | 3.4750 | -.4250 |
| | 1.8400 | 2.4625 | -.6225 | 3.1000 | 3.4300 | -.3300 |
| | 1.9400 | 2.4350 | -.4950 | 3.1000 | 3.3825 | -.2825 |
| Nov. | 1.9900 | 2.5325 | -.5425 | 3.1200 | 3.5550 | -.4350 |
| | 2.0700 | 2.5675 | -.4975 | 3.1400 | 3.5150 | -.3750 |
| | 2.1500 | 2.5875 | -.4375 | 2.9000 | 3.3575 | -.4575 |
| | 2.1500 | 2.5375 | -.3875 | 3.0000 | 3.4250 | -.4250 |
| Dec. | 2.0900 | 2.5525 | -.4625 | 2.8700 | 3.2825 | -.4125 |
| | 2.0300 | 2.5675 | -.5375 | 2.8800 | 3.3225 | -.4425 |
| | 2.0600 | 2.5575 | -.4975 | 2.9900 | 3.3850 | -.3950 |
| | 2.1100 | 2.6100 | -.5000 | 2.9900 | 3.4425 | -.4525 |
| Jan. | 2.2000 | 2.5850 | -.3850 | 2.9300 | 3.3450 | -.4150 |
| | 2.0800 | 2.6675 | -.5875 | 2.9300 | 3.3650 | -.4350 |
| | 2.1300 | 2.7400 | -.6100 | 2.9000 | 3.3100 | -.4100 |
| | 2.2300 | 2.7925 | -.5625 | 2.9400 | 3.3650 | -.4250 |
| | 2.3400 | 2.8675 | -.5275 | 2.8600 | 3.3250 | -.4650 |
| Feb. | 2.3100 | 2.8050 | -.4950 | 2.8700 | 3.3375 | -.4675 |
| | 2.4400 | 2.9500 | -.5100 | 2.7100 | 3.2325 | -.5225 |
| | 2.4600 | 2.9300 | -.4700 | 2.8000 | 3.2175 | -.4175 |
| | 2.4600 | 2.9000 | -.4400 | 2.9200 | 3.2625 | -.3425 |
| Mar. | 2.4800 | 2.9125 | -.4325 | 3.0600 | 3.3875 | -.3275 |
| | 2.5500 | 2.9350 | -.3850 | 3.0700 | 3.4125 | -.3425 |
| | 2.6400 | 3.0800 | -.4400 | 3.1400 | 3.4725 | -.3325 |
| | 2.8100 | 3.1925 | -.3825 | 3.2000 | 3.5050 | -.3050 |
| | 2.8500 | 3.1825 | -.3325 | 3.2200 | 3.5425 | -.3225 |
| Apr. | 2.8700 | 3.1875 | -.3175 | 3.1700 | 3.5550 | -.3850 |
| | 2.9400 | 3.1475 | -.2075 | 3.1400 | 3.5025 | -.3625 |
| | 2.9300 | 3.1850 | -.2550 | 3.1500 | 3.5100 | -.3600 |
| | 2.9300 | 3.1800 | -.2500 | 3.0800 | 3.4350 | -.3550 |
| May | 2.9100 | 3.1675 | -.2575 | 3.1900 | 3.4900 | -.3000 |
| | 2.8300 | 3.0650 | -.2350 | 3.1500 | 3.4400 | -.2900 |
| | 2.9100 | 3.1025 | -.1925 | 3.2500 | 3.5525 | -.3025 |
| | 2.8300 | 3.0450 | -.2150 | 3.2700 | 3.5350 | -.2650 |
| June | 2.8500 | 3.0425 | -.1925 | 3.1800 | 3.4575 | -.2775 |
| | 2.8700 | 3.1150 | -.2450 | 3.2000 | 3.4625 | -.2625 |
| | 2.8400 | 3.1400 | -.3000 | 3.2200 | 3.5225 | -.3025 |
| | 2.8800 | 3.1900 | -.3100 | 3.2100 | 3.5000 | -.2900 |
| July | 2.8400 | 3.1950 | -.3550 | 3.1700 | 3.4850 | -.3150 |
| | 2.9400 | 3.3375 | -.3975 | 3.1700 | 3.4950 | -.3250 |
| | 2.9600 | 3.3575 | -.3975 | 3.2000 | 3.5600 | -.3600 |
| | 2.9700 | | | 3.0000 | | |
| | 3.0800 | | | 2.9300 | | |
| Aug. | 3.0500 | | | 2.9700 | | |
| | 3.2300 | | | 2.9400 | | |
| | 3.1800 | | | 2.8700 | | |
| | 3.0200 | | | 2.9000 | | |

Figure 1A.


Clarkfield Cash Corn and July Futures Prices
82/83 Marketing Year
July Futures
Clkfld Cash
Dollars Per Bushel
3.70
3.20
2.70
2.20
1.70
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Month

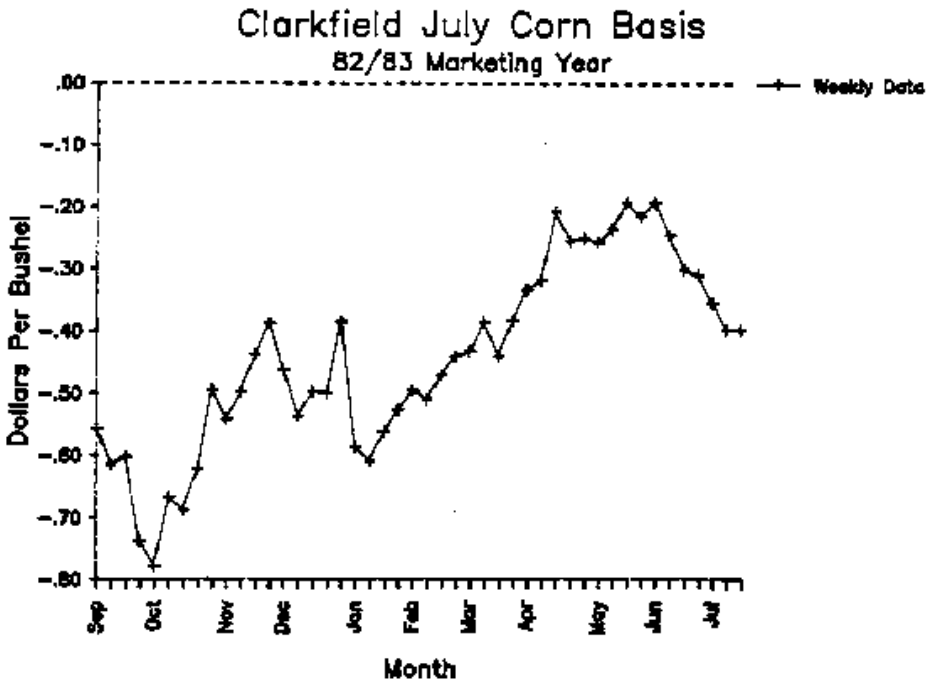
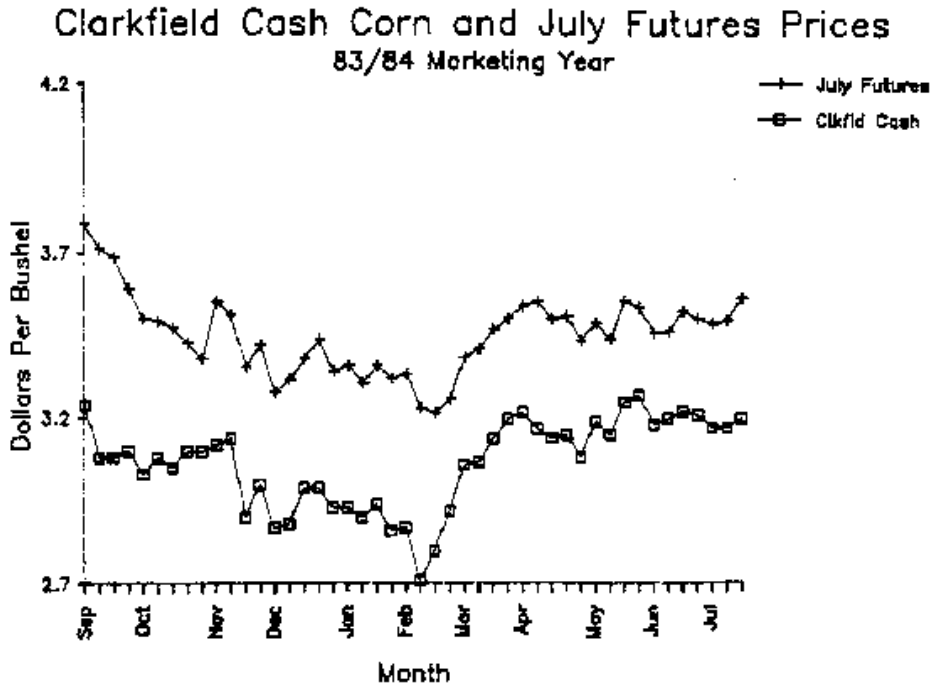

Clarkfield July Corn Basis
82/83 Marketing Year
Weekly Data
Dollars Per Bushel
.00
-.10
-.20
-.30
-.40
-.50
-.60
-.70
-.80
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Month

Figure 2A.


Clarkfield Cash Corn and July Futures Prices
83/84 Marketing Year
July Futures
Clkfld Cash
4.2
3.7
3.2
2.7
Dollars Per Bushel
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Month

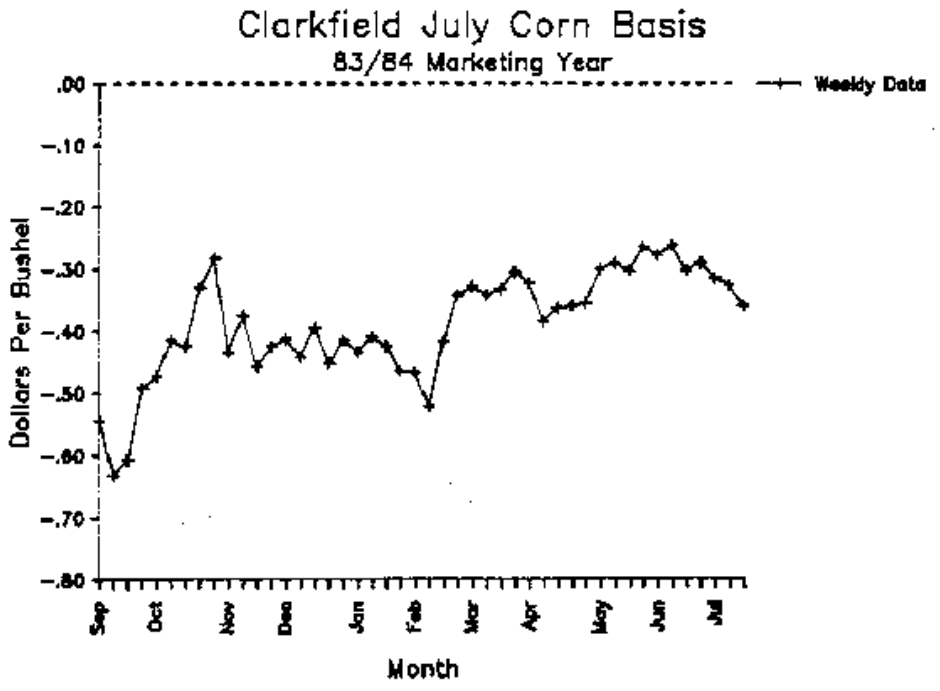

Clarkfield July Corn Basis
83/84 Marketing Year
Weekly Data
.00
-.10
-.20
-.30
-.40
-.50
-.60
-.70
-.80
Dollars Per Bushel
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Month

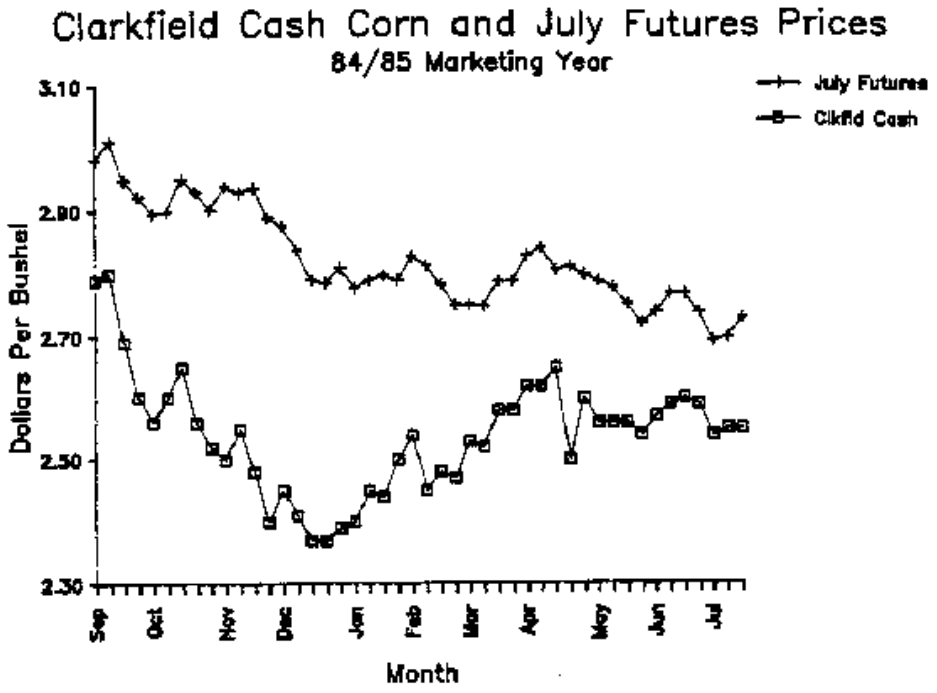
Table 3A.

Table 4A.

**CLARKFIELD CASH CORN AND JULY FUTURES PRICES**

| | 1984/85 | | | 1985/86 | | |
|---|---|---|---|---|---|---|
| | Clarkfield Cash | July Futures Price | Basis | Clarkfield Cash | July Futures Price | Basis |
| Sept. | 2.7900 | 2.9825 | -.1925 | 2.3000 | 2.3750 | -.0750 |
| | 2.8000 | 3.0125 | -.2125 | 2.4000 | 2.3750 | .0250 |
| | 2.6900 | 2.9500 | -.2600 | 2.2000 | 2.4100 | -.2100 |
| | 2.6000 | 2.9225 | -.3225 | 2.2500 | 2.4425 | -.1925 |
| Oct. | 2.5600 | 2.8950 | -.3350 | 2.2200 | 2.4400 | -.2200 |
| | 2.6000 | 2.8975 | -.2975 | 2.2700 | 2.4225 | -.1525 |
| | 2.6500 | 2.9500 | -.3000 | 2.1000 | 2.4250 | -.3250 |
| | 2.5600 | 2.9300 | -.3700 | 2.2100 | 2.4550 | -.2450 |
| | 2.5200 | 2.9000 | -.3800 | 2.1800 | 2.4450 | -.2650 |
| Nov. | 2.5000 | 2.9375 | -.4375 | 2.2000 | 2.5200 | -.3200 |
| | 2.5500 | 2.9275 | -.3775 | 2.1500 | 2.4800 | -.3300 |
| | 2.4800 | 2.9350 | -.4550 | 2.2200 | 2.4350 | -.2150 |
| | 2.4000 | 2.8875 | -.4875 | 2.2100 | 2.4025 | -.1925 |
| Dec. | 2.4500 | 2.8750 | -.4250 | 2.2400 | 2.4675 | -.2275 |
| | 2.4100 | 2.8375 | -.4275 | 2.2800 | 2.4725 | -.1925 |
| | 2.3700 | 2.7900 | -.4200 | 2.2900 | 2.5575 | -.2675 |
| | 2.3700 | 2.7850 | -.4150 | 2.3100 | 2.5350 | -.2250 |
| Jan. | 2.3900 | 2.8100 | -.4200 | 2.3100 | 2.5300 | -.2200 |
| | 2.4000 | 2.7775 | -.3775 | 2.3000 | 2.5250 | -.2250 |
| | 2.4500 | 2.7900 | -.3400 | 2.2200 | 2.5150 | -.2950 |
| | 2.4400 | 2.7975 | -.3575 | 2.2700 | 2.5025 | -.2325 |
| | 2.5000 | 2.7900 | -.2900 | 2.2500 | 2.4300 | -.1800 |
| Feb. | 2.5400 | 2.8275 | -.2875 | 2.2400 | 2.4375 | -.1975 |
| | 2.4500 | 2.8125 | -.3625 | 2.2100 | 2.3875 | -.1575 |
| | 2.4800 | 2.7825 | -.3025 | 2.3000 | 2.3600 | -.0600 |
| | 2.4700 | 2.7500 | -.2800 | 2.2200 | 2.3175 | -.0975 |
| Mar. | 2.5300 | 2.7500 | -.2200 | 2.1300 | 2.2425 | -.1125 |
| | 2.5200 | 2.7475 | -.2275 | 2.1700 | 2.2775 | -.1075 |
| | 2.5800 | 2.7875 | -.2075 | 2.2100 | 2.3275 | -.1175 |
| | 2.5800 | 2.7875 | -.2075 | 2.2300 | 2.2725 | -.0425 |
| | 2.6200 | 2.8275 | -.2075 | 2.2200 | 2.3225 | -.1025 |
| Apr. | 2.6200 | 2.8400 | -.2200 | 2.1200 | 2.2750 | -.1550 |
| | 2.6500 | 2.8050 | -.1550 | 2.1000 | 2.1850 | -.0850 |
| | 2.5000 | 2.8100 | -.3100 | 2.2000 | 2.2075 | -.0075 |
| | 2.6000 | 2.7975 | -.1975 | 2.1500 | 2.2275 | -.0775 |
| May | 2.5600 | 2.7875 | -.2275 | 2.2300 | 2.3050 | -.0750 |
| | 2.5600 | 2.7775 | -.2175 | 2.3000 | 2.3950 | -.0950 |
| | 2.5600 | 2.7500 | -.1900 | 2.2700 | 2.3850 | -.1150 |
| | 2.5400 | 2.7200 | -.1800 | 2.2800 | 2.3575 | -.0775 |
| June | 2.5700 | 2.7375 | -.1675 | 2.2800 | 2.3550 | -.0750 |
| | 2.5900 | 2.7675 | -.1775 | 2.3100 | 2.3650 | -.0550 |
| | 2.6000 | 2.7675 | -.1675 | 2.2400 | 2.3150 | -.0750 |
| | 2.5900 | 2.7375 | -.1475 | 2.1400 | 2.3200 | -.1800 |
| July | 2.5400 | 2.6925 | -.1525 | 1.8500 | 2.0775 | -.2275 |
| | 2.5500 | 2.6975 | -.1475 | 1.6700 | 1.9425 | -.2725 |
| | 2.5500 | 2.7275 | -.1775 | 1.8300 | 2.1425 | -.3125 |
| | 2.4700 | | | 1.7500 | 2.1300 | -.3800 |
| | 2.3300 | | | 1.7500 | | |
| Aug. | 2.2600 | | | 1.5000 | | |
| | 2.3500 | | | 1.5000 | | |
| | 2.2000 | | | 1.5200 | | |
| | 2.2200 | | | 1.2700 | | |

Figure 3A.


Clarkfield Cash Corn and July Futures Prices
84/85 Marketing Year
July Futures
Clkfld Cash
3.10
2.90
2.70
2.50
2.30
Dollars Per Bushel
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Month

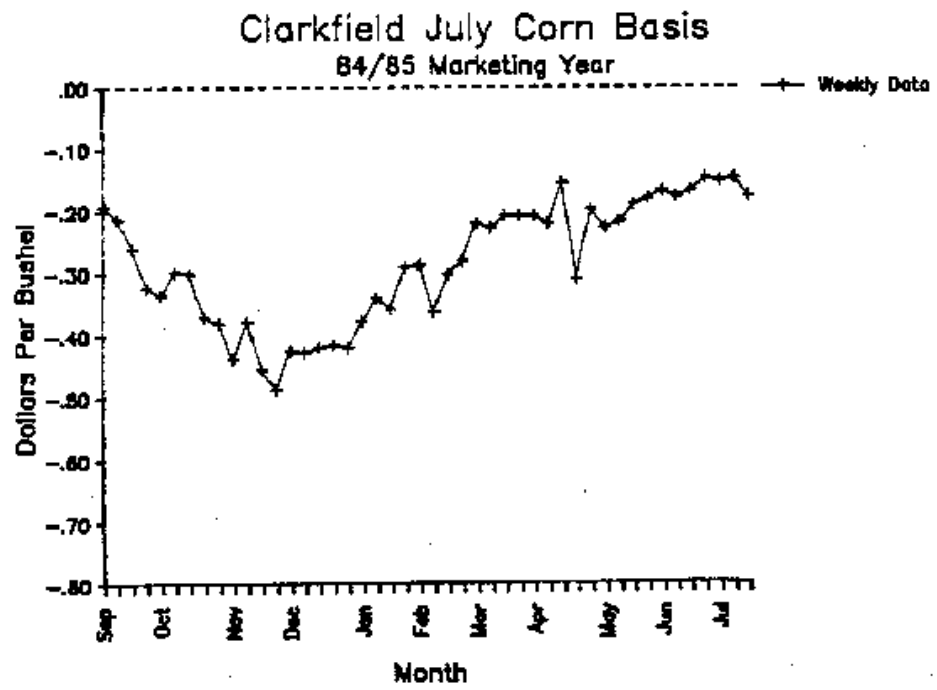
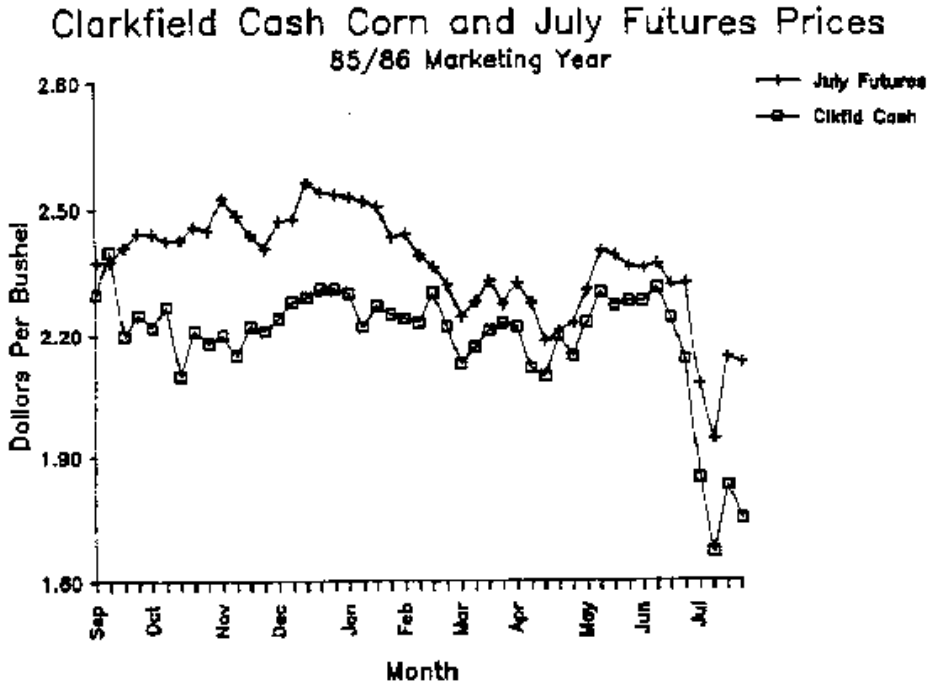

Clarkfield July Corn Basis
84/85 Marketing Year
Weekly Data
.00
-.10
-.20
-.30
-.40
-.50
-.60
-.70
-.80
Dollars Per Bushel
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Month

Figure 4A.


Clarkfield Cash Corn and July Futures Prices
85/86 Marketing Year
July Futures
Clkfld Cash
2.80
2.50
2.20
1.90
1.60
Dollars Per Bushel
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Month

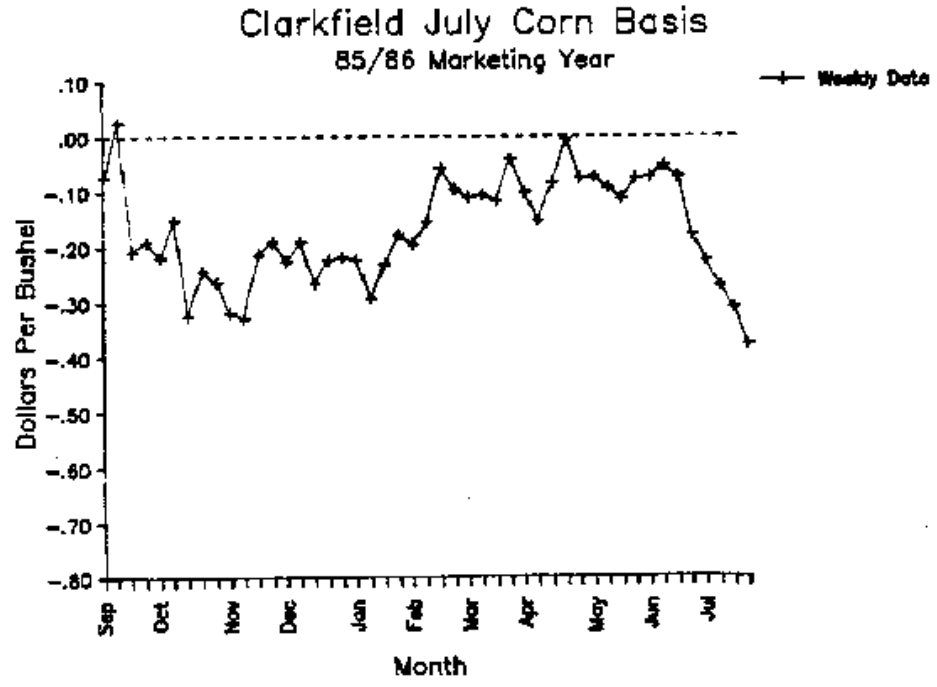

Clarkfield July Corn Basis
85/86 Marketing Year
Weekly Data
.10
.00
-.10
-.20
-.30
-.40
-.50
-.60
-.70
-.80
Dollars Per Bushel
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Month

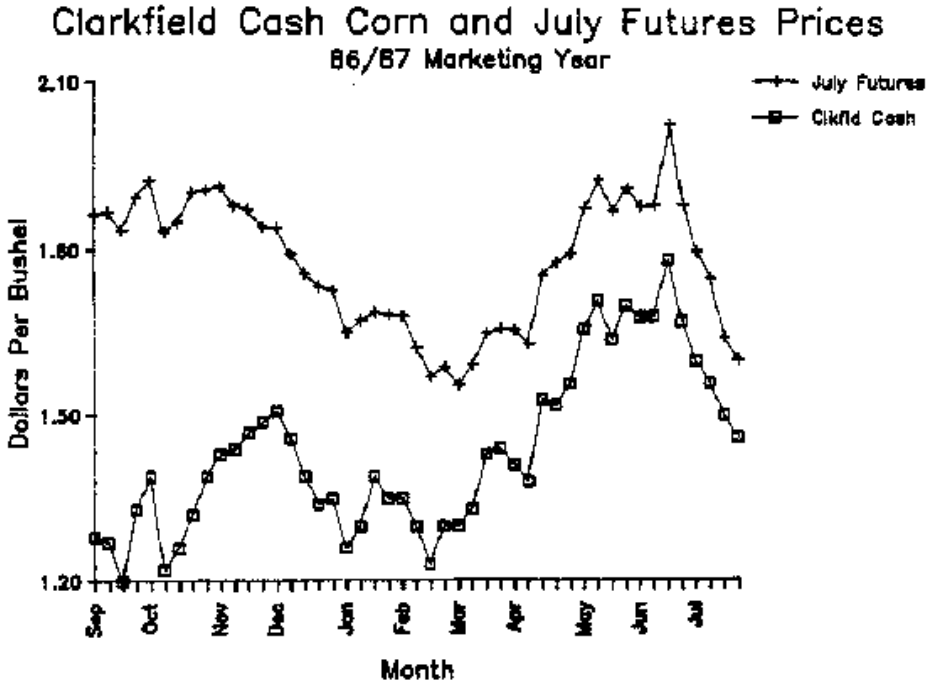
Table 5A.

Table 6A.

**CLARKFIELD CASH CORN AND JULY FUTURES PRICES**

| | 1986/87 | | | 1987/88 | | |
|---|---|---|---|---|---|---|
| | Clarkfield Cash | July Futures Price | Basis | Clarkfield Cash | July Futures Price | Basis |
| Sept. | 1.2800 | 1.8625 | -.5825 | 1.3300 | 1.8275 | -.4975 |
| | 1.2700 | 1.8675 | -.5975 | 1.4000 | 1.8900 | -.4900 |
| | 1.2000 | 1.8350 | -.6350 | 1.4300 | 1.9300 | -.5000 |
| | 1.3300 | 1.8925 | -.5625 | 1.4100 | 1.9250 | -.5150 |
| Oct. | 1.3900 | 1.9225 | -.5325 | 1.4300 | 1.9800 | -.5500 |
| | 1.2200 | 1.8325 | -.6125 | 1.4200 | 1.9825 | -.5625 |
| | 1.2600 | 1.8500 | -.5900 | 1.4300 | 2.0300 | -.6000 |
| | 1.3200 | 1.9000 | -.5800 | 1.4300 | 2.0100 | -.5800 |
| | 1.3900 | 1.9050 | -.5150 | 1.5000 | 1.9650 | -.4650 |
| Nov. | 1.4300 | 1.9100 | -.4800 | 1.4700 | 1.9025 | -.4325 |
| | 1.4400 | 1.8775 | -.4375 | 1.5400 | 1.9550 | -.4150 |
| | 1.4700 | 1.8700 | -.4000 | 1.5900 | 2.0025 | -.4125 |
| | 1.4900 | 1.8400 | -.3500 | 1.6600 | 2.0225 | -.3625 |
| Dec. | 1.5100 | 1.8375 | -.3275 | 1.6700 | 2.0425 | -.3725 |
| | 1.4600 | 1.7925 | -.3325 | 1.6600 | 1.9975 | -.3375 |
| | 1.3900 | 1.7575 | -.3675 | 1.6200 | 1.9675 | -.3475 |
| | 1.3400 | 1.7350 | -.3950 | 1.6100 | 1.9975 | -.3875 |
| Jan. | 1.3500 | 1.7275 | -.3775 | 1.5700 | 1.9700 | -.4000 |
| | 1.2600 | 1.6525 | -.3925 | 1.6000 | 1.9725 | -.3725 |
| | 1.3000 | 1.6750 | -.3750 | 1.6800 | 2.0275 | -.3475 |
| | 1.3900 | 1.6900 | -.3000 | 1.7400 | 2.1100 | -.3700 |
| | 1.3500 | 1.6850 | -.3350 | 1.7500 | 2.1100 | -.3600 |
| Feb. | 1.3500 | 1.6825 | -.3325 | 1.7000 | 2.0675 | -.3675 |
| | 1.3000 | 1.6250 | -.3250 | 1.7800 | 2.1225 | -.3425 |
| | 1.2300 | 1.5725 | -.3425 | 1.7300 | 2.0875 | -.3575 |
| | 1.3000 | 1.5900 | -.2900 | 1.6700 | 2.0750 | -.4050 |
| Mar. | 1.3000 | 1.5575 | -.2575 | 1.7300 | 2.1350 | -.4050 |
| | 1.3300 | 1.5950 | -.2650 | 1.7600 | 2.1100 | -.3500 |
| | 1.4300 | 1.6525 | -.2225 | 1.7600 | 2.1000 | -.3400 |
| | 1.4400 | 1.6600 | -.2200 | 1.7500 | 2.1200 | -.3700 |
| | 1.4100 | 1.6575 | -.2475 | 1.7800 | 2.1700 | -.3900 |
| Apr. | 1.3800 | 1.6325 | -.2525 | 1.7600 | 2.1550 | -.3950 |
| | 1.5300 | 1.7550 | -.2250 | 1.8000 | 2.1375 | -.3375 |
| | 1.5200 | 1.7775 | -.2575 | 1.8000 | 2.1325 | -.3325 |
| | 1.5600 | 1.7925 | -.2325 | 1.7600 | 2.0900 | -.3300 |
| May | 1.6600 | 1.8725 | -.2125 | 1.8300 | 2.1300 | -.3000 |
| | 1.7100 | 1.9225 | -.2125 | 1.7800 | 2.0875 | -.3075 |
| | 1.6400 | 1.8675 | -.2275 | 1.8500 | 2.1375 | -.2875 |
| | 1.7000 | 1.9075 | -.2075 | 1.8700 | 2.1700 | -.3000 |
| June | 1.6800 | 1.8750 | -.1950 | 1.9200 | 2.2425 | -.3225 |
| | 1.6800 | 1.8775 | -.1975 | 2.2000 | 2.5725 | -.3725 |
| | 1.7800 | 2.0225 | -.2425 | 2.3400 | 2.6950 | -.3550 |
| | 1.6700 | 1.8775 | -.2075 | 3.0600 | 3.3450 | -.2850 |
| July | 1.6000 | 1.7950 | -.1950 | 2.7200 | 3.3750 | -.6550 |
| | 1.5600 | 1.7475 | -.1875 | 2.9300 | 3.4400 | -.5100 |
| | 1.5000 | 1.6425 | -.1425 | 2.6700 | 3.0600 | -.3900 |
| | 1.4600 | 1.6025 | -.1425 | 2.5900 | 3.0850 | -.4950 |
| | 1.4800 | | | 2.3600 | | |
| Aug. | 1.3200 | | | 2.5300 | | |
| | 1.2600 | | | 2.4900 | | |
| | 1.3300 | | | 2.4500 | | |
| | 1.3500 | | | 2.3800 | | |
| | | | | 2.4200 | | |

Figure 5A.


Clarkfield Cash Corn and July Futures Prices
86/87 Marketing Year
July Futures
Clkfld Cash
2.10
1.80
1.50
1.20
Dollars Per Bushel
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Month

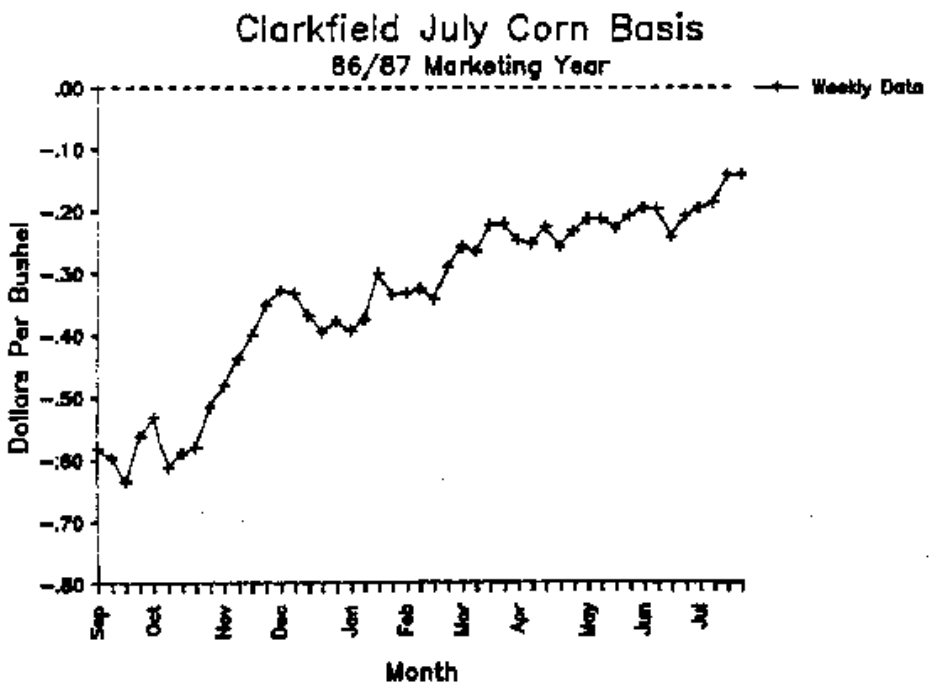
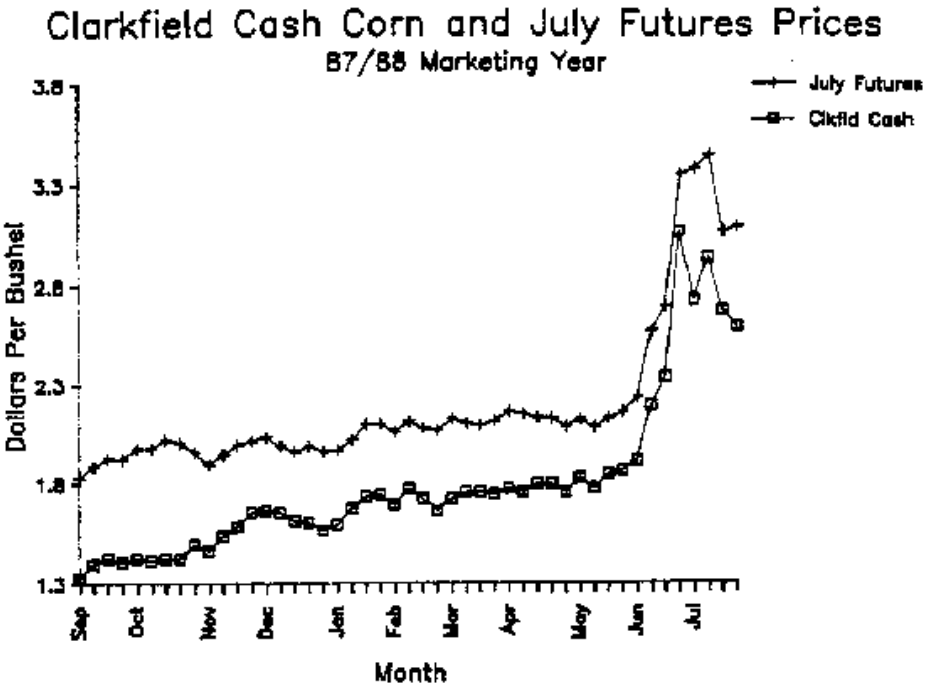

Clarkfield July Corn Basis
86/87 Marketing Year
Weekly Data
.00
-.10
-.20
-.30
-.40
-.50
-.60
-.70
-.80
Dollars Per Bushel
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Month

Figure 6A.


Clarkfield Cash Corn and July Futures Prices
87/88 Marketing Year
July Futures
Clkfld Cash
Dollars Per Bushel
3.8
3.3
2.8
2.3
1.8
1.3
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Month

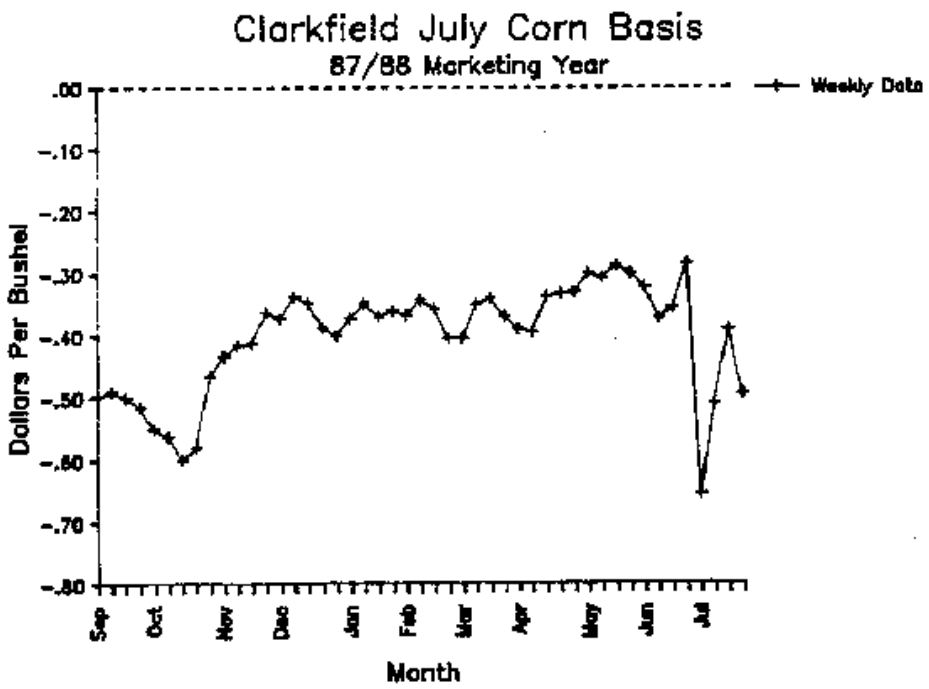

Clarkfield July Corn Basis
87/88 Marketing Year
Weekly Data
Dollars Per Bushel
.00
-.10
-.20
-.30
-.40
-.50
-.60
-.70
-.80
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Month

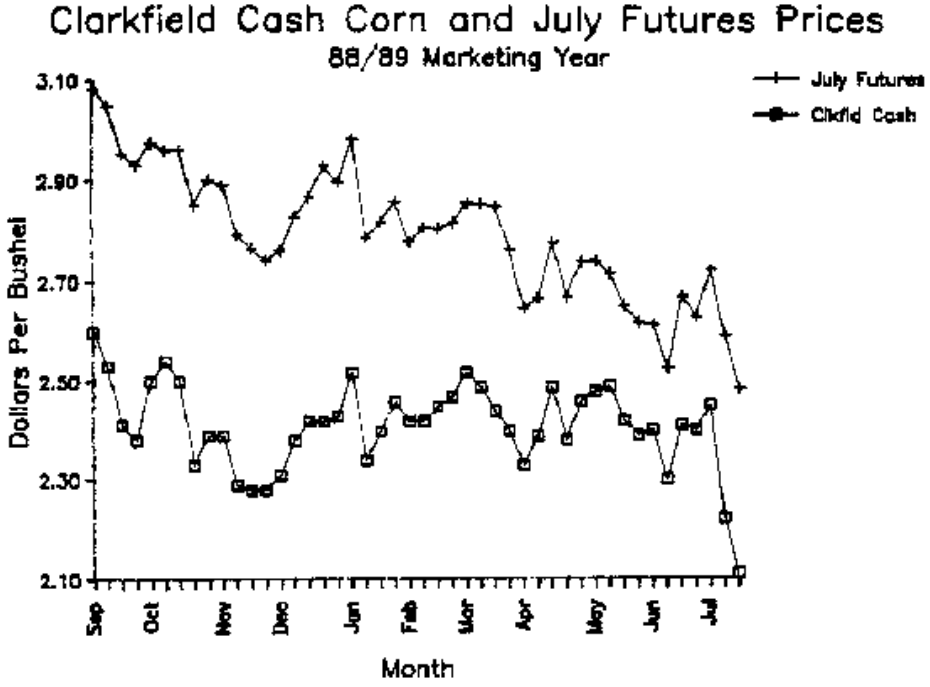
Table 7A.

Table 8A.

## CLARKFIELD CASH CORN AND JULY FUTURES PRICES

| | 1988/89 | | | 1989/90 | | |
|---|---|---|---|---|---|---|
| | Clarkfield Cash | July Futures Price | Basis | Clarkfield Cash | July Futures Price | Basis |
| Sept. | 2.6000 | 3.0825 | +.4825 | 2.0700 | 2.4800 | +.4100 |
| | 2.5300 | 3.0475 | +.5175 | 2.0800 | 2.4925 | +.4125 |
| | 2.4100 | 2.9525 | +.5425 | 2.0500 | 2.4200 | +.3700 |
| | 2.3800 | 2.9300 | +.5500 | 2.0300 | 2.4600 | +.4300 |
| Oct. | 2.5000 | 2.9750 | +.4750 | 2.1100 | 2.5750 | +.4650 |
| | 2.5400 | 2.9600 | +.4200 | 2.0000 | 2.4850 | +.4850 |
| | 2.5000 | 2.9600 | +.4600 | 2.0500 | 2.4950 | +.4450 |
| | 2.3300 | 2.8500 | +.5200 | 2.0800 | 2.5075 | +.4275 |
| | 2.3900 | 2.9000 | +.5100 | 2.1100 | 2.4925 | +.3825 |
| Nov. | 2.3900 | 2.8900 | +.5000 | 2.1400 | 2.4900 | +.3500 |
| | 2.2900 | 2.7925 | +.5025 | 2.1700 | 2.4900 | +.3200 |
| | 2.2800 | 2.7650 | +.4850 | 2.1600 | 2.5075 | +.3475 |
| | 2.2800 | 2.7425 | +.4625 | 2.1200 | 2.4650 | +.3450 |
| Dec. | 2.3100 | 2.7625 | +.4525 | 2.1100 | 2.4700 | +.3600 |
| | 2.3800 | 2.8275 | +.4475 | 2.1200 | 2.4825 | +.3625 |
| | 2.4200 | 2.8675 | +.4475 | 2.1800 | 2.4725 | +.2925 |
| | 2.4200 | 2.9300 | +.5100 | 2.1500 | 2.4850 | +.3350 |
| Jan. | 2.4300 | 2.8975 | +.4675 | 2.1200 | 2.4800 | +.3600 |
| | 2.5200 | 2.9825 | +.4625 | 2.1000 | 2.4950 | +.3950 |
| | 2.3400 | 2.7875 | +.4475 | 2.1100 | 2.5375 | +.4275 |
| | 2.4000 | 2.8175 | +.4175 | 2.0800 | 2.5100 | +.4300 |
| | 2.4600 | 2.8575 | +.3975 | 2.0500 | 2.4825 | +.4325 |
| Feb. | 2.4200 | 2.7800 | +.3600 | 2.0500 | 2.4725 | +.4225 |
| | 2.4200 | 2.8075 | +.3875 | 2.0900 | 2.5200 | +.4300 |
| | 2.4500 | 2.8050 | +.3550 | 2.1100 | 2.5275 | +.4175 |
| | 2.4700 | 2.8175 | +.3475 | 2.1600 | 2.5575 | +.3975 |
| Mar. | 2.5200 | 2.8550 | +.3350 | 2.1700 | 2.5575 | +.3875 |
| | 2.4900 | 2.8525 | +.3625 | 2.1600 | 2.5650 | +.4050 |
| | 2.4400 | 2.8475 | +.4075 | 2.2700 | 2.6425 | +.3725 |
| | 2.4000 | 2.7625 | +.3625 | 2.2800 | 2.6450 | +.3650 |
| | 2.3300 | 2.6475 | +.3175 | 2.3400 | 2.6950 | +.3550 |
| Apr. | 2.3900 | 2.6675 | +.2775 | 2.4100 | 2.7375 | +.3275 |
| | 2.4900 | 2.7775 | +.2875 | 2.4100 | 2.7575 | +.3475 |
| | 2.3800 | 2.6700 | +.2900 | 2.4400 | 2.7700 | +.3300 |
| | 2.4600 | 2.7400 | +.2800 | 2.5200 | 2.8475 | +.3275 |
| May | 2.4800 | 2.7400 | +.2600 | 2.5700 | 2.8950 | +.3250 |
| | 2.4900 | 2.7150 | +.2250 | 2.5000 | 2.8475 | +.3475 |
| | 2.4200 | 2.6500 | +.2300 | 2.4000 | 2.7475 | +.3475 |
| | 2.3900 | 2.6175 | +.2275 | 2.5100 | 2.8425 | +.3325 |
| June | 2.4000 | 2.6125 | +.2125 | 2.4500 | 2.7825 | +.3325 |
| | 2.3000 | 2.5250 | +.2250 | 2.5700 | 2.9225 | +.3525 |
| | 2.4100 | 2.6675 | +.2575 | 2.5500 | 2.8650 | +.3150 |
| | 2.4000 | 2.6275 | +.2275 | 2.5700 | 2.8575 | +.2875 |
| July | 2.4500 | 2.7200 | +.2700 | 2.6000 | 2.9425 | +.3425 |
| | 2.2200 | 2.5900 | +.3700 | 2.4900 | 2.8275 | +.3375 |
| | 2.1100 | 2.4825 | +.3725 | 2.3700 | 2.7350 | +.3650 |
| | 2.0900 | | | 2.3900 | | |
| | 1.9700 | | | 2.4000 | | |
| Aug. | 2.0300 | | | 2.3100 | | |
| | 2.1100 | | | 2.2200 | | |
| | 2.1300 | | | 2.2700 | | |
| | 2.0300 | | | 2.2200 | | |

Figure 7A.


Clarkfield Cash Corn and July Futures Prices
88/89 Marketing Year
July Futures
Clkfld Cash
Dollars Per Bushel
3.10
2.90
2.70
2.50
2.30
2.10
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Month

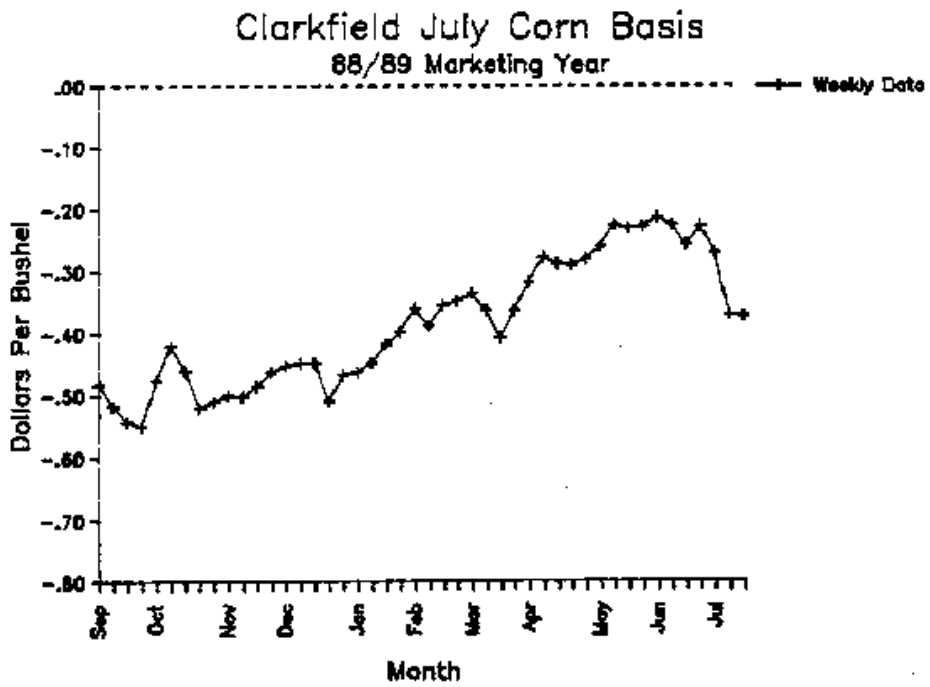
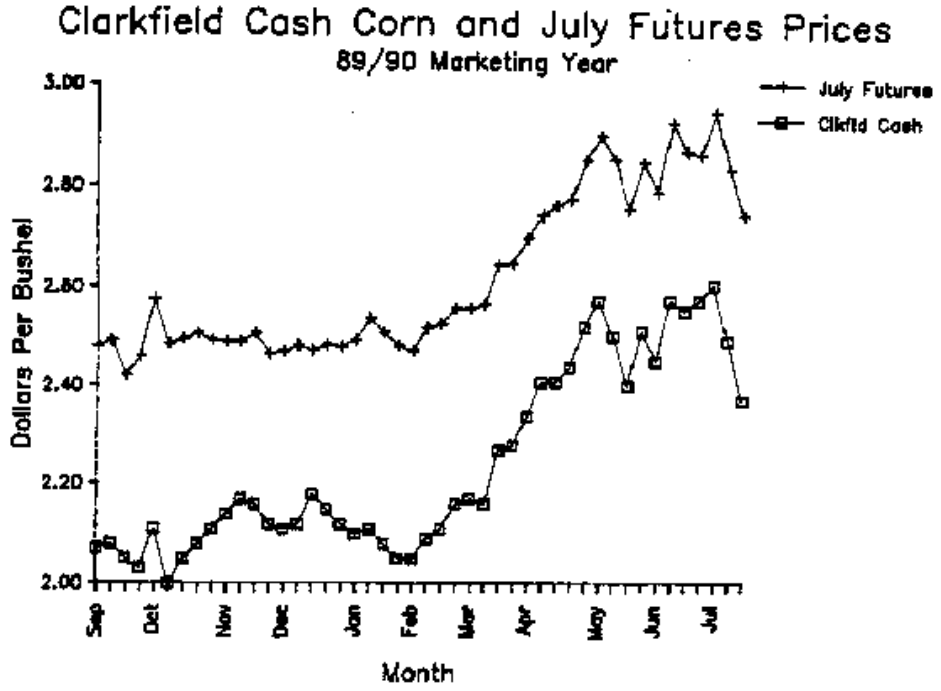

Clarkfield July Corn Basis
88/89 Marketing Year
Weekly Data
Dollars Per Bushel
.00
-.10
-.20
-.30
-.40
-.50
-.60
-.70
-.80
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Month

Figure 8A.


Clarkfield Cash Corn and July Futures Prices
89/90 Marketing Year
July Futures
Clkfld Cash
3.00
2.80
2.60
2.40
2.20
2.00
Dollars Per Bushel
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Month

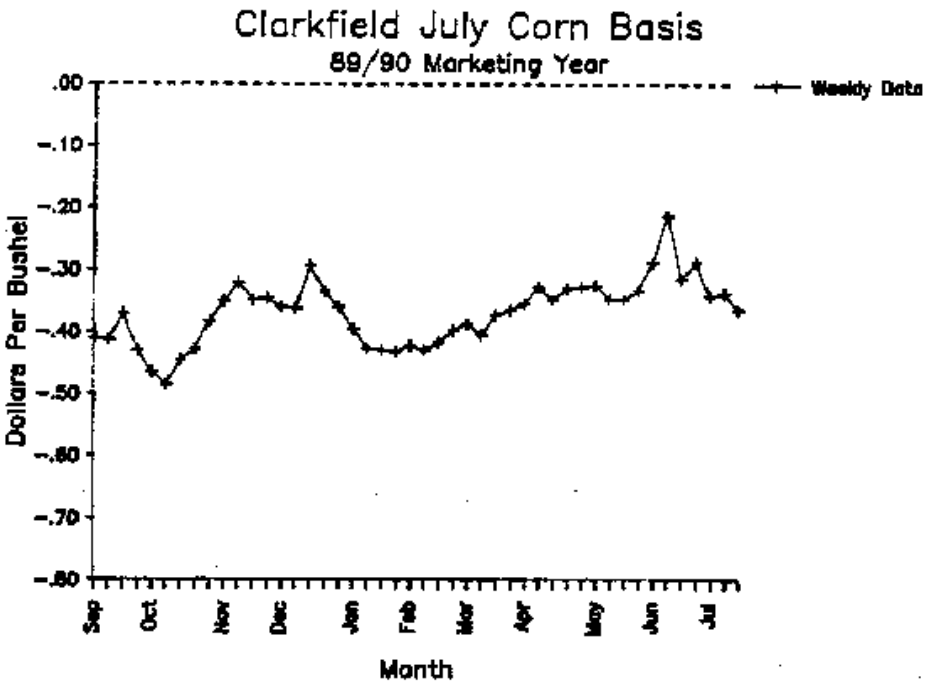

Clarkfield July Corn Basis
89/90 Marketing Year
Weekly Data
.00
-.10
-.20
-.30
-.40
-.50
-.60
-.70
-.80
Dollars Per Bushel
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Month

Table 9A **CLARKFIELD CASH CORN AND JULY FUTURES PRICES**

1990/91

| | Clarkfield Cash | July Futures Price | Basis |
|---|---|---|---|
| Sept. | 2.1000 | 2.5475 | -.4475 |
| | 2.0600 | 2.5525 | -.4925 |
| | 1.9500 | 2.4675 | -.5175 |
| | 1.9600 | 2.4700 | -.5100 |
| Oct. | 1.9200 | 2.4425 | -.5225 |
| | 2.0100 | 2.5325 | -.5225 |
| | 1.9100 | 2.4525 | -.5425 |
| | 1.9600 | 2.5050 | -.5450 |
| | 1.9700 | 2.5150 | -.5450 |
| Nov. | 1.9700 | 2.5175 | -.5475 |
| | 2.0000 | 2.5225 | -.5225 |
| | 2.0000 | 2.4625 | -.4625 |
| | 2.0100 | 2.4475 | -.4375 |
| Dec. | 2.1000 | 2.5025 | -.4025 |
| | 2.0300 | 2.5300 | -.5000 |
| | 2.0500 | 2.5225 | -.4725 |
| | 2.0600 | 2.4750 | -.4150 |
| Jan. | 2.0400 | 2.4625 | -.4225 |
| | 2.0600 | 2.4875 | -.4275 |
| | 2.0600 | 2.4700 | -.4100 |
| | 2.1200 | 2.5325 | -.4125 |
| | 2.1900 | 2.5850 | -.3950 |
| Feb. | 2.1400 | 2.5875 | -.4475 |
| | 2.1300 | 2.5625 | -.4325 |
| | 2.1200 | 2.5500 | -.4300 |
| | 2.1600 | 2.5550 | -.3950 |
| Mar. | 2.2100 | 2.6325 | -.4225 |
| | 2.2400 | 2.6150 | -.3750 |
| | 2.2200 | 2.5600 | -.3400 |
| | 2.2300 | 2.5925 | -.3625 |
| | 2.3000 | 2.6475 | -.3475 |
| Apr. | 2.2900 | 2.6625 | -.3725 |
| | 2.3200 | 2.6375 | -.3175 |
| | 2.3700 | 2.6150 | -.2450 |
| | 2.2800 | 2.5550 | -.2750 |
| May | 2.2800 | 2.5550 | -.2750 |
| | 2.2200 | 2.4525 | -.2325 |
| | 2.2500 | 2.4750 | -.2250 |
| | 2.2100 | 2.4325 | -.2225 |
| June | 2.2300 | 2.4675 | -.2375 |
| | 2.1200 | 2.3675 | -.2475 |
| | 2.1800 | 2.3775 | -.1975 |
| | 2.1800 | 2.3750 | -.1950 |
| July | 2.0900 | 2.3275 | -.2375 |
| | 2.0300 | 2.2450 | -.2150 |

| | | | |
|---|---|---|---|
| | 2.1600 | 2.3800 | -.2200 |
| | 2.2000 | | |
| | 2.2000 | | |
| Aug. | 2.1800 | | |
| | 2.2000 | | |
| | 2.0100 | | |
| | 2.2400 | | |

*No July Futures Price for this date.

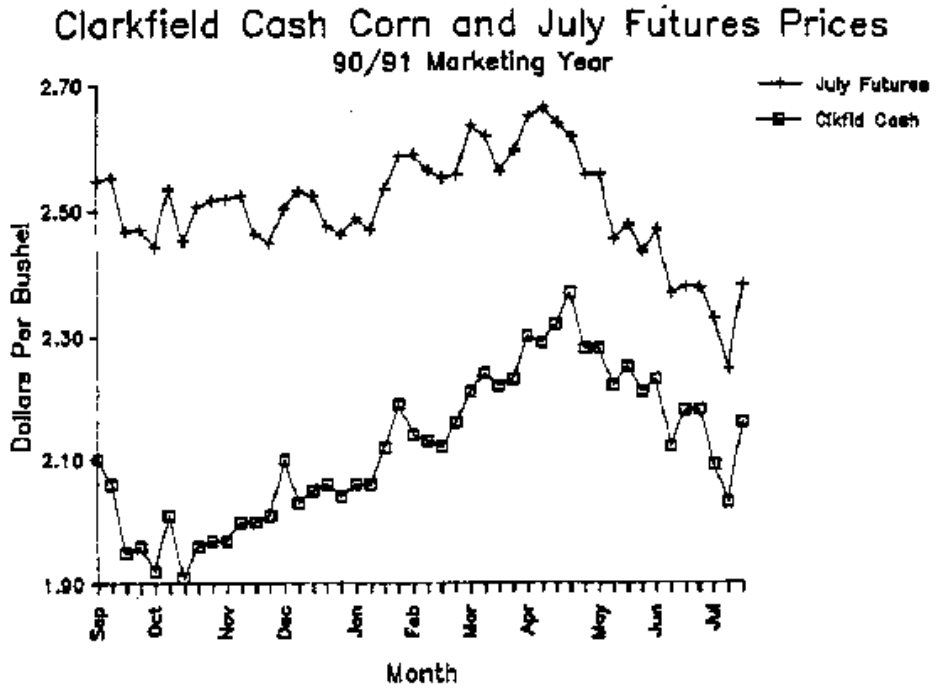
Table 10A **CLARKFIELD CASH CORN AND JULY FUTURES PRICES**

1991/92

| Clarkfield Cash | July Futures Price | Basis |
|---|---|---|
| 2.2800 | 2.6850 | -.4050 |
| 2.2000 | 2.6425 | -.4425 |
| 2.2400 | 2.6825 | -.4425 |
| 2.1100 | 2.6400 | -.5300 |
| 2.1700 | 2.7000 | -.5300 |
| 2.1300 | 2.6750 | -.5450 |
| 2.0500 | 2.6700 | -.6200 |
| 2.1300 | 2.7525 | -.6225 |
| 2.1200 | 2.7250 | -.6050 |
| 2.1700 | 2.6875 | -.5175 |
| 2.1400 | 2.6425 | -.5025 |
| 2.0900 | 2.6225 | -.5325 |
| 2.1200 | 2.6050 | -.4850 |
| 2.0900 | 2.6025 | -.5125 |
| 2.1000 | 2.5750 | -.4750 |
| 2.1800 | 2.6425 | -.4625 |
| 2.1900 | 2.6475 | -.4575 |
| 2.1600 | 2.6225 | -.4625 |
| 2.0900 | 2.6125 | -.5225 |
| 2.1700 | 2.6975 | -.5275 |
| 2.2100 | 2.7050 | -.4950 |
| 2.2500 | 2.7525 | -.5025 |
| 2.3100 | 2.7950 | -.4850 |
| 2.2600 | 2.7425 | -.4825 |
| 2.2700 | 2.7750 | -.5050 |
| 2.3000 | 2.7400 | -.4400 |
| 2.3700 | 2.8100 | -.4400 |
| 2.4000 | 2.8075 | -.4075 |
| 2.3600 | 2.7550 | -.3950 |
| 2.3400 | 2.7650 | -.4250 |
| 2.3100 | 2.6925 | -.3825 |
| 2.2900 | 2.6225 | -.3325 |
| 2.2600 | * | * |
| 2.3300 | 2.6075 | -.2775 |
| 2.2800 | 2.5125 | -.2325 |
| 2.3000 | 2.5775 | -.2775 |
| 2.3400 | 2.5950 | -.2550 |
| 2.2700 | 2.5425 | -.2725 |
| 2.3200 | 2.5625 | -.2425 |
| 2.3600 | 2.6300 | -.2700 |
| 2.3700 | 2.6400 | -.2700 |
| 2.2400 | 2.4975 | -.2575 |
| 2.3100 | 2.5125 | -.2025 |
| 2.2300 | 2.4825 | -.2525 |
| 2.2300 | 2.4375 | -.2075 |
| 2.1000 | 2.3425 | -.2425 |

2.0800 2.2700
2.0300
2.0000
1.9800
2.0100
2.0800

Figure 9A.


Clarkfield Cash Corn and July Futures Prices
90/91 Marketing Year
July Futures
Clkfld Cash
Dollars Per Bushel
2.70
2.50
2.30
2.10
1.90
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Month

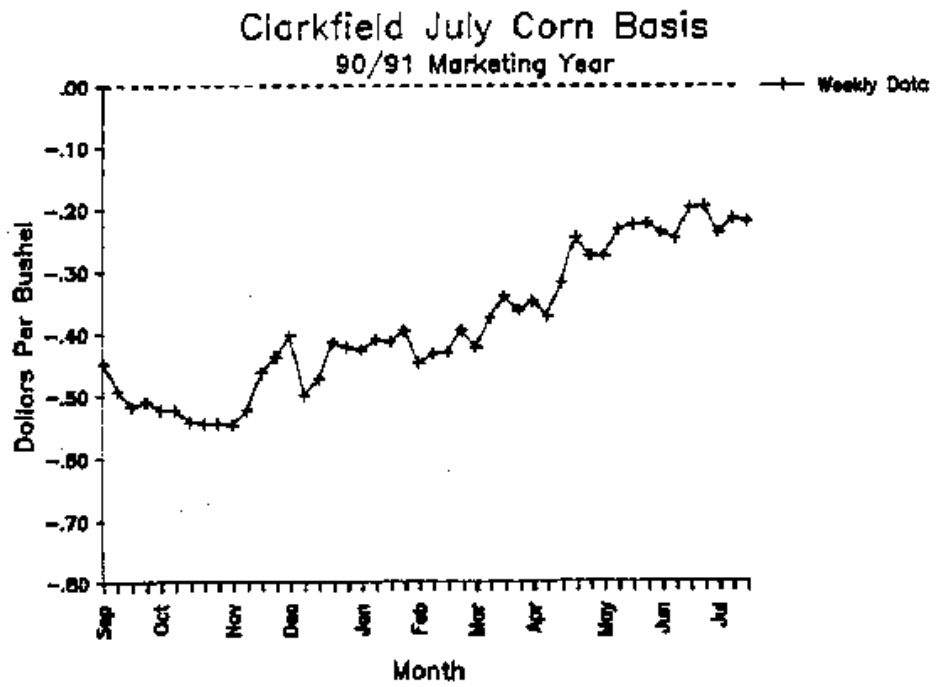
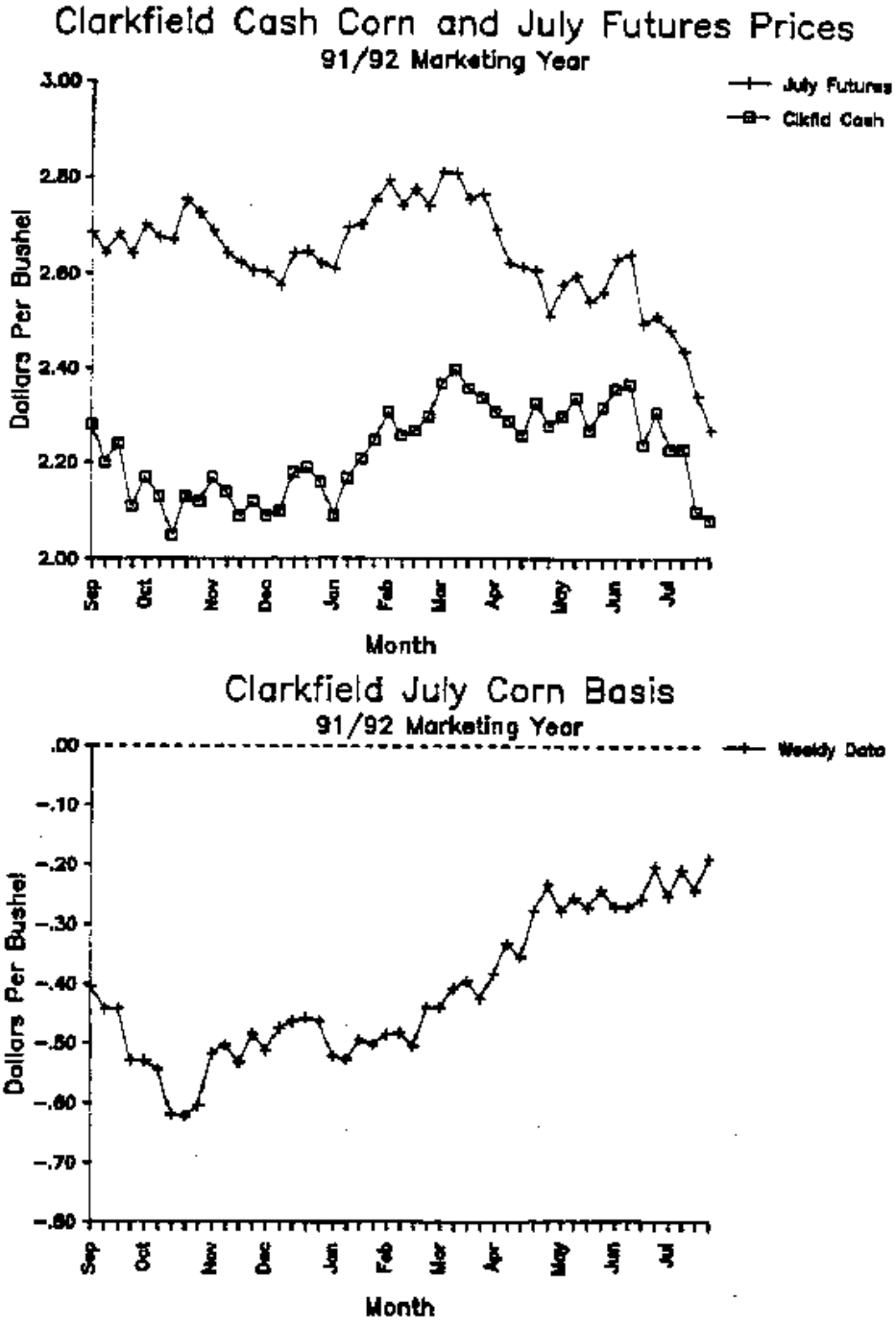

Clarkfield July Corn Basis
90/91 Marketing Year
Weekly Data
Dollars Per Bushel
.00
-.10
-.20
-.30
-.40
-.50
-.60
-.70
-.80
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Month

Figure 10A.


Clarkfield Cash Corn and July Futures Prices
91/92 Marketing Year
July Futures
Clkfld Cash
Dollars Per Bushel
3.00
2.80
2.60
2.40
2.20
2.00
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Month
Clarkfield July Corn Basis
91/92 Marketing Year
Weekly Data
Dollars Per Bushel
.00
-.10
-.20
-.30
-.40
-.50
-.60
-.70
-.80
Sep
Oct
Nov
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Month