

# **Grain Marketing and Analysis of Basis and Risk Management Strategies for Georgia, North Carolina, and South Carolina**

WORKING DRAFT

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## **CHAPTER 1: OBJECTIVE AND OVERVIEW**

### **Risk Management in U.S. Agriculture**

Agricultural producers of row crops face a myriad of sources of risk. Some of these risks include production, price, financial, legal, environmental, health, and government policy. Although all of these are important, agricultural economists interested in marketing are mostly concerned with managing price risk. Alternatives for managing price risk include marketing instruments (a wide range of cash grain contracts, futures markets, and options markets) and crop insurance (revenue insurance). A risk management plan or safety net can be established by implementing a balanced risk plan that involves taking action to be adequately protected from unfavorable outcomes. This plan in most situations will require utilizing a combination of marketing instruments, insurance products, and making use of the farm programs offered by the government. Marketing the focus of this publication is primarily concerned with the dual objective of managing price risk but also making a profit.

Fundamental changes in U.S. agricultural policy in recent farm bills have been aimed at encouraging producers to use market-based alternatives to manage price risk. It remains a difficult challenge to increase producer participation in such activities. Arguably, one of the most over-riding impediments to increased participation is a fundamental lack of understanding of how each of the alternatives can be utilized to manage price risk. Moreover, and perhaps more significant, is a lack of understanding on how the alternatives available can work in combination to achieve a specific objective. Not only do producers need to understand marketing instruments and crop insurance alternatives, they must also understand the current farm policy with the three-tier safety net that is in place and how this program can work in concert with market-based alternatives.

In many cases, price risk management objectives may be addressed by combining marketing instruments (cash contracts, futures, and options) with possibly revenue insurance, and the price supports offered by loan deficiency payments (LDP). The performance of such risk management plans may be highly state-dependent. That is, the optimal strategy and combination of market-based risk management instruments and government-provided support may depend upon market conditions at planting and at harvest. The ultimate challenge that producers must deal with is actually putting a risk management plan into action that adequately deals with this state-dependency. That is, a producer must make decisions concerning what they are going to plant, whether to purchase crop insurance or to self-insure, and then how and when they are going to sell their expected production (all of these decisions can be considered as part of a marketing strategy). These decisions will jointly influence the level of production and price risk exposure and of course in the end realized profits. Influencing these decisions should be a clear plan that seeks to achieve some balance between locking in a profit level, catastrophic loss insulation, and leaving some upside opportunity to benefit from more favorable marketing opportunities. This is a difficult proposition due to the uncertainties involved in production and prices and there is no "one size fits all" option since individuals' risk tolerance and financial situations affect the optimal combination of alternatives for a specific situation and there are also spatial considerations that must be taken into account. Moreover, neither marketing nor crop

insurance alone will achieve the balance of profits, loss insulation, and upside potential. Achieving this balance more than likely requires using combinations of marketing instruments, crop insurance, and the farm program in concert.

### **Price Risk Management and the Southeast Region**

This publication focuses solely on the topic of price risk management with emphasis on the Southeast region and in particular the tri-state region comprised of Georgia, North Carolina, and South Carolina. As has already been stated, price risk management is only one facet of a complete risk management plan that puts into place an effective safety net. Because of a focus toward price risk management, this publication first focuses on understanding the inherent risk involved and how it has behaved historically by noting trends and seasonal markets is important. Once these characteristics are identified and understood, one can then turn to market based alternatives to offset these price risks. The market-based instruments that are available include a wide range of cash grain contracts, futures contracts, and options contracts. Furthermore, the number of different strategies that could be utilized is infinite. This publication focuses on only some of the basic and simple strategies which are the foundation of more sophisticated strategies. Special attention is given to the Southeast region since there are distinct and unique characteristics about this region as compared to the Mid-west and corn-belt that affect choice of risk management strategies. These differences are made clear in Chapter 2 and discussed in some detail.

### **What is Price Risk?**

Price risk can be described as the possibility that the price of a physical commodity may decline. When a producer plants a crop there is an implicit assumption that at harvest or sometime thereafter they will be able to deliver their crop to a seller for a price that is profitable. However, between planting and harvest or sometime thereafter there is substantial probability for the price to either increase or decrease. In the case of the price increasing this is typically viewed as “opportunity” or good fortune. In the case of the price decreasing this is typically viewed as “risk” or bad fortune. Many factors can influence this price risk.

With the availability of futures markets and a wide range of marketing tools that utilize these futures prices, a producer can take “insurance” through effective price risk management strategies to reduce or even eliminate price risk. The inherent riskiness in cash price can be best illustrated using a probability density function (PDF) shown in Figure 1.1. A PDF plots the likelihood of prices being realized over a range of values with the distance between the curve and the horizontal axis representing the probability of that value occurring. The eventual realized cash price at harvest will be at a level somewhere along the horizontal axis. For example, at planting the PDF of cash soybean prices at harvest time might be represented by the more risky PDF shown in Figure 1.1. Based on this PDF the most likely price at harvest would be \$5.30 (the highest probability) but the price could be as low as \$4.00 or as high as \$6.50 but these extremes are not very likely. The range of values and the shape of this PDF illustrate the riskiness of the cash price. The less risky PDF although it has the same most likely outcome of \$5.30 it has a much smaller range of values and therefore has a much skinner and peaked shape. The range of this less risky PDF is \$4.50 to \$6.00.

Figure 1.1: Probability Density Function for Cash Soybean Price at Harvest

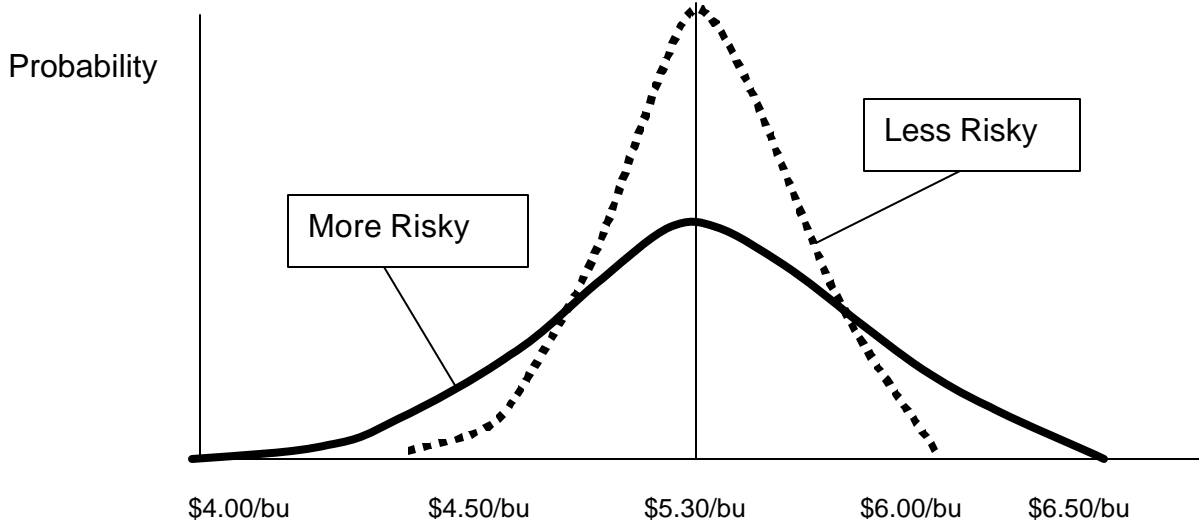
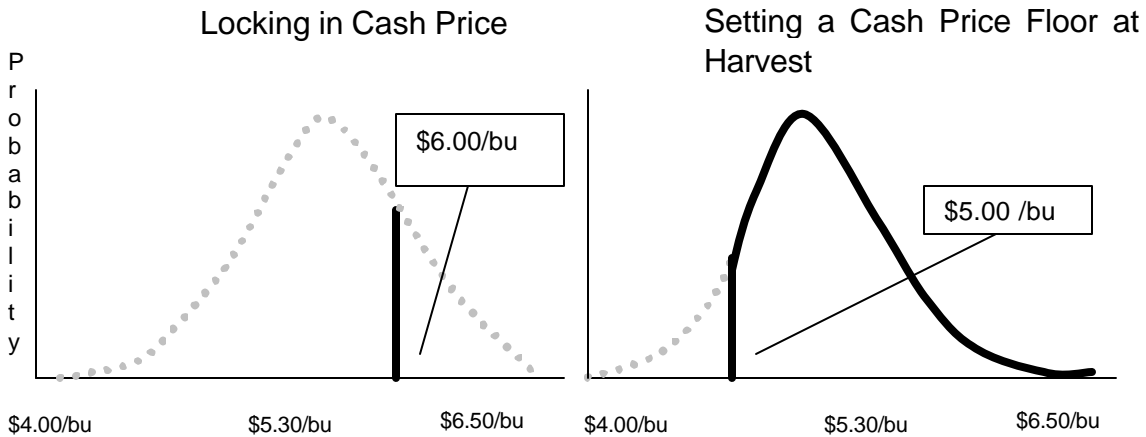


Figure 1.2: Transforming the PDF by Locking-in a Price or Setting a Price Floor



What price risk management strategies seek to do is to either lock in a price level or to establish a price floor. Locking in a price level entails establishing a price that is as far along to the right hand side of the horizontal axis as possible with all of the price uncertainty being removed. Figure 1.2 shows the transformation of the PDF from a bell-shape to a vertical line when a producer locks in a price level of \$6.00 /bu. That is, by locking in the price level there is no longer any uncertainty both downside (price risk) and upside (price good fortune) are eliminated. This same figure also shows the transformation of the PDF from a bell-shape to partial bell-shape absent a left side tail

when a producer establishes a price floor of \$5.00 /bu. That is, by setting a price floor some of the downside (price risk) has been eliminated but upside (price good fortune) remains.

**What is Basis?**

Basis can be thought of as the economics of where and when. More concretely, basis can be defined as:

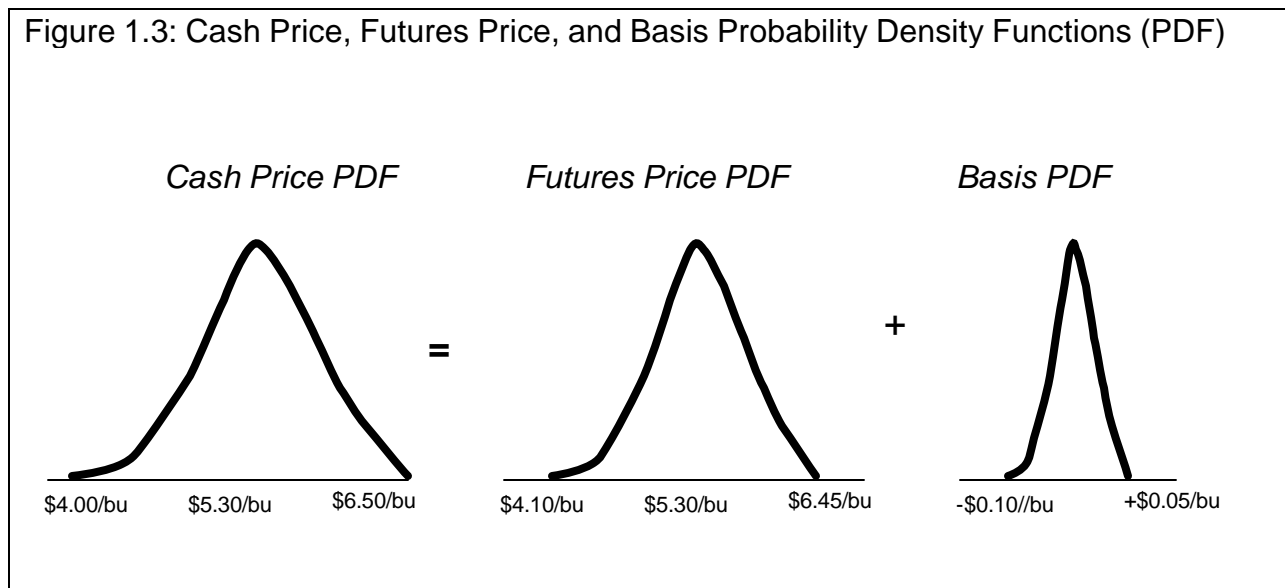
*BASIS is the difference between local cash prices and futures prices for commodities at any point in time:*

$$\text{Basis} = \text{Local Cash Price} - \text{Futures Price}.$$

Using this definition of basis we can also express local cash price as the summation of futures price plus basis:

$$\text{Local Cash Price} = \text{Futures Price} + \text{Basis}.$$

As was shown in Figure 1.1 the local cash price at harvest is a random variable whose inherent riskiness can be expressed in the form of a PDF. The above formula showing how local cash prices are calculated reveals that the PDF for local cash prices can also be thought of conceptually as the sum of the PDFs for the random variables of futures price and of the basis, respectively at harvest. This is shown in Figure 1.3 where the shape of the cash price PDF resembles the sum of the futures price PDF and the basis PDFs at harvest.



A noticeable feature of comparing the shape of the PDFs is that most of the riskiness in the cash price stems from the riskiness observed in the futures PDF with much less risk stemming from the basis PDF. This characteristic is fundamental to hedging, namely, that price level risk as observed in the futures price is much more risky than basis risk. This relationship of local cash price being determined by the sum

of futures prices and local basis is also fundamental to managing price risk. Clearly, understanding and making effective risk management decisions that manage local cash price risk, amounts to understanding and managing futures price risk and basis risk. The futures and options markets allow producers to gather significant amounts of information concerning the riskiness of futures price levels (the shape of PDF) as well as the opportunity to hedge and offset this risk. However, information concerning the local basis is less readily available. Much of the focus of the remainder of this publication and the supplement tables made available on the accompanying webpage are dedicated toward documenting and characterizing what the PDF might look like for a particular location at different points in time using historical estimates. Understanding or having a feel for what this PDF looks like will enhance producer's ability to make effective risk management decisions and to evaluate current bids and offers.

## **Summary**

This publication serves as a resource for all producers of corn, wheat and soybeans in the tri-state region comprised of Georgia, North Carolina, and South Carolina. This publication and supporting database provides important current estimates of basis over a significant and diverse geographical region with supporting education material and examples about how this information can be utilized for more effective marketing and risk management strategies.

This publication and supplemental tables documents the historical basis for Georgia, South Carolina, and North Carolina for corn, wheat, and soybeans over the period 1997-2002. Made available electronically are the cash price and basis information (in Excel spreadsheet format) for 47 soybean locations, 54 corn locations and 33 wheat locations within the region. This information can be found at the following url:

<http://www.ag-econ.ncsu.edu/faculty/piggott/handbook.htm>.

Based on this information in Chapter 2 of this publication, we explain how basis has changed in each state, for each commodity, over the study period and offer possible explanations for the changes. Several factors have regional wide influence over basis relationships. In Chapter 3 we demonstrate how basis can be used to enhance producer marketing decisions to manage price risk. We explain how historical basis can be used to evaluate current cash bids by buyers, bids for future delivery, and how basis information can be used in deciding whether or not to store a commodity for sale.

In Chapter 4, we discuss the advantages and disadvantages of different marketing strategies and how they interact with the provisions of the farm bill. The 2002 farm bill carries implications for producer marketing decisions. The loan program and the resulting loan deficiency program (LDP) safety net or marketing loan gains, presents opportunities for the astute marketer to increase crop income above the level of cash market sales. A set of strategies are presented illustrating the relationship between changes in market prices and LDPs, and how the various marketing alternatives provide different net prices received under a range of futures price outcomes. The use of put options as a price risk management tool offers an excellent strategy that provides a long-run advantage over other strategies.

## CHAPTER 2: TRENDS AND SEASONAL PATTERNS IN BASIS 1997-2002

### Introduction

Basis levels within a given region are affected by many factors including the local supply and demand in the market region, availability of regional storage, handling and processing, and the volume of imports and cost of transportation into the region. In this chapter, some common factors affecting basis across the tri-state region comprised of Georgia, North Carolina, and South Carolina are identified and discussed. This is followed by a characterization of trends in basis with brief explanations of factors influencing these trends where appropriate.

Common elements across the three states that have significantly influenced grain and soybean basis are:

- significant reductions in grain and soybean supply caused by a shift in acreage away from grain and soybeans toward cotton production;
- changes in grain and soybean use with some important changes in livestock production;
- increased reliance of grain and soybeans produced outside of the region and the importance of transportation assurance to meet demand, symptomatic of growing local grain and soybean deficits.

Table 2.1 documents changes in wheat, corn, soybeans, and cotton production over the period 1990 to 2002. The tri-state region of Georgia, North Carolina, and South Carolina experienced production declines of 38.6% for wheat, 17.6% for corn, and 28.5% for soybeans comparing 1990 and 2002 production levels. In contrast, the increase in cotton production over the twelve-year period has been 209.3%. These changes in production can be explained by significant changes in acreage with declines of 26.7% for wheat, 35.6% for corn, and 36.9% for soybeans, and an increase of cotton acreage of 276.9% over the same period.

The significant shift towards cotton production can be attributed to the success of the boll weevil eradication program and the introduction of biotechnology in the late 1990's with both herbicide tolerant and insect-resistant cotton. More recently, the 2002 farm bill that was favorably disposed to cotton subsidies should ensure these trends in acreage in the region remain in place. Therefore, it is likely that the supply of grain and soybeans in the region will not increase. Evidence that others think similarly is the recent development and opening of the Wilmington, North Carolina importing facility that began importing soybean meal products and wheat from foreign countries in the later part of 2002.

Table 2.2 highlights the impact of livestock expansion within the region. One method of quantifying grain demand is to employ feed use data and the calculation of "Grain Consuming Animal Units (GCAU)" which places various types of livestock on a common grain demand basis. For example, one dairy cow is expected to consume the same amount of grain (2.15 tons) as 5,000 broilers in a year. The resultant grain use is estimated in Table 2.2. It is important to note that the largest categories of regional growth are broilers and hogs, which creates substantial feed grain and protein meal requirements. There has been a general shift away from dairy, layer and turkey production and thus feed use in these categories.

Table 2.1: Area, Yield, Production of Grain and Cotton for GA, NC, SC 1990, 1997, and 2002

	Plant Acres 000's acres	Harv. Acres 000's acres	Yield bu/ac	Prod. 000's bu	Plant Acres 000's acres	Harv. Acres 000's acres	Yield bu/ac	Prod. 000's bu	Plant Acres 000's acres	Harv. Acres 000's acres	Yield bu/ac	Prod. 000's bu	Plant Acres Δ%	Prod. Δ%	Plant Acres Δ%	Prod. Δ%	Plant Acres Δ%	Prod. Δ%
	1990				1997				2002				Change 1990-1997		Change 1997-2002		Changes 1990-2002	
<b>Wheat</b>																		
GA	650	590	35	20,650	400	350	44	15,400	350	200	41	8,200	-38.5	-25.4	-12.5	-46.8	-46.2	-60.3
NC	600	550	41	22,550	730	670	51	34,170	650	480	42	20,160	21.7	51.5	-11.0	-41.0	8.3	-10.6
SC	400	380	38	14,440	310	300	50	15,000	210	190	37	7,030	-22.5	3.9	-32.3	-53.1	-47.5	-51.3
<b>Total</b>	<b>1,650</b>	<b>1,520</b>	<b>38.0</b>	<b>57,640</b>	<b>1,440</b>	<b>1,320</b>	<b>48.3</b>	<b>64,570</b>	<b>1,210</b>	<b>870</b>	<b>40.0</b>	<b>35,390</b>	<b>-12.7</b>	<b>12.0</b>	<b>-16.0</b>	<b>-45.2</b>	<b>-26.7</b>	<b>-38.6</b>
<b>Corn</b>																		
GA	660	550	68	37,400	500	450	105	47,250	340	290	115	33,350	-24.2	26.3	-32.0	-29.4	-48.5	-10.8
NC	1200	1070	68	72,760	960	870	89	77,430	790	700	83	58,100	-20.0	6.4	-17.7	-25.0	-34.2	-20.1
SC	390	320	48	15,360	350	325	95	30,875	320	260	46	11,960	-10.3	101.0	-8.6	-61.3	-17.9	-22.1
<b>Total</b>	<b>2,250</b>	<b>1,940</b>	<b>61.3</b>	<b>125,520</b>	<b>1,810</b>	<b>1,645</b>	<b>96.3</b>	<b>155,555</b>	<b>1,450</b>	<b>1,250</b>	<b>81.3</b>	<b>103,410</b>	<b>-19.6</b>	<b>23.9</b>	<b>-19.9</b>	<b>-33.5</b>	<b>-35.6</b>	<b>-17.6</b>
<b>Soybeans</b>																		
GA	900	700	14	9,800	400	380	21	7,980	160	140	21	2,940	-55.6	-18.6	-60.0	-63.2	-82.2	-70.0
NC	1400	1350	24	32,400	1400	1330	29	38,570	1360	1280	23.5	30,080	0.0	19.0	-2.9	-22.0	-2.9	-7.2
SC	800	750	18.5	13,875	580	570	22.5	12,825	435	415	17	7,055	-27.5	-7.6	-25.0	-45.0	-45.6	-49.2
<b>Total</b>	<b>3,100</b>	<b>2,800</b>	<b>18.8</b>	<b>56,075</b>	<b>2,380</b>	<b>2,280</b>	<b>24.2</b>	<b>59,375</b>	<b>1,955</b>	<b>1,835</b>	<b>20.5</b>	<b>40,075</b>	<b>-23.2</b>	<b>5.9</b>	<b>-17.9</b>	<b>-32.5</b>	<b>-36.9</b>	<b>-28.5</b>
<b>Grain Total</b>	<b>7,000</b>	<b>6,260</b>		<b>239,235</b>	<b>5,630</b>	<b>5,245</b>		<b>279,500</b>	<b>4,615</b>	<b>3,955</b>		<b>178,875</b>	<b>-19.6</b>	<b>16.8</b>	<b>-18.0</b>	<b>-36.0</b>	<b>-34.1</b>	<b>-25.2</b>
<b>Cotton</b>																		
	Plant Acres 000's acres	Harv. Acres 000's acres	Yield lbs/ac	Prod. 000's bale	Plant Acres 000's acres	Harv. Acres 000's acres	Yield lbs/ac	Prod. 000's bale	Plant Acres 000's acres	Harv. Acres 000's acres	Yield lbs/ac	Prod. 000's bale						
GA	355	350	555	405	1440	1425	646	1,919	1450	1360	557	1,578	305.6	373.8	0.7	-17.8	308.5	289.6
NC	201	200	631	263	690	685	652	930	940	920	421	806	243.3	253.6	36.2	-13.3	367.7	206.5
SC	155	154	452	145	290	286	688	410	290	200	314	131	87.1	182.8	0.0	-68.0	87.1	-9.7
<b>Total</b>	<b>711</b>	<b>704</b>	<b>546.0</b>	<b>813</b>	<b>2,420</b>	<b>2,396</b>	<b>662.0</b>	<b>3,259</b>	<b>2,680</b>	<b>2,480</b>	<b>430.7</b>	<b>2,515</b>	<b>240.4</b>	<b>300.9</b>	<b>10.7</b>	<b>-22.8</b>	<b>276.9</b>	<b>209.3</b>

Source: NASS, USDA

Table 2.2. Estimated SC, NC and GA Grain Consuming Animal Units (GCAU) and Corn Equivalent (CEQ) Utilization, 1990, 1997 and 2002.

	Beef	Broilers	Layers	Turkeys	Dairy	Hogs	All	Total CEQ's
	---- GCAU or CEQ Bushels (X 1,000) ----							
<i>Georgia</i>								
1990	68	1,709	514	31	158	251	2,732	209,718
1997	74	2,364	649	3	141	119	3,350	257,178
2002	68	2,581	444	0	120	79	3,292	252,742
Δ% 90-97	8%	38%	26%	-91%	-11%	-53%	23%	23%
Δ% 97-02	-8%	9%	-32%	-100%	-15%	-34%	-2%	-2%
Δ% 90-02	-1%	51%	-14%	-100%	-24%	-69%	21%	21%
<i>North Carolina</i>								
1990	41	1,081	418	899	149	640	3,228	247,807
1997	59	1,330	373	829	117	2,194	4,902	376,345
2002	52	1,470	240	705	101	2,194	4,761	365,567
Δ% 90-97	42%	23%	-11%	-8%	-21%	243%	52%	52%
Δ% 97-02	-12%	11%	-36%	-15%	-14%	0%	-3%	-3%
Δ% 90-02	25%	36%	-43%	-22%	-32%	243%	48%	48%
<i>South Carolina</i>								
1990	29	167	155	85	56	94	586	44,963
1997	26	366	123	174	38	70	796	61,123
2002	24	386	117	153	29	69	777	59,672
Δ% 90-97	-10%	119%	-20%	104%	-32%	-26%	36%	36%
Δ% 97-02	-11%	6%	-5%	-12%	-22%	-2%	-2%	-2%
Δ% 90-02	-20%	131%	-25%	80%	-47%	-27%	33%	33%
<i>Combined (GA, NC, SC)</i>								
1990	139	2,957	1,086	1,015	362	985	6,545	502,488
1997	160	4,059	1,145	1,006	296	2,382	9,048	694,646
2002	143	4,437	800	859	250	2,341	8,831	677,981
Δ% 90-97	15%	37%	5%	-1%	-18%	142%	38%	38%
Δ% 97-02	-10%	9%	-30%	-15%	-16%	-2%	-2%	-2%
Δ% 90-02	3%	50%	-26%	-15%	-31%	138%	35%	35%

<sup>1/</sup> GCAU Factor are beef cattle = .0547, Broiler=.002, Layers = .0217, Turkeys = .0155,  
Dairy (cow+calf) = 1.0474, and Hogs = 0.2285. One GCAU consumes 2.15 tons per year.  
Source: ERS, USDA

Table 2.3. Estimated SC, NC and GA Grain Production, Utilization and Deficit, 1990, 1997 and 2002.

Year	All GCAU (1,000)	Required CEQ's (1,000 Bu)	Regional Corn Production (1,000 Bu)	Corn Deficit (1,000 Bu)	Percent of Use Grown (%)	Regional Wheat Production (1,000 Bu)	Adjusted 1/ Regional Wheat Production (1,000 Bu)	Regional Corn & Wheat Production (1,000 Bu)	Regional Corn & Wheat Deficit (1,000 Bu)	Percent of Use Grown (%)
1990	6,545	502,488	125,520	376,968	25%	57,640	61,757	187,277	315,211	37%
1997	9,048	694,646	155,555	539,091	22%	64,570	69,182	224,737	469,908	32%
2002	8,831	677,981	103,410	574,571	15%	35,390	37,918	141,328	536,653	21%

<sup>1/</sup> Wheat (a 60 pound bushel) is adjusted to a 56 pound bushel basis to compare with corn

To get a sense of the scale of the deficit, consider the case of feed grains (corn and wheat) shown in Table 2.3. In 2003, estimated feed use in the tri-state region was approximately 678 million bushels while wheat and corn production in 2002 was 35.4 and 103.4 million bushels, respectively, for a total of 138.8 million bushels. Thus, during the 2002 year the region produced approximately 21 percent of its total feed grain needs for its livestock (Table 2.3). This is a 77 day supply (or slightly more than 2 months). The implications of this deficit situation could be huge if external supplies became unavailable or more costly to acquire. Additionally, these deficit figures assume all corn and wheat produced would be fed. Other market channels, principally wheat and corn milling and exports, are active and also consume these commodities. Thus, these data most likely understate the true nature of the deficit for feed use.

Due to the grain and soybean deficit nature of the region, grain purchasing introduced by the major integrated poultry and hog feed mill operators has changed over the last few years. Feed mills have become more dependent upon corn railed from the Midwest and Cornbelt to meet their needs. Livestock producers in North Carolina have turned to importing feed supplies from foreign countries with the opening of an off-loading facility in Wilmington, North Carolina in late 2002. The current capacity of this facility is 600,000 metric tons annually. The Brunswick, Georgia port facility has off-loaded oats for several years. The potential for additional importing facilities located in the region of interest is a stark possibility given the growing deficits in the future.

### **Trends in Georgia Grain Basis Over the Period 1997-2002**

Several structural changes in the Georgia economy have worked to alter the grain and soybean basis across the state. First, the most important factor has been the shift in cropping patterns over the past decade as Georgia producers reduced grain and soybean acreage and increased cotton production. Since 1990, Georgia cotton acreage has increased from 0.350 million acres to 1.45 million acres in 2002. During the same period, the combined acreage of corn, soybeans, and wheat has dropped from 1.95 million acres to 0.850 million acres, a decline of almost one half. The impact of this shift has been fewer bushels of grain and soybeans flowing through the market system resulting in the closing of country grain handling points. Theory would indicate that the loss of buying competition in Georgia should weaken the overall grain basis. As will be pointed out later, Georgia grain basis has generally weakened during the study period consistent with this theory.

Second, is the loss of export terminals handling grains. The Port of Savannah, Georgia and the Port of Charleston, South Carolina both experienced the closing of grain handling facilities. The impact of the closing of markets is a general weakening of the basis as those markets were lost.

Third, is the loss of hog production in Georgia during the decade of the 1990s. This was precipitated in part by the loss of slaughter facilities in Georgia and the emergence of highly integrated hog production and processing in North Carolina. The impact upon grain basis is also a general weakening as local demand for grains fell, especially corn and soybeans.

Fourth, is a change in grain purchasing introduced by the major integrated poultry feed mill operators over the last few years. Due to the loss of Georgia corn production, feed mills have become more dependent upon corn railed into Georgia from

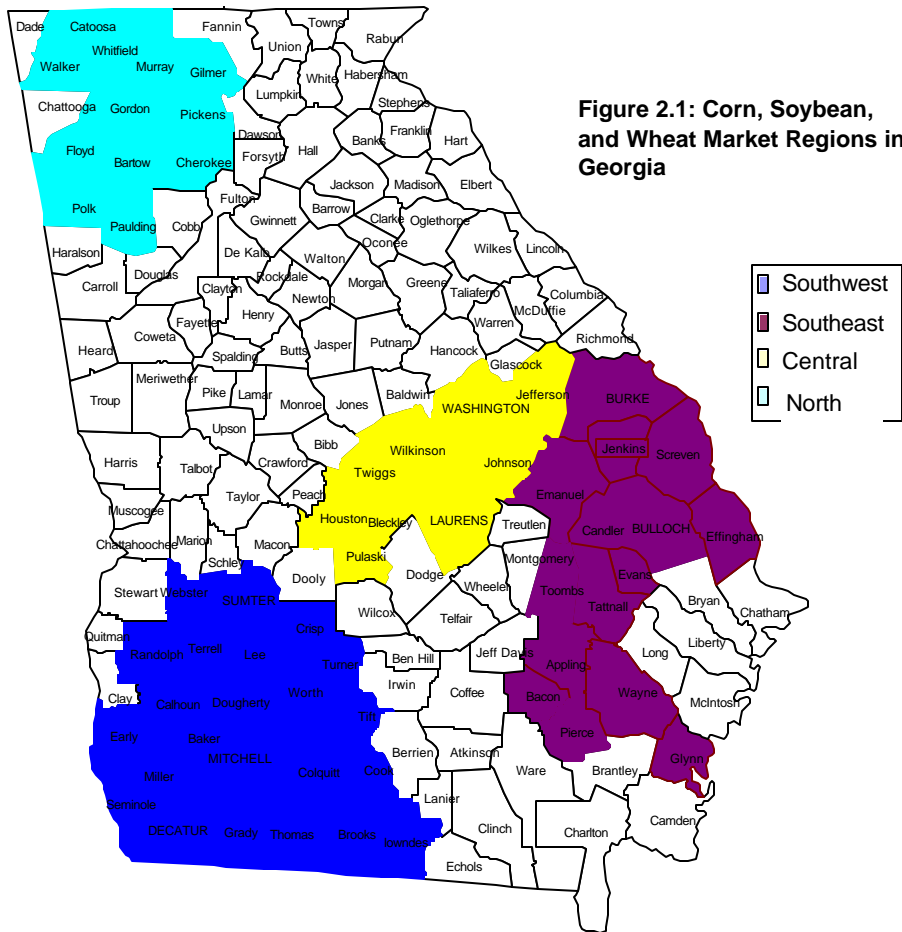
the Midwest and Cornbelt to meet their needs. The railroad companies recognized a market opportunity in their competitive environment and introduced fast load/unload facilities to turn their cars around faster. The fast load/unload equipment is a relatively new innovation that lessens the time rail cars spend sitting idle. This saves money for the feed mills as they avoid demurrage charges and is beneficial for the railroad companies as they can turn the cars around faster. In return for the fast unloading equipment provided by the rail companies, feed mills are required to purchase a very large percent of their grain needs provided by the rail service. Those percentages may be above 95% of total use in some cases. This change has adversely impacted demand for local grains by the mills and thus weakened the local grain basis. In essence, these rail contracts are dictating a reduced demand for local grain and an increased demand for grain produced in other areas, thereby eroding the viability of some local markets.

### *Georgia Corn Basis Trends*

Analysis of changes in Georgia cash corn basis indicates a general weakening of the basis in all four regions (see Figure 2.1) over the six year study period. In Southeast Georgia, the basis has weakened substantially due to the factors discussed above and documented in Table 2.4. During the three year period of 1997-1999, the cash corn basis average for the calendar year in Southeast Georgia was about 13 cents over the nearby futures price. Over the three year period 2000-2002, the basis has weakened to an annual average of 8 cents under the nearby futures contract. This represents a loss to corn producers of 21 cents per bushel on corn sold during that period.

Table 2.4. Trends in Georgia Grain Basis by Market Area 1997-2002

<u>Crop/Area</u>	<u>1997-1999 ave.</u>	<u>2000-2002 ave.</u>	<u>Difference</u>
<i>Dollars Per Bushel</i>			
<b>Corn</b>			
<i>Southeast</i>	0.13	-0.08	-0.21
<i>Southwest</i>	0.16	0.10	-0.06
<i>Central</i>	0.09	-0.07	-0.16
<i>North</i>	0.12	0.08	-0.04
<b>Soybeans</b>			
<i>Southeast</i>	-0.24	-0.36	-0.12
<i>Southwest</i>	-0.37	-0.34	0.03
<i>Central</i>	-0.32	-0.27	0.05
<i>North</i>	-0.46	-0.39	0.07
<b>Wheat</b>			
<i>Southeast</i>	-0.22	-0.44	-0.12
<i>Southwest</i>	-0.22	-0.40	-0.18
<i>Central</i>	-0.39	-0.44	-0.05
<i>North</i>	-0.36	-0.33	0.03



The impact on the cash corn basis in some other areas of Georgia is similar. In the Central Georgia region, the basis averaged 9 cents over the nearby futures during 1997-1999 but weakened to an average of 7 cents under the nearby futures during the 2000-2002 period for a weakening in basis of 16 cents. In the North Georgia and Southwest Georgia regions, cash corn basis weakened by lesser degree. Both of these areas have large integrated poultry operations with captive feed mills that are the dominant purchasers of corn in those areas. In North Georgia, the cash corn basis averaged 12 cents over nearby futures and weakened by 4 cents to average 8 cents over the nearby futures during the 2000-2002 timeframe. In the Southwest Georgia region, the cash corn basis averaged 16 cents over the nearby futures contract during the 1997-1999 and weakened by 6 cents to average 10 cents over the nearby contract.

### *Georgia Soybean Basis Trends*

There is a different pattern in the cash soybean basis in Georgia than in the corn basis with the exception of the Southeast market. The Southeast regions soybeans saw similar basis changes as in corn while the other three regions soybeans realized a general but small strengthening of the basis.

In Southeast Georgia, the cash soybean basis averaged 24 cents under the nearby futures during the 1997-1999 marketing period and weakened to an average of 36 cents under during the 2000-2002 period for an average weakening of the basis of

about 12 cents per bushel. Much of this basis weakening in Southeast Georgia may be caused by the temporary closing of the closest soybean processing facility in South Carolina and major buyer of soybeans in Southeast Georgia, now re-opened under the name of Carolina Soya at the time of writing. That facility was closed for about 18 months during 2000 and into 2002. The average basis during that timeframe was the weakest in that region during the study period. In Central Georgia, a region without a major soybean processor, the cash soybean basis strengthened but only slightly from 32 cents under the nearby to 27 cents under.

In both the Southwest and North Georgia regions, the cash soybean basis also strengthened during the study period. Both of these regions contain major soybean processors with ADM in the Southwest region and Cargill in the North. In North Georgia, cash soybean basis gained an average of 7 cents moving from an average of 46 cents under during 1997-1999 to 39 cents under during 2000-2002. In Southwest Georgia, the cash soybean basis moved from 37 cents under to 34 cents under for an average gain of 3 cents per bushel.

### *Georgia Wheat Basis Trends*

The cash wheat basis weakened in three of the four regions of Georgia during the study period. The greatest weakening occurred in Southwest Georgia where the cash wheat basis dropped from an average of 22 cents under nearby wheat futures, during 1997-1999 to an average of 44 cents under during the 2000-2002 timeframe. In the Central and Southeast regions of Georgia, the cash wheat basis weakened as well but by a lesser amount with declines of 5 and 12 cents, respectively. In the North Georgia region the basis actually strengthened but only by an average of 3 cents.

### **Seasonal Trends in Georgia Grain Basis**

The seasonal trends in Georgia cash corn basis show similar general trends in all four major regions. Typically, the basis is the weakest during the corn harvest period from August through October (Figure 2.2). The basis generally strengthens following harvest into late fall or early winter generally reaching a maximum during the late winter months or early spring and holding fairly steady during the summer. The basis then weakens dramatically around June-July going into the new crop harvest period. There are differences in the patterns in the different regions of the state as can be seen in Figure 2.2.

A major difference between corn and soybean basis is the soybean basis is much less variable across the regions with the exception of the North region during April (Figure 2.3). The cash soybean basis is typically the weakest during the months of July and August with steady increases from this period to the end of the calendar year. Cash soybean basis is typically fairly steady during the first half of the calendar year before beginning to weaken during late summer. Counter to the trend in corn of weakening during harvest, the soybean basis does not show a clear weakening trend during the October-November harvest period. There is no clear or apparent explanation for the sharp drop in the basis during April for the North region.

Figure 2.2: Seasonal Trends In Georgia Corn Basis

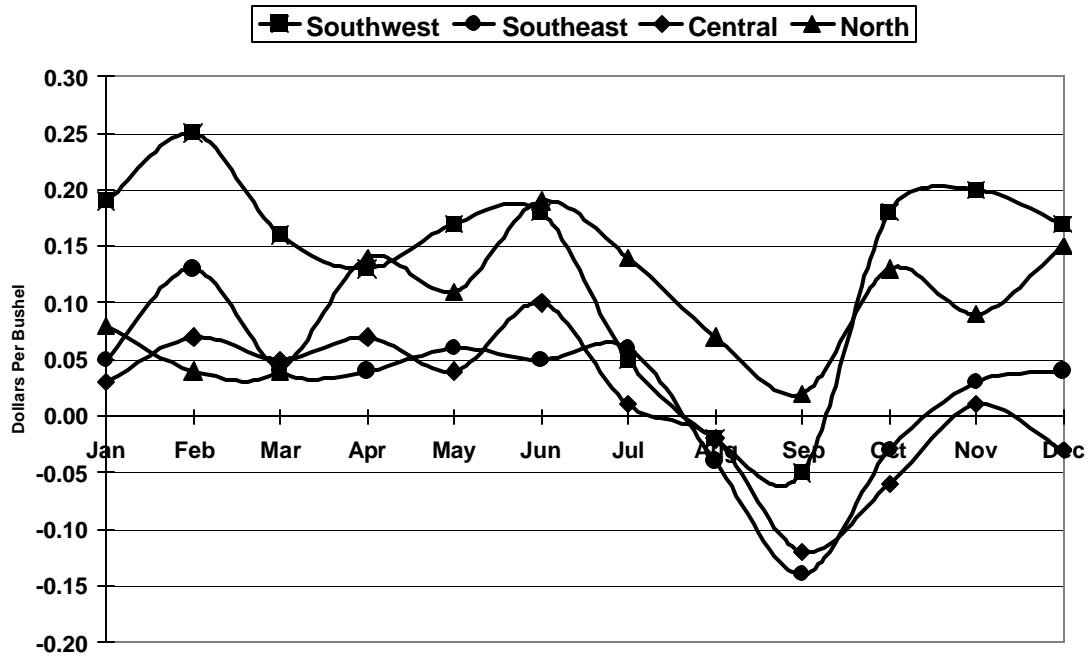
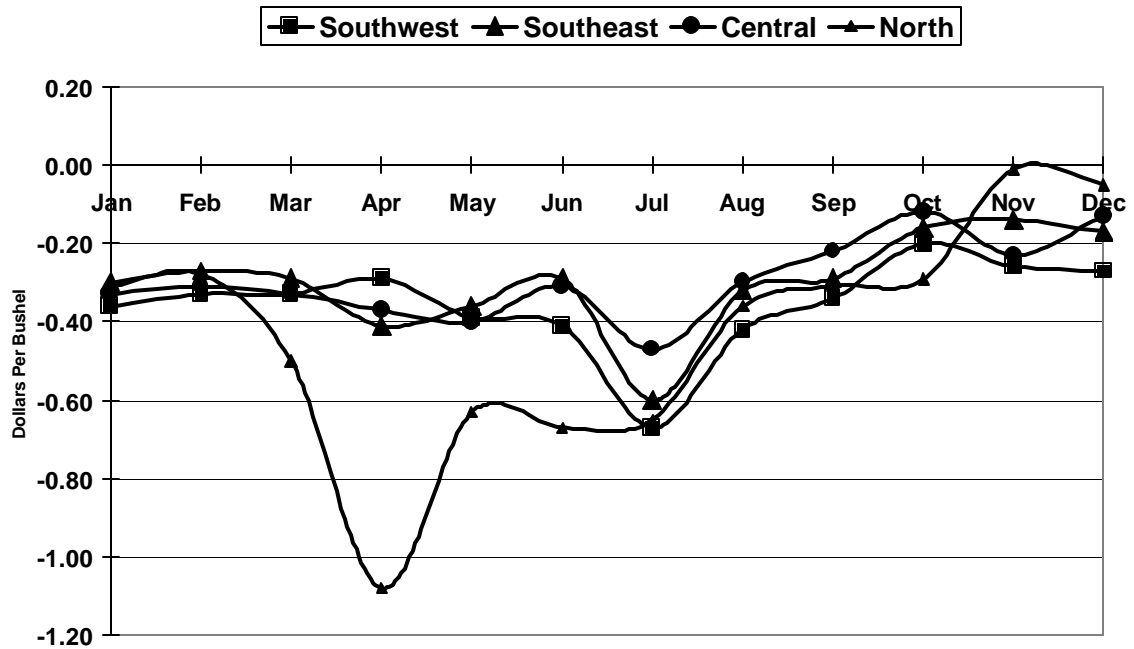
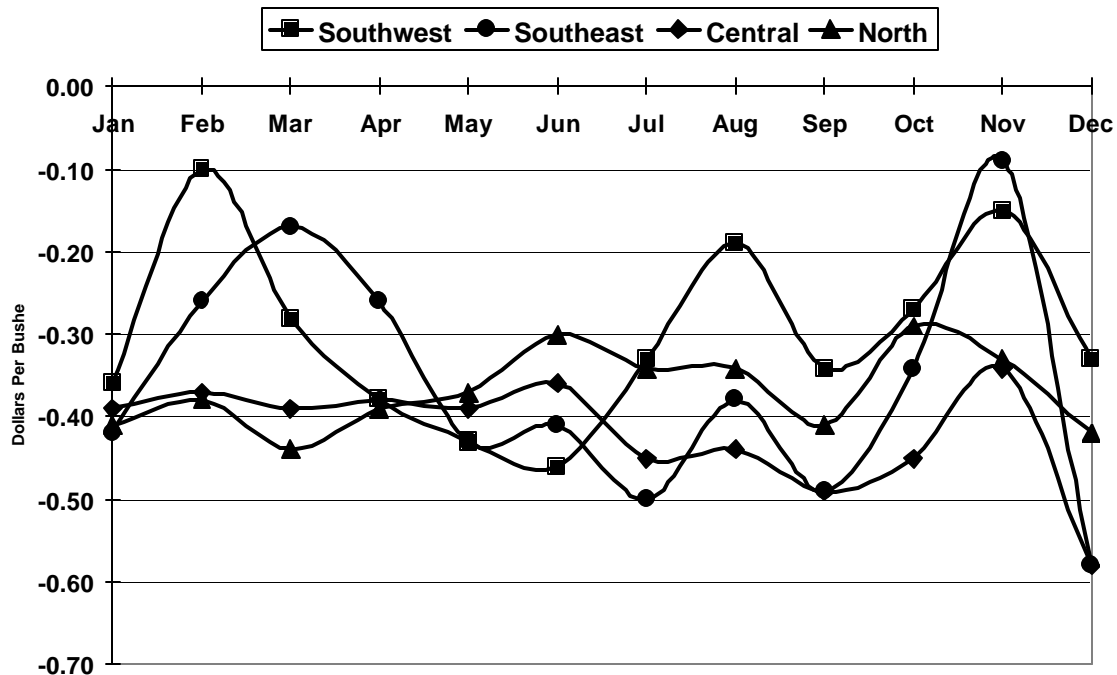


Figure 2.3: Seasonal Trends In Georgia Soybean Basis



Seasonal trends in Georgia cash wheat basis, as shown in Figure 2.4, are quite variable across the regions. The Southeast and Southwest regions show considerable variation throughout the year while the North and Central regions tend to show less variation during the year.

**Figure 2.4: Seasonal Trends In Georgia Wheat Basis**



### Trends in North Carolina Grain Basis Over the Period 1997-2002

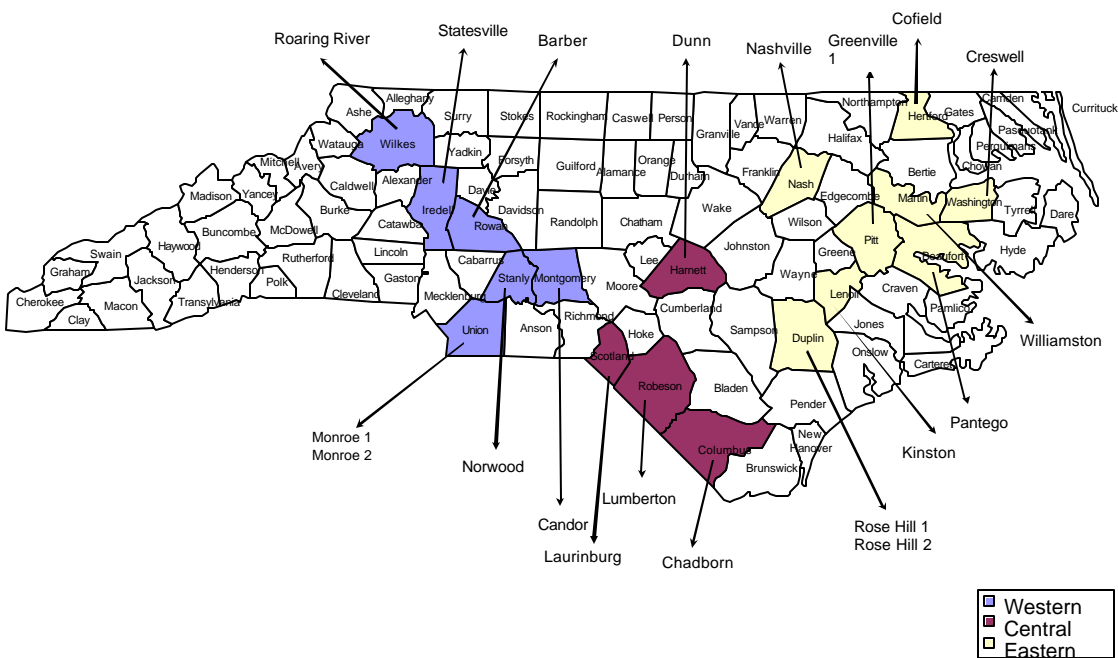
The trends in North Carolina grain basis over the study period have been mixed. The corn basis has consistently weakened across the state with the most significant weakening in the Central and Western regions (Figure 2.5). The soybean basis on the other hand has generally strengthened in the Western and Central regions but weakened in the Eastern region (Figure 2.6). Several factors have been prominent in impacting these changes in basis. A driving influence has been the changes in local supply and demand. As Table 2.1 shows corn and soybean acreage declined in North Carolina over the study period. Planted acreage in 2002 for corn was 17.7% less than in 1997, whereas soybean acreage was 2.9% less than in 1997. This acreage has shifted into cotton production with cotton acreage increasing 36.2% over the same period. This decline in planted acreage, combined with unfavorable yields in 2002 compared to 1997, resulted in reductions of 25% and 22% in corn and soybeans supplied in 2002 compared to 1997, respectively. Demand for corn and soybeans in North Carolina has increased significantly since 1990. Table 2.2 shows that the grain consuming animal units in North Carolina have increased by 52.0% from 1990 to 1997, then declined slightly by 3% over the period 1997-2002, for a net gain of 48% over the period 1990-2002. This growth in grain consuming units can be attributed to significant growth in the hogs (243%) and beef (43%) production during 1990-1997. The more recent declines can be attributed to stagnant hog numbers combined with declines in

beef (12%), layers (36%), turkeys (15%) and dairy (14%) production over the period 1997-2002.

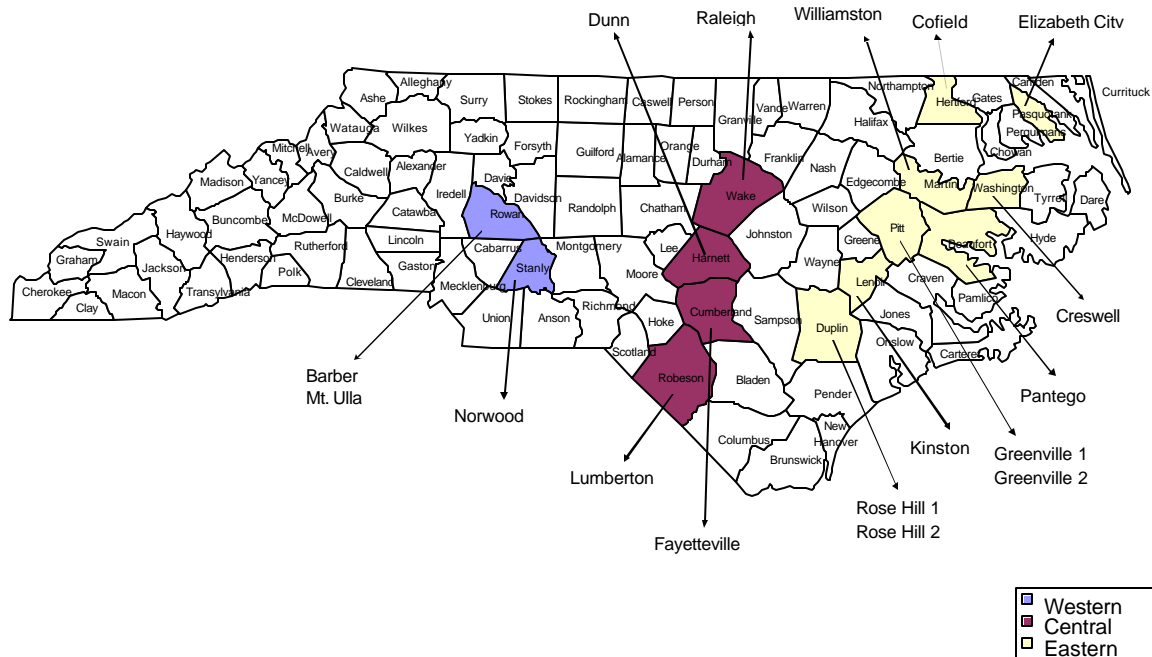
The increase in demand for and declines in supply of grains and soybeans have led to a growing deficit and an increased reliance on out-of-state sources for corn and soybean meal. The weakening in corn basis across the state can be rationalized by there being less corn flowing through the intra-state system causing some corn buying points to close down thus reducing competition. For example, Greenville (Cargill), Kinston, and Williamston closed in 2000. Another explanation is increasing dependence on corn railed into the state and the terms of these contracts requiring significant volumes of grain needs as a stipulation. This requirement has amounted to reduced demand for locally produced corn and as a result it has had an unfavorable impact on basis.

North Carolina has also experienced a decline in soybean crushing capacity, a trend that has occurred throughout the Southeast. A soybean crushing plant in Cofield, North Carolina (Perdue Farms) closed in 2001. This closure meant that North Carolina is now limited to a single company in the soybean crushing business, Cargill, with plants located in Fayetteville and Raleigh. This reduction in crushing capacity in the Eastern region attributed to a weakening of soybean basis. On the other hand there has been a slight strengthening in basis in the Central and Western regions of North Carolina over the study period. In these regions the decline in soybean production in North Carolina has had an overriding impact with an increasing proportion of the soybean crushed at these plants in Fayetteville and Raleigh having to be railed in from other areas. This has been beneficial for soybean basis levels as these crushing facilities have had to offer more “attractive” basis levels to procure soybeans to meet throughput needs.

**Figure 2.5: Corn Elevators and Feedmills in North Carolina**



**Figure 2.6: Elevators and Crushers in North Carolina**



*North Carolina Corn Basis Trends*

Table 2.5 reveals that the weakening in corn basis in North Carolina has been as much as 10 cents a bushel in the Central region of the state. Average basis in the Central region over the period 1997-1999 was 14 cents over but weakened to 4 cents over in the period 2000-2002. The weakening in basis in the Western region has been of a similar magnitude as the Central region, with average basis over the period 1997-1999 being 32 cents over but declining to 23 cents over in the period 2000-2002, a weakening of 9 cents. The weakening in the Eastern region has been the least, presumably due to the livestock concentration in this region and a larger number of buying points. The weakening of basis in this region is of the order of 7 cents, the average basis over the period 1997-1999 being 15 cents over but declining to be 8 cents over in the period 2000-2002.

Table 2.5. Changes in North Carolina Grain Basis by Market Area.

<u>Crop/Area</u>	<u>1997-1999 Ave.</u>	<u>2000-2002 Ave.</u>	<u>Difference</u>
<i>Dollars Per Bushel</i>			
<b>Corn</b>			
<i>Western</i>	\$0.32	\$0.23	-\$0.09
<i>Central</i>	\$0.14	\$0.04	-\$0.10
<i>Eastern</i>	\$0.15	\$0.08	-\$0.07
<b>Soybeans</b>			
<i>Western</i>	-\$0.29	-\$0.20	\$0.09
<i>Central</i>	-\$0.08	-\$0.06	\$0.02
<i>Eastern</i>	-\$0.16	-\$0.23	-\$0.07

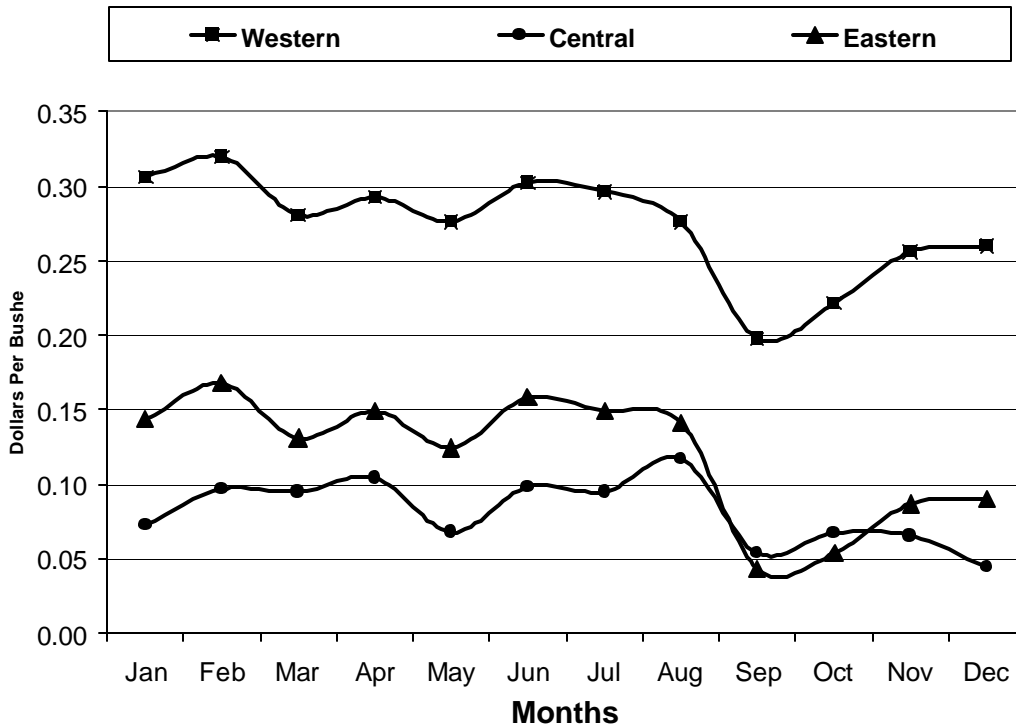
#### *North Carolina Soybean Basis Trends*

Table 2.5 reveals the mixed trends in soybean basis for the study period of 1997 to 2002. Soybean basis has strengthened as much as 9 cents in the Western region. Average basis in this region was 29 cents under in 1997-1999 and increased to 20 cents under in 2000-2002. Following a similar but less dramatic pattern, soybean basis has also strengthened in the Central region with an average basis of 8 cents under in 1997-1999 increasing slightly over the period 2000-2002 to 6 cents under. Finally, like the trends in the corn market, the Eastern region, where the majority of the soybeans are produced, has experienced a weakening in basis. The average basis in the Eastern region during 1997-1999 was 16 cents under and this has further deteriorated to 23 cents under during the period 2000-2002, a weakening of 7 cents per bushel.

#### **Seasonal Trends in North Carolina Grain Basis**

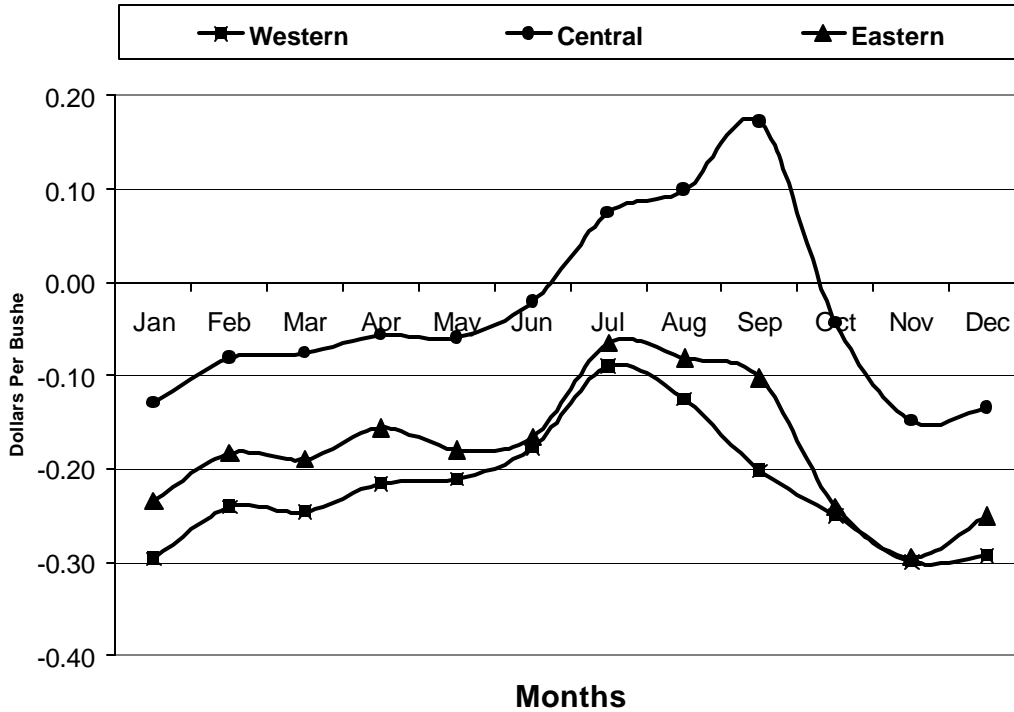
The seasonal trends in North Carolina cash corn basis by region are shown in Figure 2.7. Similar seasonal trends are displayed in all market regions. The common element that corn basis can be characterized as being the lowest during the harvest period in the month of September. The Western and Eastern regions have the most similar seasonal pattern through the calendar year. However, the Western region has a fairly consistent 20 cent stronger basis throughout the year. For the Western and Eastern region basis strengthens quite consistently up until February. After February, basis displays a slight downward trend before significantly weakening in August. For the Central region the trend is slightly different particularly after the September low. That is, for the Central region, basis strengthens in October but then weakens for the remainder of the calendar year. There is some strengthening in January through February before leveling off until August where it weakens significantly. One final comparison worth making is basis for the Western and Eastern regions display large and similar ranges whereas the Central region appears to have a smaller range over the calendar year.

**Figure 2.7: Seasonal Trends in North Carolina Corn Basis 1997-2002**



The seasonal trends in North Carolina cash soybean basis display different seasonal patterns compared to corn as shown in Figure 2.8. There is also more variation in the soybean seasonal patterns between regions than for corn. That is, basis is distinctly different for the Central region compared to the Western and Eastern regions. The reason for these differences stems from the two soybean crushing facilities being located within the Central region. Due to the presence of the crushing facilities the basis in the Central region is consistently stronger by about 10 to 15 cents than the basis in the Western and Eastern regions. The majority of soybeans in the Western and Eastern region are transported to the Central region to be crushed. Basis is weakest in all three regions in the month of November around harvest time. In the Central region, after harvest basis strengthens consistently and gradually up through June. During June and through September basis in the Central region strengthens much more significantly, increasing about 18 cents before weakening dramatically from September to November. A similar seasonal pattern occurs for the Western and Eastern regions with a gradual strengthening in basis up through the month of June before the strengthening is more prominent peaking in July and then weakening the remainder of the months until making the low in November.

**Figure 2.8: Seasonal Trends in North Carolina Soybean Basis 1997-2002**



**Trends in South Carolina Basis Over the Period 1997-2002**

Since South Carolina exists in a regional market with transshipments of grain and soybeans to and from Georgia and North Carolina, regional data are important in considering trends. The regional view is dramatic with cotton acreage increasing 267% from 1990 to 2002, while corn, soybean and wheat acreage declined 37%, 31%, and 38%, respectively. South Carolina cotton acreage increased from 0.154 million acres in 1990 to 0.310 million acres in 2000, an increase of about 100 percent. During the same period, the acreage of corn, soybeans and wheat declined 13%, 43% and 49%, respectively. The impact of this shift has been fewer bushels of grain and soybeans flowing through the market system, which resulted in the closing of many country grain-handling points.

Hog production has declined 27% in South Carolina since 1990 as regulatory efforts have stifled development of larger integrated units. Similarly, dairy and layer production have declined. However, there has been an expansion of the state's poultry production (primarily turkey and broiler), expansion of the North Carolina hog production industry, and increases in Georgia poultry production just across the state's borders. Grain demand actually declined slightly in the study period over the period 1997-2002 with a decline of 2% across the region and in South Carolina as shown in Table 2.2. This may help explain the general weakening of the South Carolina corn basis in the latter half of the study period.

The estimated feed grain use in South Carolina for 2002 is approximately 60 million bushels per year. Wheat and corn production in 2002 was 7 and 12 million

bushels, respectively, which is 33% of use or a 118 day supply. Much of the South Carolina and regional wheat crop now finds its way into feed use. This may help to explain why the wheat basis has declined less than corn and soybeans.

One factor to note is that the basis in the Central region (Figure 2.9-2.11) of South Carolina is generally higher than the other regions. This is due to the heavy influence of terminal buying sites. A crushing facility, two feed mills, a food wheat mill, and the export elevator comprised the majority of the surveyed buying sites. Also, the Piedmont region reflects only one elevator (Anderson, South Carolina) that is a local buying station for wheat and soybeans. This elevator does not issue formal bids for corn and may not issue bids on wheat or soybeans for part of the year.

#### *South Carolina Corn Basis Trends*

Analysis of changes in South Carolina cash corn basis indicates a general weakening of the basis in all of the state's regions over the six-year study period. In the Pee Dee region, the basis has weakened substantially as documented in Table 2.6. A possible explanation may be that severe drought in the late 1990's may have influenced a stronger basis during the 1997-1999 period. During the three-year period of 1997-1999 in the Pee Dee region, the cash corn basis average for the calendar year was about 3 cents under the nearby futures price. Over the three-year period 2000-2002, the basis weakened to an annual average of 15 cents under the nearby futures contract. This represents a loss of 12 cents per bushel on corn sold during that period. The impact on the cash corn basis in other areas of South Carolina is similar but less dramatic. In the Central region, the basis averaged 13 cents over the nearby futures during 1997-1999 but weakened to an average of 6 cents over the nearby futures during the 2000-2002 period for a loss in basis of 7 cents. In the Savannah Valley region, the cash corn basis averaged 3 cents over nearby futures and weakened by 8 cents, to average 5 cents under during the 2000-2002 timeframe.

#### *South Carolina Soybean Basis Trends*

There is similar weakening pattern in the cash soybean basis in South Carolina (Table 2.6). In the Pee Dee region, the cash soybean basis averaged 18 cents under the nearby futures during the 1997-1999 marketing period, and weakened to an average of 32 cents under during the 2000-2002 period, for an average weakening of the basis of about 14 cents per bushel. In the Central region, the cash soybean basis weakened from 1 cent over to 13 cents under, a loss of 14 cents per bushel. The Piedmont region witnessed a similar weakening of 14 cents per bushel. In the Savannah Valley region, cash soybean basis shrank 3 cents changing from 23 cents under during 1997-1999 to 26 cents under during 2000-2002. Much of this basis weakening in South Carolina may be caused by the temporary closing of one of the State's two soybean crushing facilities at Estill in Hampton County, South Carolina was closed for about 18 months but has now re-opened under the name of Carolina Soya at the time of writing.

Table 2.6. Trends in South Carolina Basis 1997-1999 and 2000-2002 by Market Area.

<u>Crop/Area</u>	<u>1997-1999 Ave.</u>	<u>2000-2002 Ave.</u>	<u>Difference</u>
<i>Dollars Per Bushel</i>			
<b>Corn</b>			
<i>Central</i>	\$0.13	\$0.06	-\$0.07
<i>Pee Dee</i>	-\$0.03	-\$0.15	-\$0.12
<i>Savannah Valley</i>	\$0.03	-\$0.05	-\$0.08
<b>Soybeans</b>			
<i>Central</i>	\$0.01	-\$0.13	-\$0.14
<i>Pee Dee</i>	-\$0.18	-\$0.32	-\$0.14
<i>Piedmont</i>	-\$0.29	-\$0.45	-\$0.16
<i>Savannah Valley</i>	-\$0.23	-\$0.26	-\$0.03
<b>Wheat</b>			
<i>Central</i>	-\$0.11	-\$0.26	-\$0.15
<i>Pee Dee</i>	-\$0.50	-\$0.51	-\$0.01
<i>Piedmont</i>	-\$0.55	-\$0.51	\$0.04
<i>Savannah Valley</i>	-\$0.53	-\$0.51	\$0.02

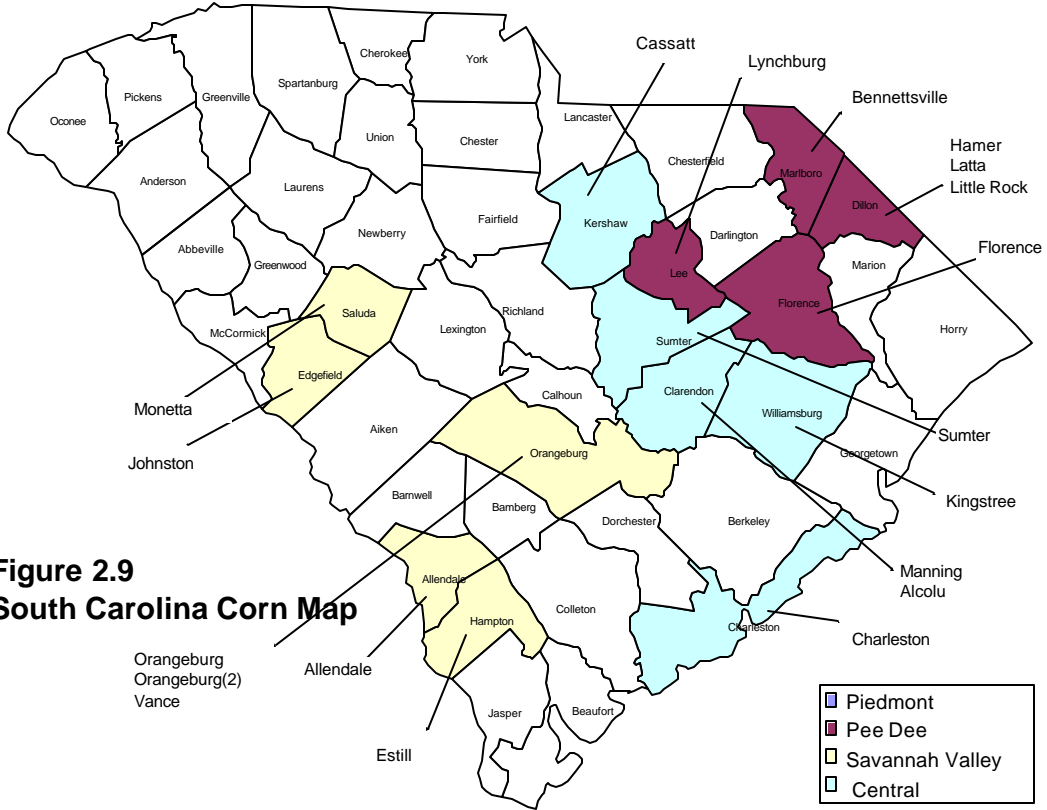
#### *South Carolina Wheat Basis Trends*

The cash wheat basis strengthened slightly in two of the regions, namely, the Piedmont and Savannah Valley regions during the study period (Table 2.6). The Pee Dee region remained essentially unchanged with a slight 1 cent weakening. This stability may be attributed, in part, to the increased use of wheat as a feed grain in hog and poultry rations. These livestock categories can utilize wheat as a portion of rations. The fact that wheat harvest occurs when local corn supplies are exhausted may encourage feed use of wheat. Many buyers have been recently offering contracts for wheat at the July spot corn price in recent years. The Central region experienced the greatest decline in basis with a 15 cent weakening. This is principally due to reduced exports from the Charleston port facility, which is in this region.

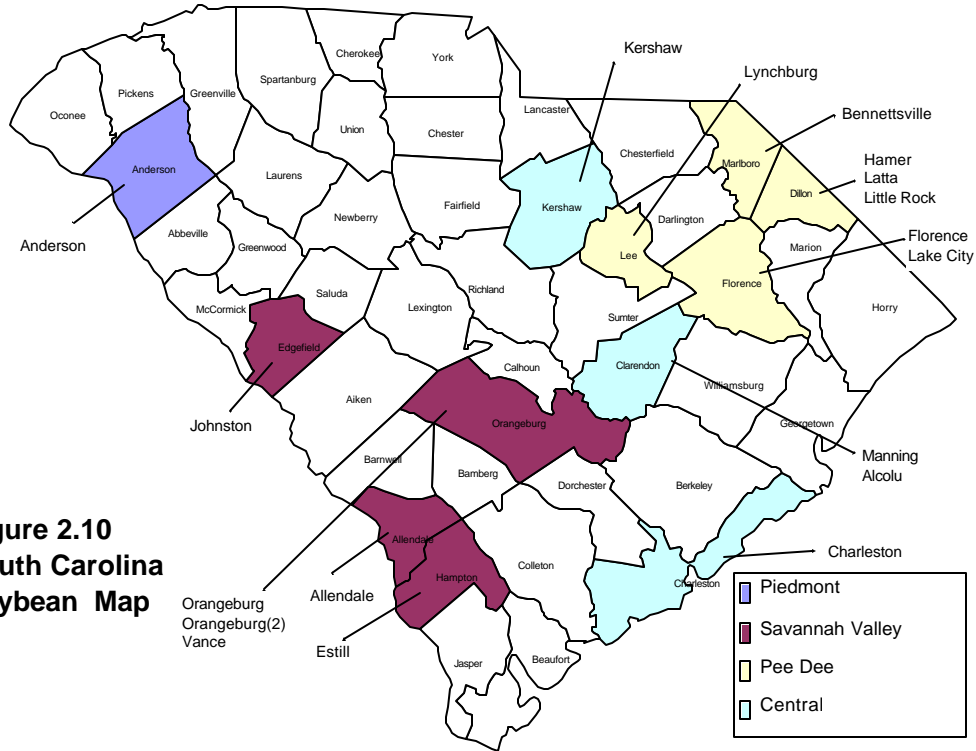
#### **Seasonal Trends in South Carolina Basis**

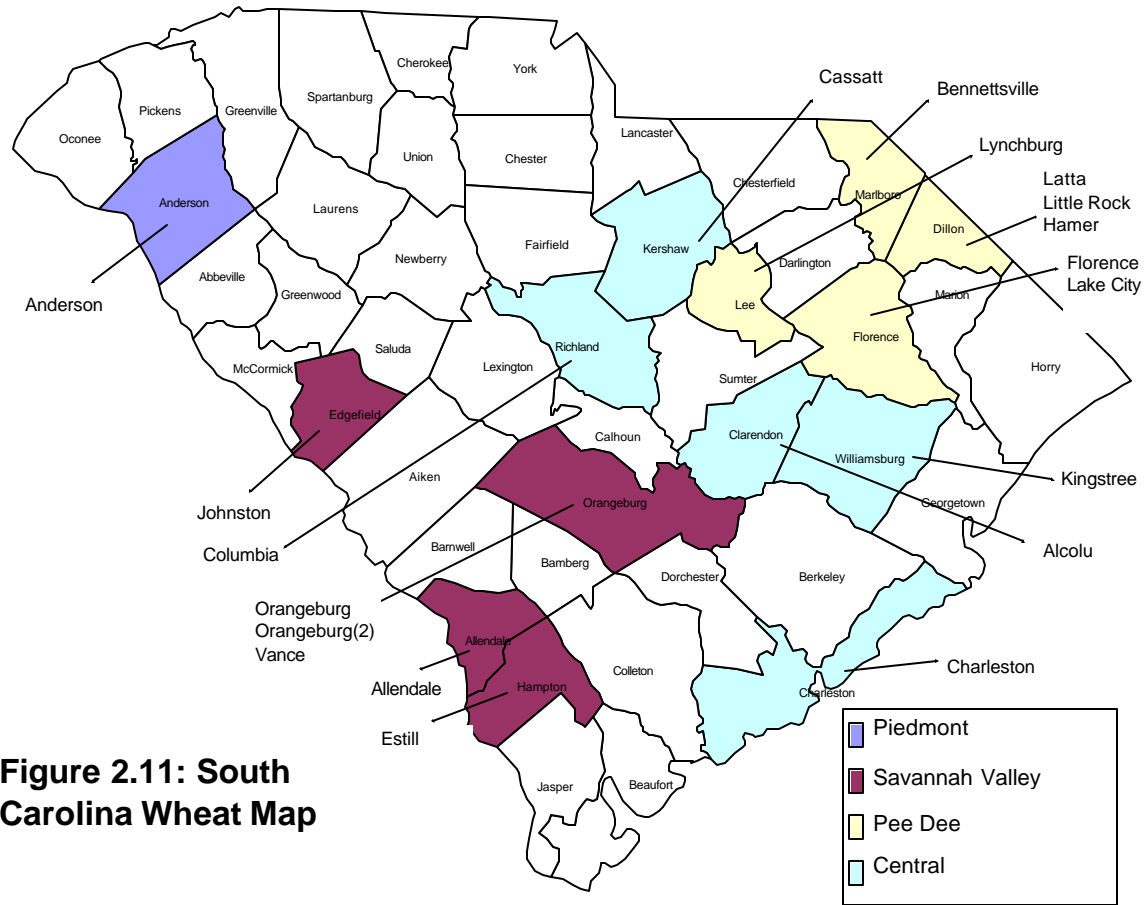
The seasonal trends in South Carolina cash corn basis show similar general trends in all three areas as shown in Figure 2.12. The basis is the weakest during the corn harvest period from August through October. The basis then strengthens into late fall or early winter. It reaches a maximum during the late winter months or early spring and holds fairly steady during the summer. A notable spike then occurs in June as most available local supplies have long since been exhausted. This has potential implications for wheat as it finds its way into feed channels during this same time. The basis then weakens dramatically from June going into the new crop harvest period.

The seasonal trends in South Carolina cash soybeans demonstrate a pre-harvest pattern similar to that of cash corn where there is a substantial weakening prior to harvest and the making of the low at harvest during October-November as shown in Figure 2.13. A major difference between corn and soybean basis is the soybean basis



**Figure 2.10  
South Carolina  
Soybean Map**



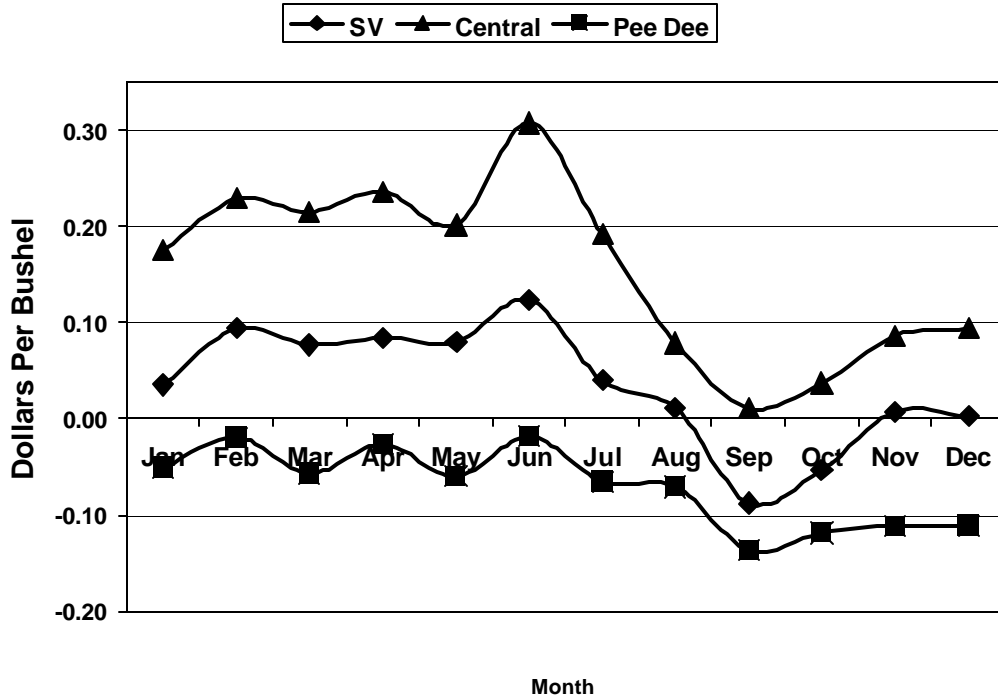


**Figure 2.11: South Carolina Wheat Map**

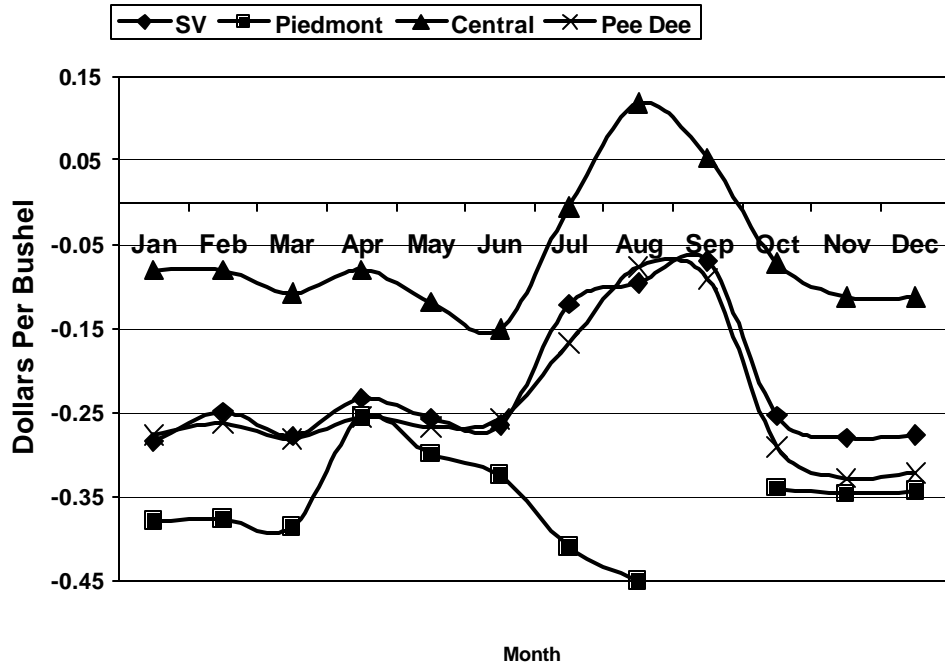
is much less variable from harvest through early summer. Cash soybean basis is typically fairly steady during the first half of the calendar year before beginning to strengthen during late summer. The cash soybean basis is typically the strongest during the months of July and August when local supplies are shortest with steady decreases from this period to the end of the calendar year with the exception of the Piedmont region.

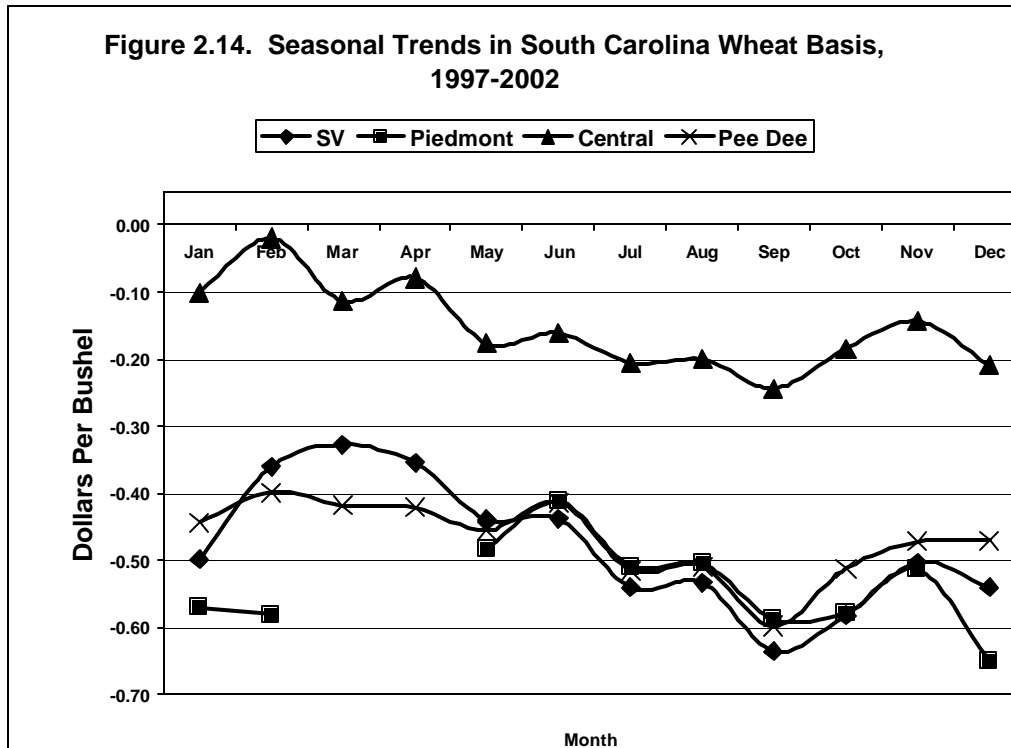
Seasonal trends in South Carolina cash wheat basis are for a mildly declining basis trend during the first nine months of the year as shown in Figure 2.14. A notable weakness is observed in September. After September there is a period of several months where the basis strengthens up until November before it begins to weaken. Note that the average basis in the Central region is considerably higher than in the other regions. This is due primarily to Columbia being a food wheat mill and Port of Charleston influences.

**Figure 2.12: Seasonal Trends in South Carolina Corn Basis, 1997-2002**



**Figure 2.13: Seasonal Trends in South Carolina Soybean Basis, 1997-2002**





### Comparison of Seasonal Basis Trends Across the Three States

It is interesting to compare seasonal basis trends across the three states in similar geographic areas. In Figure 2.15, the comparison is for the corn basis in the Eastern regions of each state along the coastal plains. There is quite a difference between the patterns of North Carolina and South Carolina and that of Georgia. The pattern in North Carolina and South Carolina are similarly seasonal although North Carolina has a fairly stable positive differential whereas the seasonal patterns for Georgia are distinctly different. The corn basis in South Carolina is negative throughout the year while the corn basis in North Carolina is positive throughout the year. In Georgia, the basis is generally positive but weakens to be negative during the harvest period of August and September.

Another striking feature is the magnitude of the difference between the states. Perhaps that can be explained by livestock production in each of the states in those market areas. North Carolina has its hogs located heavily in the Eastern areas and that added demand is strong. Georgia has considerable poultry production in the southeast to add demand. South Carolina has fewer total grain consuming animal units than the other two states (see Table 2.2) and thus local demand may well be weaker than the other two states. In the Pee Dee, South Carolina region, the buyers are local elevators who probably move most corn to Eastern North Carolina. The difference may simply reflect transports costs to North Carolina. The similarity in seasonal patterns and the fairly constant differential between these regions supports this view.

*The lesson to be taken is that local end use demand is a large component in determining the basis within any given market area. When local end use demand is high relative to supply then the basis tends to be relatively strong. When local end use demand is low relative to supply then the basis tends to be weak.*

**Figure 2.15: Three State Corn Basis - Eastern Markets**

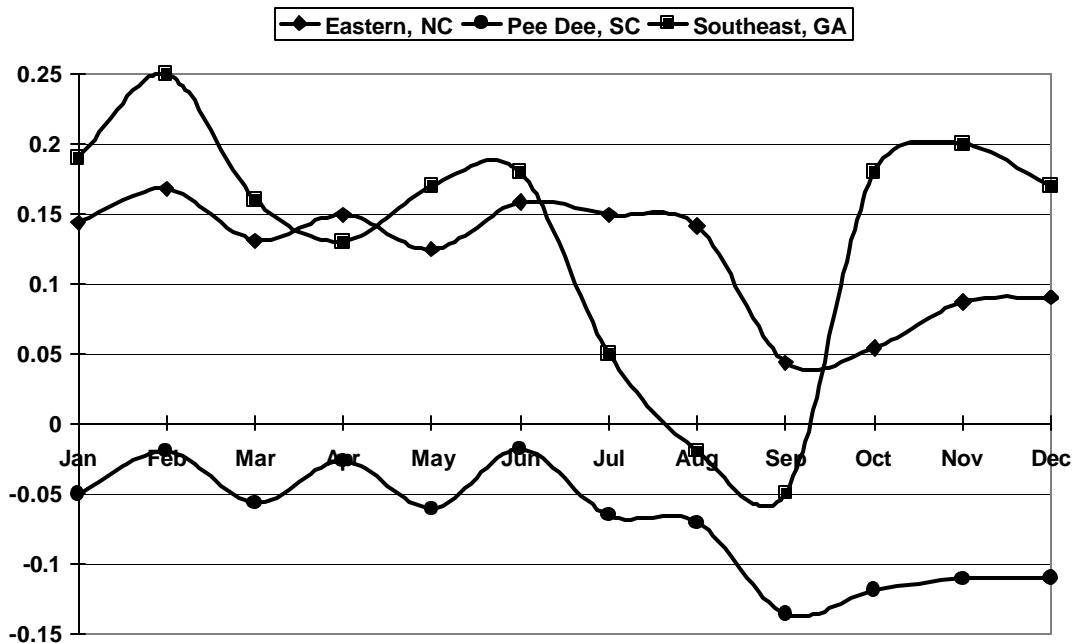


Figure 2.16 shows a comparison of the seasonal trends in the soybean basis in the Central regions of the three states. The trends in soybean basis are quite similar for North and South Carolina with stability during the first five months of the year, a general strengthening during the summer, and a weakening pattern into the harvest period. The Central region in Georgia demonstrates a general weakening pattern from January through July when a significant strengthening pattern emerges into the harvest period. The weakening of the basis at harvest in Georgia is much less than the other two states.

Transportation cost could affect the basis. For instance, the basis in Georgia is significantly weaker than in the other two states and that can be attributed to the distance to processing facilities. The Central regions in both North and South Carolina are or were during the study period, close to processors and thus the cost of transport from the field to the mill is less than in Georgia. The Central region in Georgia is 125 to 175 miles to the nearest processor. That added distance and thus added transport cost could account for the lower basis in Georgia than in the other two states.

*The lesson is that local demand determines the relative strength of the basis and that transport costs from the production areas to the end user/processor can be a significant factor in determining the basis.*

Figure 2.16: Three State Soybean Basis - Central Markets

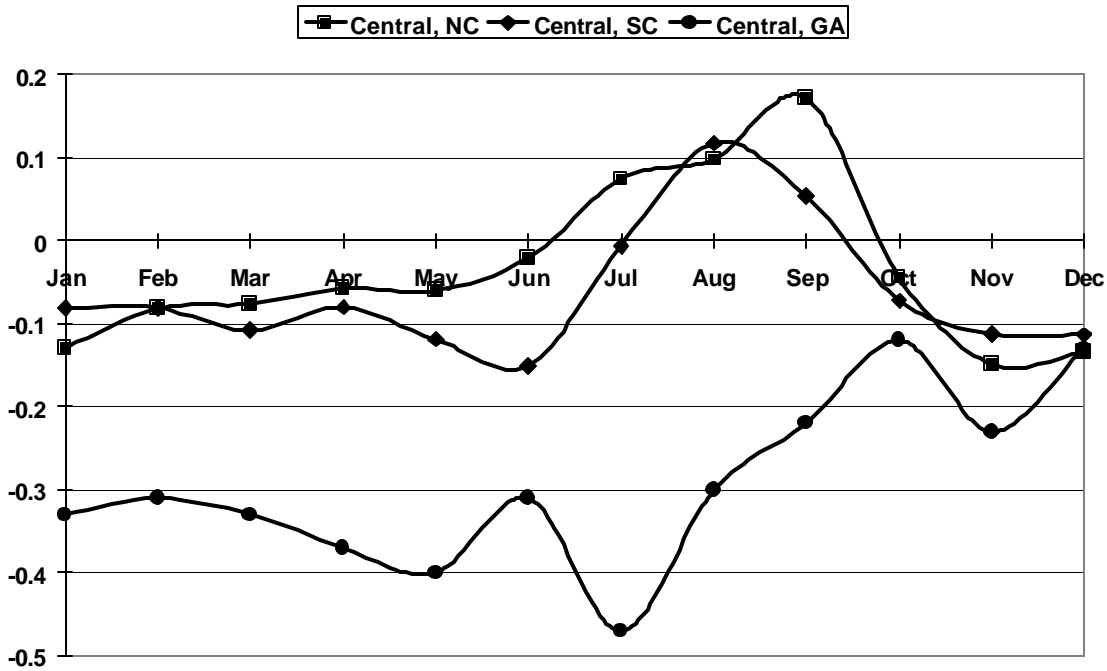
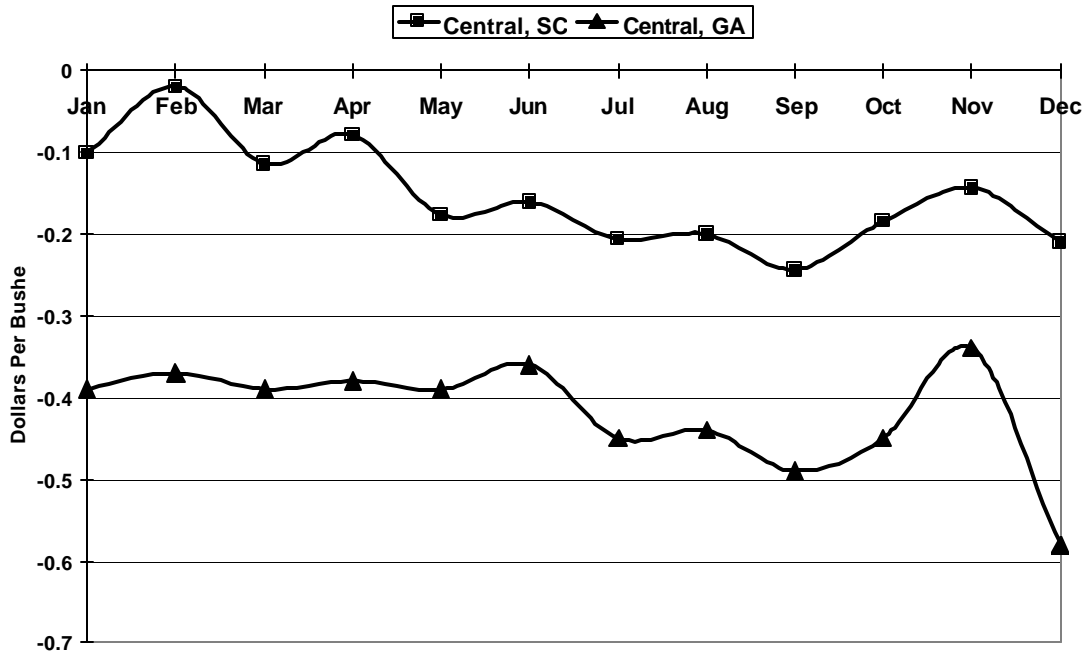


Figure 2.17 contains the wheat basis trends from the Central region in Georgia and South Carolina. There is no basis data for wheat in North Carolina. The Central market areas of both states contain the major wheat mills located in the two states and the major production areas are within reasonable proximity to the mills. While the overall annual pattern is similar in shape in the two states, the basis is much stronger in South Carolina than in Georgia. The reason for the disparity can likely be explained by the source of the basis data. In Georgia, the basis represents the average of country elevator/buying points or first handlers. In South Carolina, the basis represents the average of mostly feed mills or end users. The basis is normally weaker at the first handler point than at the final user level. This differential is clearly illustrated in Figure 2.17.

**Figure 2.17: Two State Wheat Basis - Central Markets**



*The lesson to be taken is that basis will be stronger at the end user/processor than at an intermediary handler. The intermediary handler must reduce its bid below the final use price level to cover operating costs including a profit and transport cost from the buying point to the end user.*

### **Summary Key Points**

Based on the information and data provided in this chapter the following summary statements characterizing important basis trends and factors affecting basis can be made:

- Georgia and South Carolina have large poultry industries as their demand base whereas North Carolina has a large and mature hog industry and an expanding broiler industry as its user base.
- Common trends in changes in basis in North Carolina and Georgia during the study period can be characterized as a weakening of corn basis and strengthening of soybean basis. South Carolina had declines in both corn basis and soybean basis with the decline in soybean crushing capacity having an overriding weakening impact upon statewide soybean basis.
- The weakening of the corn basis varied from 4 to 21 cents in Georgia but was less dramatic in North Carolina with a weakening of 7 to 10 cents and similarly for South Carolina a weakening of 7 to 12 cents over the study period of 1997-2002.

- There was considerable variation of the change in soybean basis within regions of both North Carolina and Georgia. There were examples of both strengthening and weakening of the soybean basis with a common factor of the regions where basis weakened experiencing loss of soybean crushing capacity. In the case of Southeast Georgia this was the closing of the Estill, South Carolina crush plant and in the case of Eastern North Carolina the closing of the Cofield, North Carolina plant. The strengthening of the soybean basis varied from 3 to 7 cents in Georgia and in North Carolina varying from 2 to 9 cents. In South Carolina there was a little variation between regions, except for the Savannah Valley, however, in all regions there was a consistent finding of a weakening of the soybean basis.
- In the absence of a loss of crushing capacity, at least for North Carolina and Georgia, it is reasonable to expect an overall strengthening of soybean basis which is what the data supports. In the face of declining supplies of soybeans and corn in the Southeast region, soybean basis has fared better than corn. One explanation as to why soybean basis has strengthened over the study period relative to corn is due to the relative quality of local soybeans and corn. Southeastern soybeans compared to Midwest soybeans normally have a higher protein content and therefore are more desirable for crushing. While Southeastern corn, rightly or wrongly, is often considered inferior to Midwest corn due to occasional incidences of aflatoxin which renders corn unusable for most feed uses.
- The wheat basis in Georgia and South Carolina can be characterized as weakening up to 18 cents or showing modest strengthening of 4 cents across regions for the period 1997-2002. The predominant production areas of both states show a weakening basis trend. The weakening can be attributed to the closing of export facilities in Savannah and Charleston, however, feed use has probably provided some offsetting influence in some regions.
- The three states documented here have many similarities in regards to grain production and consumption. However, there exists significant variation in basis patterns between the states. Generalizations of basis in one state cannot be safely transferred to similar areas of the other states.

## CHAPTER 3: USING HISTORICAL BASIS TO MAKE MORE INFORMED AND EFFECTIVE RISK MANAGEMENT DECISIONS

### Some Basics of Basis, Marketing Decisions, and Managing Price Risk

Historical price series are useful to put the current level of prices into perspective. They provide some indication of how current levels compare to previous years, and they are also useful for detecting the presence of seasonal trends in price levels. Both of these factors can be helpful in evaluating current market conditions allowing for more informed marketing decisions. However, in relation to marketing decisions, it is also informative to look at historical basis because basis tends to be more predictable than general price levels. Knowing the historical basis and its typical patterns throughout a marketing year can be helpful to producers in making better marketing decisions and in particular evaluating cash bids. The information in the previous chapter provides a comprehensive account of basis trends and seasonal patterns over the study period of 1997 to 2002 for the tri-state region.

One can think of the futures market prices at any point in time as a measure of the expected levels of supply and demand balance for the U.S. and for the world for that matter, at different times in the future. Most of the major grain players in the world markets pay significant attention to the Chicago Board of Trade and also utilize this market to manage price risk. The higher the price, the more expected demand there is for the product relative to expected supply. Conversely, it can be said that expected supply is greater than expected demand when prices are low. Thus, the futures price is a gauge of the relative expected demand and supply into the future.

The futures contract closest to expiration is often referred to as the “nearby” futures contract. One can think of the nearby contract as a measure of the current demand and supply situation in the U.S. and world markets. Similarly, the basis serves that same function for local cash markets. When current basis is relatively strong it implies that current local demand is high relative to supply. The converse is also true, when current basis is weak it implies local demand is low compared to supply. The terms weak and strong are used to describe basis levels. This is a relative concept, where a weak basis would be a basis that is below typical historical levels and a strong basis is a basis that is above typical historical levels.

#### *Using Basis to Gauge Cash Bids*

Historical basis data is used as the measuring stick to determine if the basis is relatively weak or relatively strong at any point in time. One need only compare a current basis to the historical levels to decide if the current basis is stronger or weaker than normal for any point in time.

Perhaps the greatest value gained from knowledge of historical basis information is using it to evaluate current cash price offers. Cash bids are set by buyers using the nearby futures price and adjusting it to their local situation to arrive at their cash bids to sellers. That adjustment is the basis. Sellers can determine the current basis provided by the bids and compare that to the historical basis. This relationship can be represented as:

$$\text{Current Cash Price} = \text{Current Nearby Futures Price} + \text{Historical Basis}$$

Assuming there are no major changes to the market environment, a basis stronger than the historical basis in a current bid would indicate a strong desire from the buyer for the commodity than would normally be expected. That would be a signal that the current bid is a relatively “attractive” bid to consider. Conversely, a weaker basis than the historical basis would indicate a weaker desire from the buyer for the commodity than would normally be expected. That would be a signal that the current bid is relatively “unattractive”.

For example, in October a corn buyer in Southeast Georgia is offering a bid for immediate delivery that contains a basis of 20 cents over December futures. To evaluate that bid, the seller would compare that to the historical basis for that time frame. Based on the recent historical basis over the period 1997-2002, the nearby basis in October for the Southeast region has been as high as 18 cents over (2000) and as low as 20 cents (2002) under the December futures, with an average of 3 cents under (see Table 3-A). The current bid of 20 cents over would represent a very strong bid compared to what might be expected and may be an “attractive” bid to consider accepting. In fact, the current bid would set a new six-year high for October. It implies that local demand for corn is relatively greater than available local supply. If the bid offered was at a basis of 15 cents under, then that bid should be interpreted as a poor offer due to the weak basis and the seller might well wait until the basis is “stronger” to sell the grain or look elsewhere for a buyer. This implies that available supply is relatively greater than local demand.

Table 3-A: Average Monthly Corn Basis with Nearby Futures for Southeast, GA.

<i>Dollars Per Bushel</i>													
year	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec	
1997	0.33	0.32	0.28	0.09	0.27	0.25	0.11	0.01	-0.04	0.03	0.08	0.04	
1998	0.11	0.15	0.11	0.15	0.15	0.18	0.13	0.16	0.02	-0.01	0.13	0.15	
1999	0.17	0.27	0.14	0.28	0.24	0.08	0.34	0.00	-0.27	-0.03	0.05	0.16	
2000	0.05	0.08	0.00	0.01	0.02	0.06	-0.02	-0.10	-0.16	0.18	0.21	0.26	
2001	-0.14	-0.09	-0.09	-0.11	-0.12	-0.10	-0.09	-0.12	-0.17	-0.16	-0.20	-0.22	
2002	-0.20	0.05	-0.20	-0.20	-0.23	-0.20	-0.10	-0.18	-0.20	-0.20	-0.08	-0.13	
<i>Max.</i>	-0.20	-0.09	-0.20	-0.20	-0.23	-0.20	-0.10	-0.18	-0.27	-0.20	-0.20	-0.22	
<i>Min.</i>	0.33	0.32	0.28	0.28	0.27	0.25	0.34	0.16	0.02	0.18	0.21	0.26	
<i>Aver.</i>	0.05	0.13	0.04	0.04	0.06	0.05	0.06	-0.04	-0.14	<b>-0.03</b>	0.03	0.04	

Source: [http://www.ag-econ.ncsu.edu/faculty/piggott/corn\\_datGA.htm](http://www.ag-econ.ncsu.edu/faculty/piggott/corn_datGA.htm)

*The lesson is that basis can be used to decide whether it is beneficial to accept an offered cash price at any point in time. If the basis is strong relative to history, then the bid is attractive and indicates a strong desire to buy by the purchaser and a good opportunity to sell for the seller. The converse is also true. By knowing what the basis has been in the past the seller can decide with greater confidence whether or not any given price offer is a reasonable.*

### *Using Basis To Evaluate Forward Price Offers for Harvest Delivery*

All cash pricing depends on the following relationship:

$$\text{Cash Price Offer} = \text{Nearby Futures Price} + \text{Nearby Basis}$$

Because of this fundamental relationship of how cash price offers are derived, we can use a similar relationship to evaluate forward price offers. All forward pricing is done using futures markets and estimates of basis levels at harvest. Typically, we expect cash forward pricing to closely follow this formula:

$$\begin{aligned} \text{Forward Price Offer} &\approx \text{Harvest Contract Futures Price} \\ &+ \text{Historical Basis at Harvest} \end{aligned}$$

The harvest contract futures price plus the historical basis at harvest can be combined to calculate a projected forward contract price for delivery at harvest. This projected forward contract price can be compared with a forward bid offer to evaluate the “attractiveness” of the forward bid offer. For corn the December futures contract, for soybeans the November futures contract, and for wheat the July futures contracts are all considered to be the harvest futures contracts (i.e., the futures contracts that expire closest to but not before the typical harvest time period for the regions of interest)

For example, if a producer in Pasquotank County, North Carolina was interested in locking-in a price for soybeans in June for harvest delivery in late October, knowing the historical basis can be helpful in evaluating current harvest delivery offers. To illustrate, let’s say the November soybean futures contract, the futures contract that expires closest to but not before the time the producer is planning to sell their soybeans, is trading at \$6.00 in June. In addition, the producer calls the local buyer at Elizabeth City (the closest local elevator) and a forward harvest delivery price offer of \$5.85 is made. The local buyer is quoting a price that is 15 cents under the current futures price. In other words, it is a basis of 15 cents under (-\$0.15). Is this a reasonable price? Should the producer go ahead and contract some of their anticipated production at this price?

Knowledge of the historical basis can help the producer decide whether to either accept or reject the offer (see Table 3-B). The monthly historical basis for Elizabeth City over the period 1997-2002 provides the average, minimum, and maximum values by month.. Using this information, the producer can make a more informed decision about whether to accept the current offer of \$5.85. Over this six-year history, the average basis in October at Elizabeth City has been 27 cents under (-\$0.27) with a maximum of 14 cents under (1997) and minimum of 37 cents under (2002). If the buyer was to make an offer using the average basis we would expect an offer of \$5.73 ( $\$6.00 + [-\$0.27] = \$5.73$ ), but the current offer is 12 cents above this level ( $\$5.85 - \$5.73 = \$0.12$ ). In this case the producer has an opportunity to lock-in a basis that is significantly above the six-year average.

Assuming that the price level is also acceptable, the current offer gives the producer an opportunity to eliminate both price and basis risk on the amount of their expected production that they elect to contract. The producer must also be comfortable with the fact that entering into a forward contract also precludes benefiting from any price rallies, or strengthening in basis, once the contract is agreed upon. If they are not comfortable with the price level, they might want to discuss the possibility of a basis

contract. A basis contract allows the producer to lock-in the current basis, but to determine the price level at a later date.

Table 3-B: Average Monthly Soybean Basis with Nearby Futures for Elizabeth City, NC.

*Dollars Per Bushel*

year	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec	
1997	-0.20	-0.15	-0.17	-0.18		-0.16	-0.10	0.39	0.03	0.14	-0.14	-0.25	-0.17
1998	-0.10	-0.06	-0.06	-0.10		-0.11	-0.13	-0.36	-0.07	-0.16	-0.20	-0.29	-0.31
1999	-0.26	-0.26	-0.28	-0.25		-0.35	-0.35	-0.38	-0.29	-0.34	-0.31	-0.35	-0.21
2000	-0.25	-0.25	-0.30	-0.29		-0.34	-0.34	-0.05	-0.05	-0.25	-0.36	-0.51	-0.47
2001	-0.38	-0.24	-0.20	-0.17		-0.19	-0.18	-0.10	-0.09	-0.16	-0.37	-0.42	-0.31
2002	-0.24	-0.17	-0.18	-0.14		-0.13	-0.13	-0.02	0.15	0.10	-0.21	-0.25	-0.23
2003	-0.14	-0.09	-0.09	-0.12		-0.20							
<i>Min.</i>	-0.38	-0.26	-0.30	-0.29		-0.35	-0.35	-0.38	-0.29	-0.34	-0.37	-0.51	-0.47
<i>Max.</i>	-0.10	-0.06	-0.06	-0.10		-0.11	-0.10	0.39	0.15	0.14	-0.14	-0.25	-0.17
<i>Aver.</i>	-0.22	-0.17	-0.18	-0.18		-0.21	-0.21	-0.09	-0.05	-0.11	<b>-0.27</b>	-0.35	-0.28

Source: [http://www.ag-econ.ncsu.edu/faculty/piggott/soy\\_dat\\_short.htm](http://www.ag-econ.ncsu.edu/faculty/piggott/soy_dat_short.htm)

*The lesson is that historical basis can be used to evaluate forward price contract offers. A stronger than expected basis in conjunction with an acceptable price level may signal an opportunity to eliminate price and basis risk by agreeing to a forward price contract. This strategy is advantageous in that it provides protection from any declines in price levels or weakening basis. The primary disadvantage with this strategy is that it also precludes benefiting from price rallies or strengthening in basis once the contract is entered into. There is also production risks as the producer is under contract to deliver the amount of grain specified.*

### *Basis and Hedging*

It is essential to understand how local prices and basis have behaved historically for producers and others making decisions to reduce their exposure to price risk. Basis risk is fundamental to hedging. The principle of hedging hinges upon eliminating exposure to price risk while remaining susceptible to basis risk. This means basis risk must be significantly less than price risk for hedging to be attractive. To establish whether this is indeed the case, it is necessary to have historical records of basis and prices. If this information is not available, producers and others cannot make fully informed decisions concerning marketing.

To illustrate that producers face greater exposure to price risk than basis risk, consider the following example. Let's say the current futures price of soybeans is \$6.00 per bushel and that the historical basis has been 30 cents under yielding a local cash price of \$5.70. If basis were to vary by 100% or 30 cents, a very wide swing by historical records, the local cash price would vary by 30 cents or from \$5.40 to \$6.00 depending on the direction of the basis change. But if the futures price were to change by only 10% or 60 cents, a less than average amount during a growing season, the local cash price would vary by 60 cents or from \$5.10 to \$6.30, a range of \$1.20. Clearly, a small variation in futures price can cause local cash prices to change by a greater amount than a large change in the basis.

*The lesson is that basis risk is less than futures price risk. This is relationship between price and basis risk is fundamental to hedging.*

### *Using Basis in Deciding Whether to Hedge or Contract*

Knowledge of the historical basis can be useful in deciding whether to hedge versus entering a cash forward contract. Continuing with our example of a producer in Pasquotank County, North Carolina interested in locking-in a price for his crop before harvest. By locking in pre-harvest, he can avoid price lows that usually come about with selling at harvest. Continuing with of the November futures contract trading at \$6.00 in June, but with a harvest delivery offer of only \$5.65, a basis of 35 cents under ( $\$5.65 - \$6.00 = -\$0.35$ ). The six-year history of the October basis in Elizabeth City, North Carolina (Table 3-B) reveals that 35 cents under is a close to the record low (the lowest was 37 cents under ( $-\$0.37$ ) in 2002 versus an average of  $-\$0.27$ ). Because the offered basis is weak, the producer should probably pass on this forward contract price offer. In the absence of historical records it would have been difficult to put the merits of the offer into perspective.

Despite the less-than-attractive basis offered, if the producer finds the current November futures price of \$6.00 attractive, then an opportunity exists to go ahead and lock-in this price level. The way to do this is by hedging using futures. This strategy locks-in the attractive price level but allows the producer to benefit from the likely improvement in basis that should occur. That is, we can be fairly confident about this improvement due to our historical perspective of historical basis levels relative to the current offer. The producer hedges by selling the appropriate number of futures contracts (an amount the producer is confident in producing) and buying them back at the same time he sells his crop in the cash market (offsetting).

A hedge could be undertaken by buying put options that can protect against downward price movements.<sup>1</sup> Although the producer has locked-in a price level by taking this position in the futures market (or options), they still face basis risk—the risk that basis will weaken further. However, the basis is already close to a historical low, so the producer may be more willing to take on this risk because the historical records show the basis should improve which will work to their benefit. Once hedged, should the basis strengthen, the producer can then offset the futures hedge by pricing the soybeans through a forward contract (if it is still prior to harvest) or by using a cash sale at harvest. Either plan means the producer benefits by this improvement in basis when compared to taking the forward contract offer in June.

For example, if the November contract is trading at \$5.75 in September, and the forward contract harvest delivery price is \$5.50, the basis offer for harvest delivery is now 25 cents under ( $-\$0.25$ ). This basis is more like the typical level (the average basis in October is  $-\$0.27$  from Table 3-B). This offer represents an opportunity to lock-in a reasonable basis thus avoiding the possibility of a below average basis at harvest. The producer not only locks in this basis by entering the forward price contract but also locks in a price level in the cash market. This means there is no longer any reason to continue with the price level protection offered by the hedge undertaken in June. Now

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<sup>1</sup> A put option is an asset that gives the holder the right to sell grain to the writer of the option at a specified price (the strike) up to a specified date.

the producer offsets the futures positions by buying the same number of contracts at \$5.75, which nets \$0.25 on their futures position. The hedge did its job of protecting the \$6.00 price level from June since the producer was able to net the \$0.25 (sold at \$6.00 and bought back at \$5.75) which effectively gets added to their forward contract price. Thus, the net price for the soybeans that were marketed is  $\$5.50 + \$0.25 = \$5.75$ . Notice that the producer receives an additional \$0.10, compared to having taken the \$5.65 offer in June, an amount equal to the strengthening in basis between June and September.

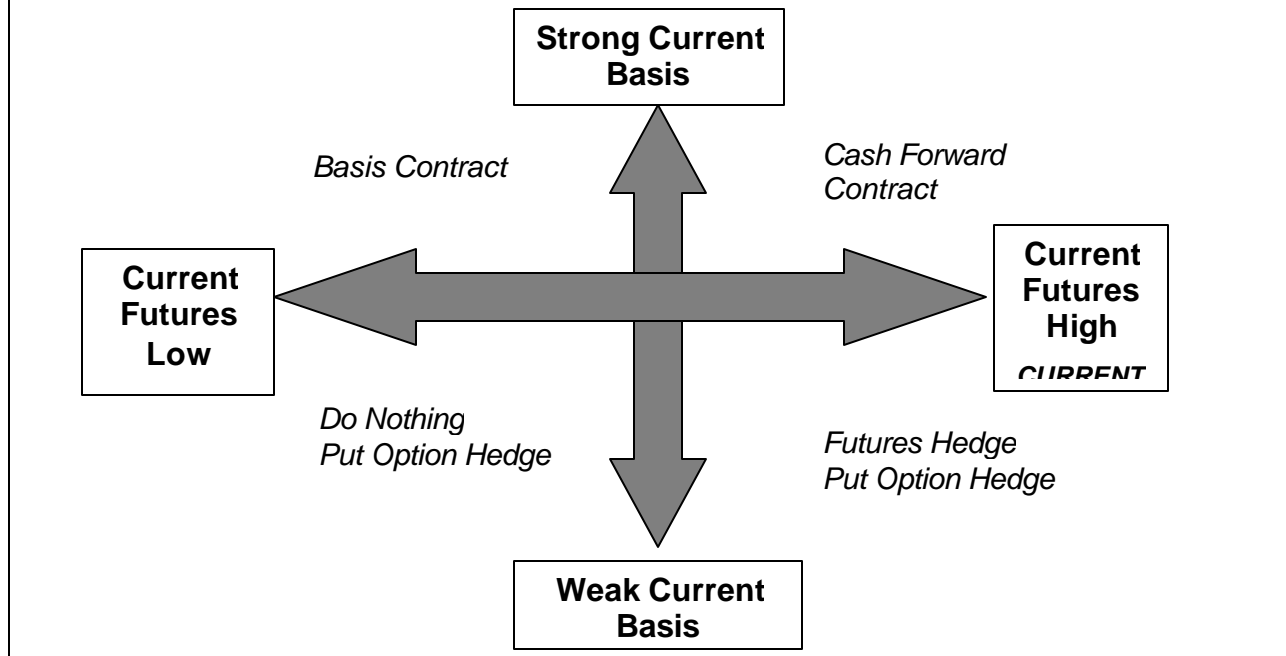
Most of what has been described above can be characterized in the Table 3-C and Figure 3-A, which display the merits of risk management under alternative scenarios of basis and futures prices. Table 3-C shows the risks associated with different marketing strategies.

Table 3-C: Marketing Strategies and Impact Upon Futures and Basis Risk to the Seller

<b><i>Marketing Strategies</i></b>	<b><i>Futures Price Risk</i></b>	<b><i>Basis Risk</i></b>
<b><i>Cash Sale At Harvest</i></b>	Yes	Yes
<b><i>Cash Forward Contract</i></b>	No	No
<b><i>Basis Contract</i></b>	Yes	No
<b><i>Futures Hedge</i></b>	No	Yes
<b><i>Options Hedge (Put)</i></b>	No	Yes

Figure 3-A illustrates recommended strategies for different futures price and basis situations. Each of the strategies takes advantage of potential changes in either futures price or basis and protects the seller against adverse movements in those elements. The recommended strategies are the “least risky” marketing alternative for each situation. For example, when the basis is strong and current futures prices are high, the best strategy with the least risk would be to enter into a cash forward contract. That contract locks in both the favorable basis and attractive futures price. It protects against a weakening of the basis and against futures prices falling.

Figure 3-A: Recommended Marketing Strategies for Different Futures Price and Basis Situations



*The lesson is that basis can be used to decide whether it is beneficial to hedge or use a cash forward contract. A weaker than expected basis in conjunction with an acceptable price level, may signal an opportunity to eliminate price risk by hedging and retaining only basis risk. This strategy allows the producer to lock-in the current price level, but not the basis allowing the producer to benefit from any strengthening in basis. The premise is that basis tends to be less volatile and more predictable than price levels. Locking in the price level eliminates the more risky component (price) leaving the less risky and more predictable component (basis) to strengthen to its typical level. A stronger basis makes hedging less attractive (a weakening of basis is detrimental to a producer who is hedged) and may signal that a forward price contract may be more appropriate.*

#### *Using Basis in Deciding Whether to Store*

Another use for knowledge of historical basis is to decide whether or not to store a commodity in anticipation of a higher price at some time in the future. Storage is profitable when the local cash prices rise enough to offset the cost of holding the commodity in storage. Costs of on-farm storage consist of fixed costs of the storage facility, costs of conditioning and preservation, and the opportunity cost of the value of the commodity. These monthly costs vary from farm to farm but may be near 5 cents per bushel for corn, 6-7 cents for wheat, and 8-9 cents for soybeans. Commercial storage costs may be more or less than on-farm costs. Local cash prices need to rise by more than these costs to make storage profitable.

Knowledge of the historical basis can be useful in deciding whether to store grain for a deferred sale. It can also be helpful in deciding whether it may be worth investing in on-farm storage facilities. That is, if basis consistently strengthens to an extent it offsets the cost of storage year after year it may pay to invest in on-farm storage facilities. As before, the rationale is to try to avoid the typical price lows that come about by simply selling at the prevailing harvest price with no other marketing.

Whether a producer uses on-farm or commercial storage, storage incurs additional expenses. Thus, ultimately a significantly higher price is needed if storage is to be profitable. Storage not only involves additional expenses it also involves additional risks such as possible spoilage that must also be factored in to the decision. Local cash prices can change when futures market prices change and/or when changes in the basis are made by purchasers. Historical basis information and data about seasonal movements in futures prices provide a prediction of how the basis and thus, the cash price, is likely to change from one point in time to another.

When contemplating storage, the spread between the nearby futures and a deferred contract month is perhaps the best indicator of whether this might be a profitable strategy. For example, if in October the November soybean contract is trading at \$5.70 and the March contract is trading at \$5.90, there is a spread or carry of 20 cents. That is, the market is willing to pay 20 cents to store soybeans from November to March. Another indicator of whether storage over this period might be worthwhile is having knowledge of what basis typically does between October and March. Recall that Figure 2.8 revealed that typically basis is weakest when supplies are plentiful around harvest in October-November for the Eastern region of North Carolina (the region of North Carolina that includes Elizabeth City in our example). Thus, we anticipate that the basis is most likely to be improving over the period from November to April. Remember that a producer who owns soybeans benefits from a strengthening in basis. Thus, whether storage is beneficial or not depends upon whether the strengthening in basis combined with the carry that is being offered is more than enough to cover the costs associated with storage. The return to storage can be expressed as:

$$\text{Return to Storage} = \text{Futures Carry} + \text{Basis Gain} - \text{Cost of Storage}$$

Let's continue with our example of a producer in Pasquotank County, North Carolina. We assume the soybean futures are trading as in the example above with a 20 cent carry being offered in October between November and March (the November contract is trading at \$5.70 and the March contract at \$5.90 in October). In addition, the current nearby basis is at the historical average at 30 cents under (\$0.30), which results in a current local cash price of \$5.40 ( $\$5.70 + [-\$0.30] = \$5.40$ ). The producer must decide whether to accept the current cash price of \$5.40 or to store their soybeans in an effort to improve the net price. Knowing the historical basis is essential to making this decision. That's because the profitability of storage hinges on the carry being offered plus the amount the basis is likely to strengthen from October to March. Historical data gives some indication of what the basis gain might be.

Figure 2.8 plots the monthly average nearby basis for the Eastern region of North Carolina (the relevant region) from 1997-2002. The specific data for Elizabeth City

supports the theory that the basis tends to be weakest in November (\$-0.35) but improving through December (-\$0.28), January (-\$0.22) and February (-\$0.17). If the basis follows typical historical levels and a producer defers selling their soybeans until March they could benefit 15 cents in strengthened basis (the average over the six year history shown in Table 3-D) plus capture the current carry of 20 cents. This means there is potentially 35 cents that could be captured by storing soybeans from October through March. This potential benefit needs to be weighed against the costs of storage. Storage costs vary depending on location (on-site or commercial) and other market factors. If we assume a 8 cents per month storage cost we can “pencil” a return of 3 cents per bushel ( $0.15+0.20-0.32=0.03$ ) for storing from November until March.

Table 3-D: Strengthening in Basis for Elizabeth City, NC 1997-2002

Year	Nov	Mar	Strengthen
1997	-0.25	-0.17	0.08
1998	-0.29	-0.06	0.23
1999	-0.35	-0.28	0.07
2000	-0.51	-0.30	0.21
2001	-0.42	-0.20	0.22
2002	-0.25	-0.18	0.07
Aver.	-0.35	-0.20	0.15

Source: [http://www.ag-econ.ncsu.edu/faculty/piggott/soy\\_dat\\_short.htm](http://www.ag-econ.ncsu.edu/faculty/piggott/soy_dat_short.htm)

Of course, the producer remains susceptible to both price and basis risk if they simply put their soybeans in storage. Price level risk can be managed by hedging using the March contract to lock-in the current carry being offered, which leaves only basis risk. A simple comparison of historical strengthening in basis between November and March (such as the one presented in Table 3-B) gives the producer some confidence in accepting this basis risk. Using our example of Elizabeth City we see that the previous six years there has been a strengthening in basis of the order of 15 cents.

*The lesson is, producers should use historical data to evaluate not only price and basis risk, but to determine the potential benefit of storage. This information combined with storage cost estimates, allows producers to make well-informed decisions about whether or not to defer the sale of their crop.*

### Seasonality and Storage

Seasonal futures price trends can also be combined with historical basis to further evaluate whether one should store. For example, consider the situation for a Southwest Georgia corn grower who harvests corn in September. In Figure 2.2, we find that the basis in September has averaged 5 cents under futures during the month of September and strengthens to 25 cents over futures in February for a 30-cent basis gain over the five-month period. If it costs five cents a month to store the corn, storage costs would be 25 cents and basis gain would provide 5 cents return per bushel. Over that same period, we find that nearby futures prices also typically rise as well. In Figure 3.4, we

find that the combined impact of basis gain and nearby futures prices seasonal movements indicate that local cash prices typically rise from \$2.23 in September to \$2.79 in February for a gain in local price of \$0.56. Thus, this corn grower could “pencil in” a return to storage of \$0.56 minus \$0.25, equaling a \$0.31 return to storage versus selling at harvest.

*The lesson is that basis can be used to decide whether it is beneficial to store for a deferred sale. Typically, basis is weakest at harvest, but producers benefit from selling their crop when basis is strong. A basis that improves considerably after harvest combined with an attractive spread between the nearby (harvest futures) and distant futures may signal an opportunity to benefit from storage. Although storage is costly and requires additional exposure to unfavorable price movements, some of this risk can be managed by hedging with futures (or options) to lock-in price levels. If the carry being offered is close to the cost of the storage, this can be captured with a hedge, allowing any strengthening in basis after harvest to be added to the net price. A historical basis that has behaved predictably can give producers additional confidence when making storage decisions but of course there are no guarantees.*

### **Combining Basis with Seasonal Price Movements**

An important rationale for compiling the data in this publication and the supplemental tables is to inform producers and about the relative cash market conditions they face in selling their crops. Knowing how the basis changes during the year provides key information about the local supply and demand conditions in their market area. This information should aid in evaluating different marketing strategies and develop pricing strategies of crops to maximize crop income and manage price risk.

One way basis data can aid in decision making is for basis data to be combined with the seasonal movements in futures prices. Of course, the underlying assumption is that current and future seasonal price tendencies will be similar to those of historical trends barring any further structural changes in the market. This may or may not be the case in any future year. One can combine the data of seasonal trends in basis with the seasonal trends in grain and soybean futures market prices to formulate an estimate of the seasonal cash prices. Earlier we used simple formulas to show price relationships and so we can illustrate this concept with the following formula:

$$\text{Adjusted seasonal cash price} = \text{Seasonal futures price tendencies} \\ + \text{Seasonal basis tendencies}$$

Thus we can think of the adjusted seasonal cash price as a standard against which we can compare current prices. This will allow for the development of better-informed market risk management strategies by knowing where prices are now relative to recent history.

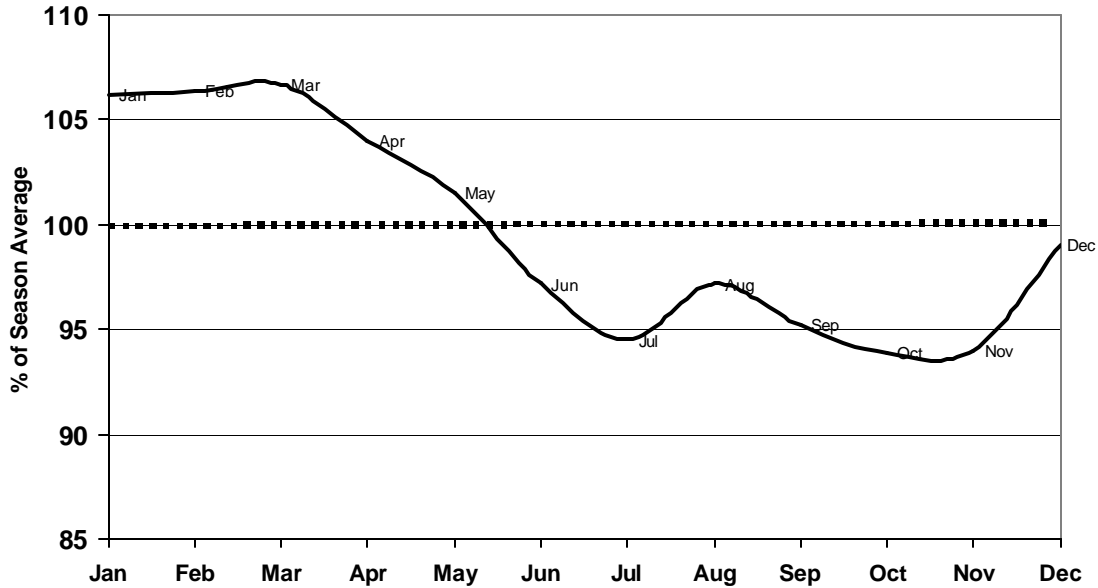
Figures 3.1, 3.2, and 3.3 demonstrate the historical seasonal price movements of grain and soybean prices using the nearby futures contract for each commodity. To develop these seasonal tendencies, we took the average futures contract price for each month of each year and divided that number by the average price for the entire year and multiplied by 100 to develop an annual index. The six years within the period were in

turn averaged to develop the seasonal price tendencies. The nearby contract was rolled over to the next month on the first trading day of the expiring contract. Prices on the charts above the 100% line indicate prices that tend to be above the season average and similarly, price below the 100% line indicate prices below the season average.

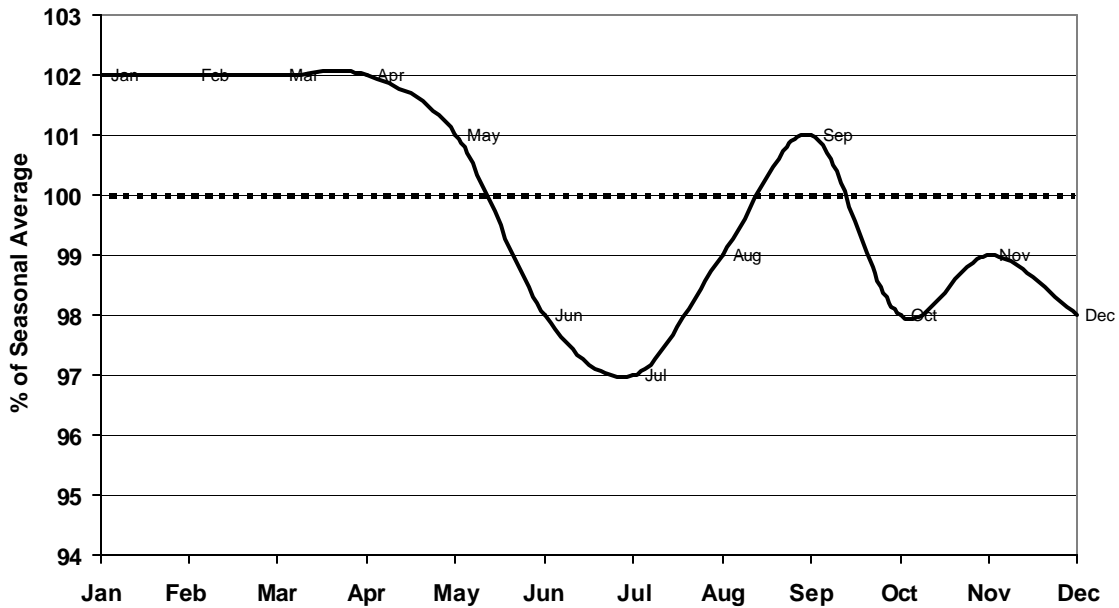
The key element to take from the above three figures is the tendency of futures prices to be above the annual average prior to the planting of the crop and at harvest, prices tend to be below the average.

We can combine the above data with the seasonal trends in basis to derive localized cash price trends for each commodity. We could develop a localized cash price trend for each local market in the three states. For illustration purposes the following three figures show the information for corn, soybeans and wheat for the Georgia markets.

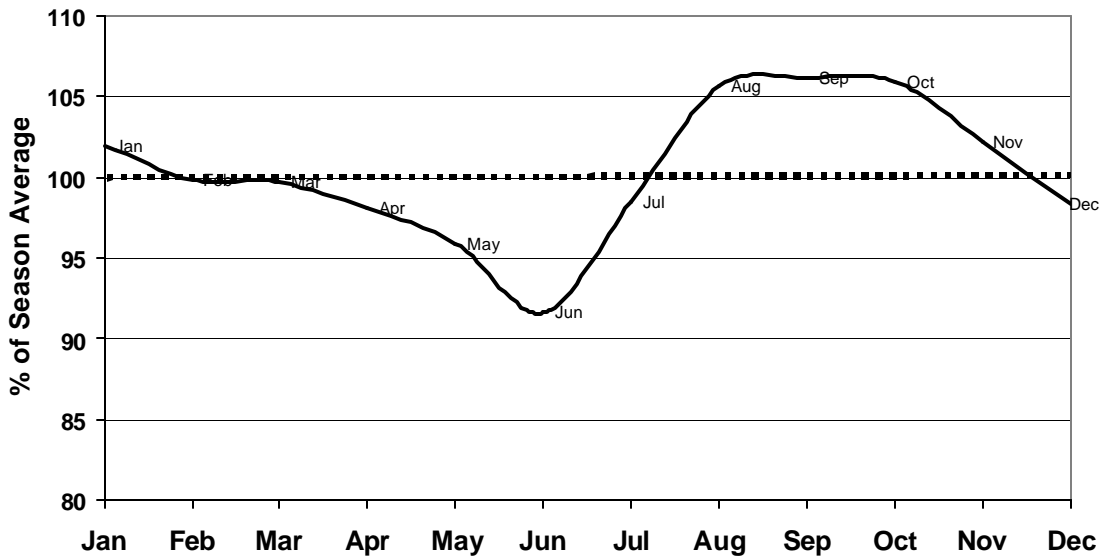
**Figure 3.1: Corn Seasonal Nearby Futures Price Tendencies 1997-2002**



**Figure 3.2: Soybean Seasonal Nearby Futures Price Tendencies 1997-2002**



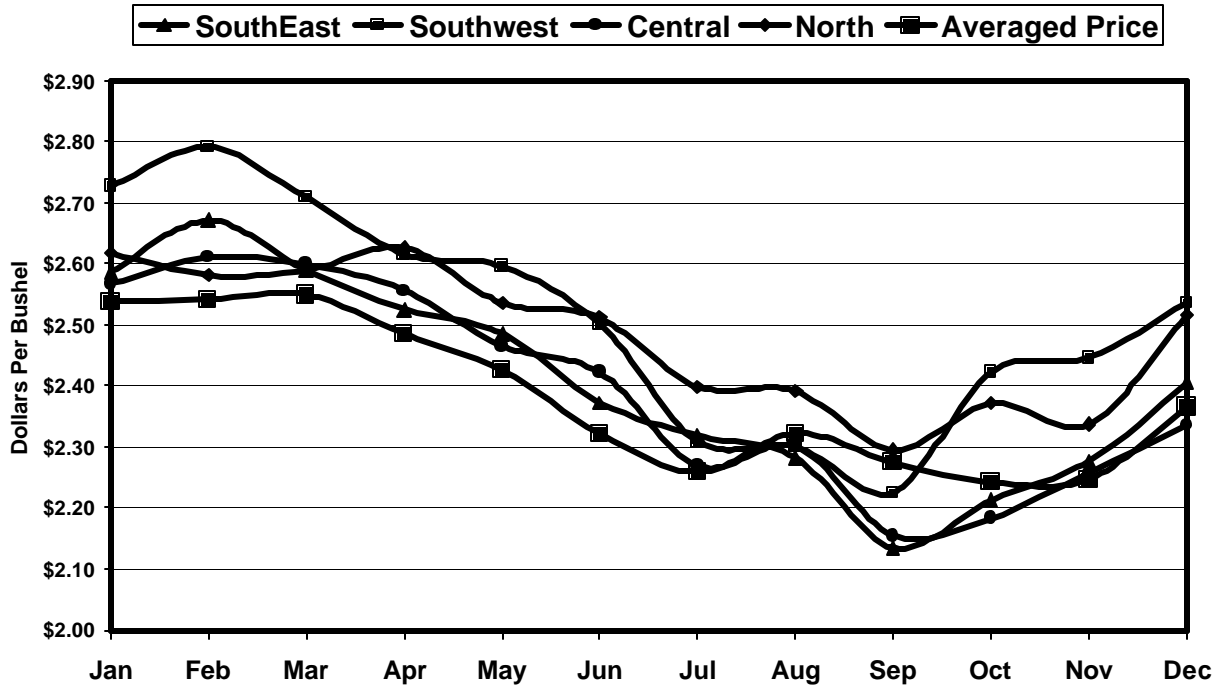
**Figure 3.3: Wheat Seasonal Nearby Futures Price Tendencies 1997-2002**



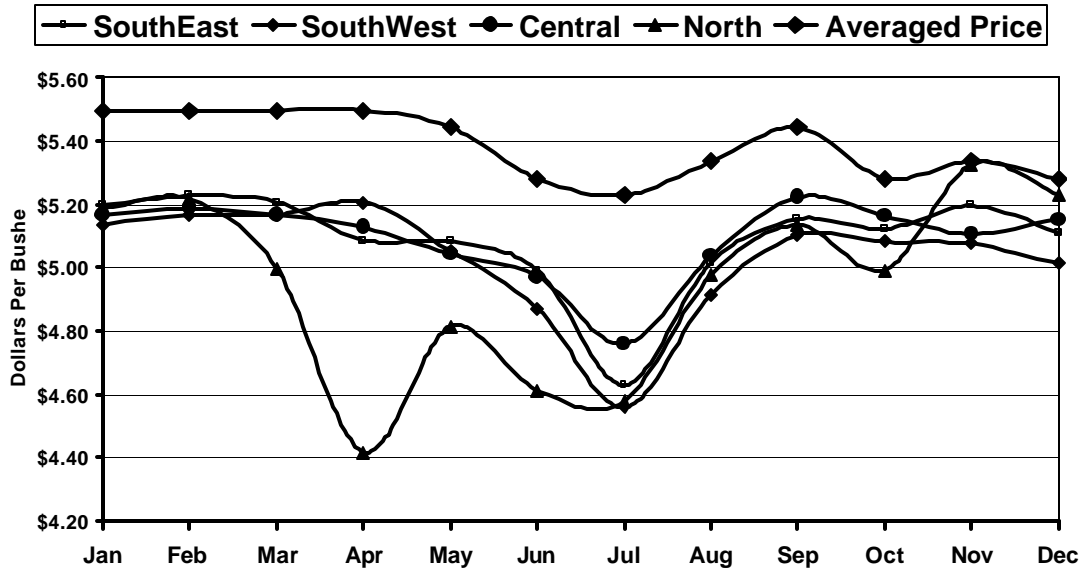
Figures 3.4, 3.5 and 3.6 depict the combined seasonal trends of both futures prices and local basis. Each figure was “fitted” with the average nearby futures price during the period of 1997-2002 to provide a realistic representation of historical cash price trends. Comparison of the futures price trend figures with the combined figures

points out that futures price movements are dominant in determining overall cash price trends but the basis trends can add an important but slightly weaker influence to local cash prices. For this reason, it is very important for producers to manage their exposure to futures price risk by using either forward cash contracts, hedging in the futures markets, or purchasing put options. Figures 3.4, 3.5 and 3.6 also illustrate the fact the futures price risk is far greater than basis risk.

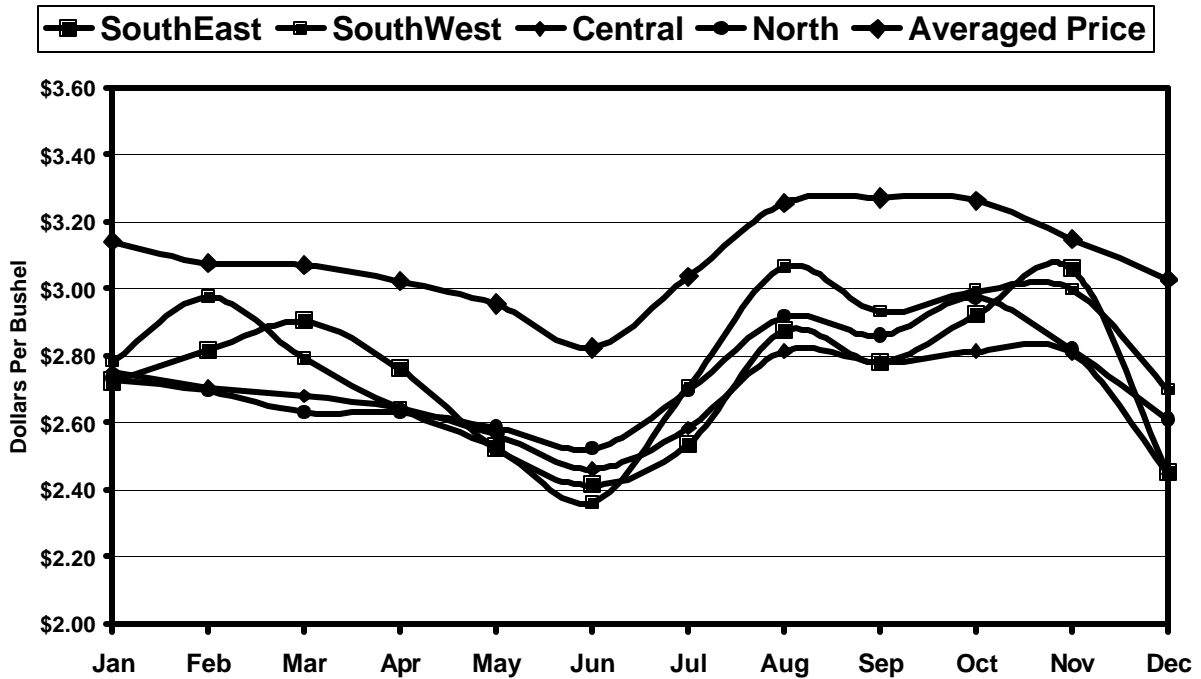
**Figure 3.4: Adjusted Seasonal Localized Corn Cash Price in Georgia**



**Figure 3.5: Adjusted Seasonal Localized Soybean Cash Price in Georgia**



**Figure 3.6: Adjusted Seasonal Localized Wheat Cash Price in Georgia**



### **Using Adjusted Seasonal Localized Prices**

Close inspection of Figures 3.4, 3.5 and 3.6 provides insight into how local cash prices might be expected to behave during the calendar year if we can assume the prices in the future will tend to follow historical patterns. In the case of corn in Figure 3.4, we can see that our 'best' prices typically occur during the first six months of the year and the market tends to be weakest during July through November. That would indicate the use of marketing strategies that place a price on corn during the first half of the year and avoiding selling during July through November. Futures prices tend to be above the season average early in the year and the basis is also at its strongest during the time frame making local cash prices strong.

The case of soybeans (Figure 3.5) indicates that local cash prices tend to be strongest during the January through April and the September through December periods and weakest during the May through August period. The North region is an exception with an abnormal drop in basis during April. Soybean futures tend to weaken during the May through August time frame with a general weakening of the basis contributing during July. That would indicate the use of marketing strategies that place a price on soybeans should favor early or late (if storage cost can be recouped) in the year but avoiding the May through September period, especially July.

In the case of wheat (Figure 3.6), local cash prices tend to be at their seasonal highs during the post harvest period of July through November and weakest during the harvest period of May and June. That would indicate the use of marketing strategies that place a price on the crop after harvest or using forward pricing to place a price on the crop at or near the planting time frame.

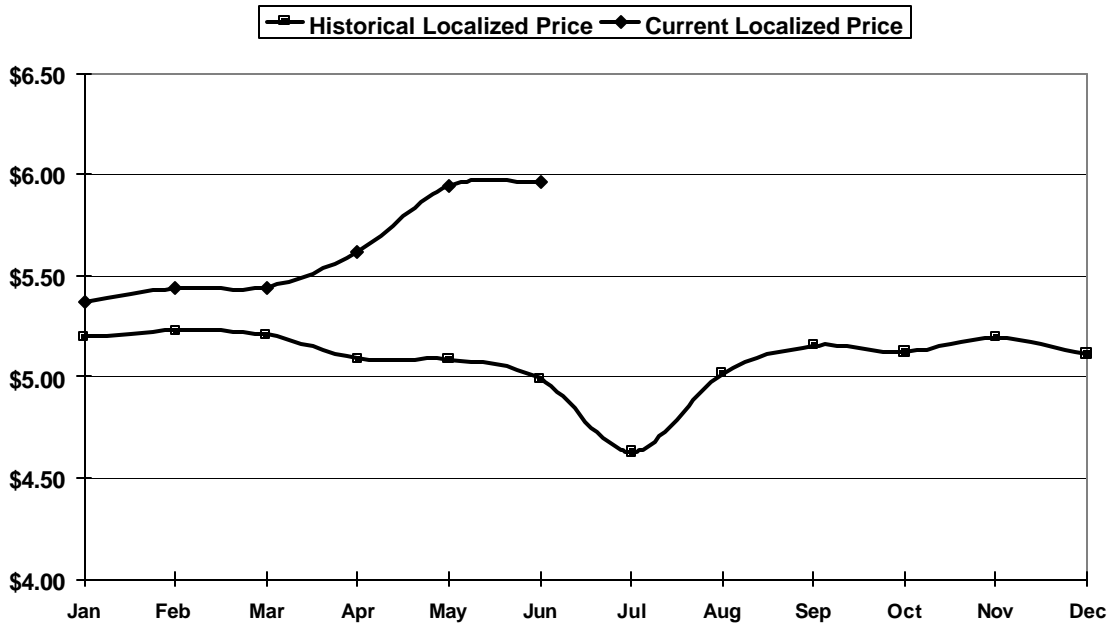
### **Using Localized Historical and Seasonal Tendencies to Evaluate Current Prices**

Localized historical prices can be used as a measuring stick to compare the current market offering. Knowing where prices have been at any point in time over the past few years can be helpful in evaluating current prices. It is often difficult to decide whether or not a current bid is a relatively "attractive" without a benchmark for comparison.

The localized historical price is obtained by using the information contained in Figures 3.4, 3.5 and 3.6 and "localizing" it by using the historical basis for any given buying point. Thus we have the seasonal tendencies of the futures price adjusted by the local basis to derive a localized historical price.

Consider Figure 3.7 showing the localized historical price of soybeans in Southeast Georgia during 1997-2002 and the localized price during the first six months of 2003. During June, prices have averaged about \$5.00 per bushels over the past six-years. This year, 2003, prices are near \$6.00 per bushel or 20 percent above what one might expect. That would indicate that the current bid by buyers is relatively "attractive" and might be a good indication of a selling opportunity compared to what was available over the past six-years. The historical series also indicates that we might expect the current prices to decline coming into near term months.

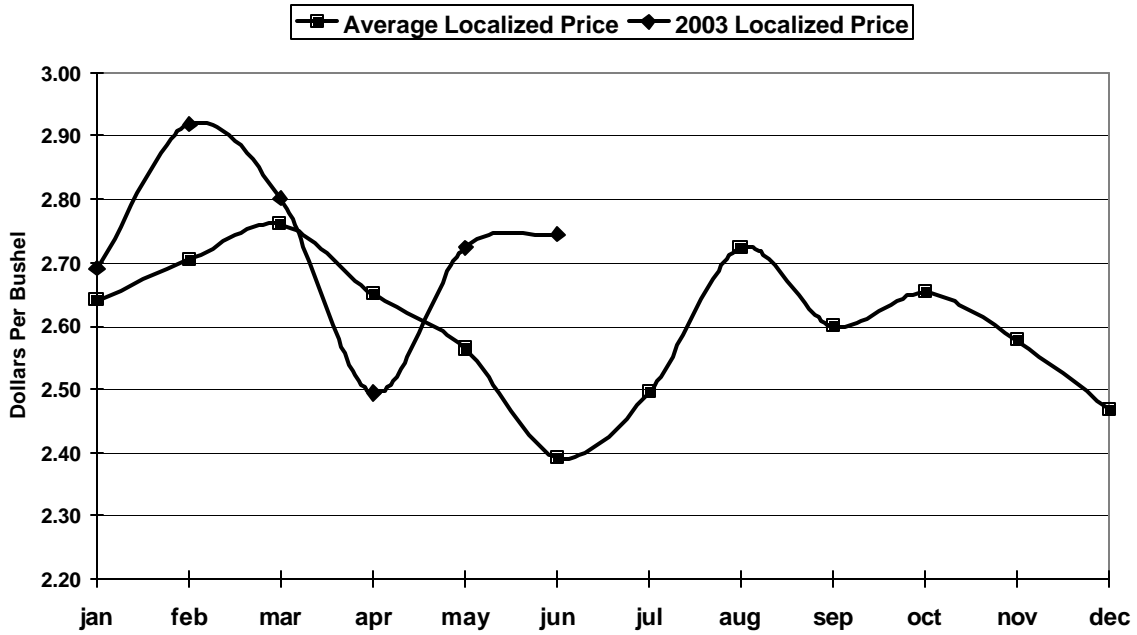
**Figure 3.7: Southeast GA Soybean Prices  
Historical vs Current**



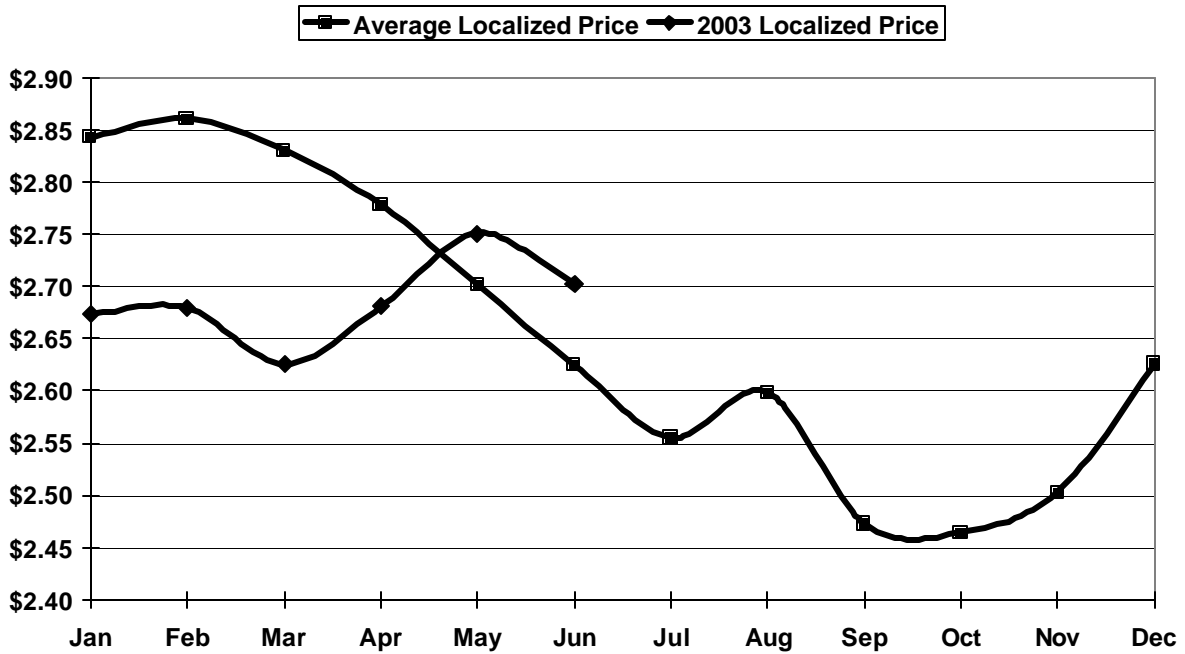
Similarly, Figure 3.8 shows the comparison of historical and current wheat prices in Orangeburg, SC. There is a historical downward trend in price as the crop enters the harvest period of May and June averaging below \$2.50 per bushel in June. In June of 2003, the localized cash price in Orangeburg was about \$2.75 per bushel indicating a relatively strong demand for wheat with price nearly 10 percent above the past six year average. That would be interpreted as an “attractive” price and growers should consider sales at harvest versus storage under a scenario such as this. Current prices were near or below the historical average prices for the remainder of the months prior to harvest.

In Figure 3.9 we observe that the 2003 localized corn prices in Western North Carolina were a good bit below the historical average until May. Local producers would not have seen any advantage from forward pricing the 2003 corn crop early in the year. In May, current prices were 5 cents above the historical average and in June the margin increased slightly to 8 cents above the average. But, the current prices have turned downward following the normal seasonal drop in prices during the growing season. Western North Carolina producers are confronted by a mild dilemma. While prices are above average in June, they are not by much—by only about 3 percent. It is not completely clear that the current bid is overly “attractive” yet at the same time it is not “unattractive” either, by historical standards.

**Figure 3.8: Orangeburg, SC Wheat Prices  
Historical and Current**



**Figure 3.9: Western NC Corn Prices  
Historical and Current**



*The lesson is that historical localized prices can be used to decide whether it is beneficial to accept an offered price at any point in time. If the current bid is strong relative to history, then the bid is attractive and indicates a strong desire to buy by the purchaser and a good opportunity to sell for the seller. The converse is also true. By knowing what prices have been in the past the seller can decide with greater confidence on whether or not any given price offer is a good one or not.*

### **Summary Key Points**

Based on the information in this chapter the following summary statements characterizing important factors that can lead to making more informed and effective risk management decisions can be made:

- Basis can be used to decide whether it is beneficial to accept an offered cash price at any point in time. If the basis is strong relative to history, then the bid is attractive and indicates a strong desire to buy by the purchaser and a good opportunity to sell for the seller. The converse is also true. By knowing what the basis has been in the past the seller can decide with greater confidence whether or not any given price offer is a reasonable.
- Basis can be used to evaluate forward price contract offers. A stronger than expected basis in conjunction with an acceptable price level may signal an opportunity to eliminate price and basis risk by agreeing to a forward price contract. This strategy is advantageous in that it provides protection from any declines in price levels or weakening basis. The primary disadvantage with this strategy is that it also precludes benefiting from price rallies or strengthening in basis once the contract is entered into. There is also production risk involved in delivering the specified contracted amount.
- Basis can be used to decide whether it is beneficial to hedge or use a cash forward contract. A weaker than expected basis in conjunction with an acceptable price level, may signal an opportunity to eliminate price risk by hedging and retaining only basis risk. This strategy allows the producer to lock-in the current price level, but not the basis allowing the producer to benefit from any strengthening in basis. A stronger basis makes hedging less attractive (a weakening of basis is detrimental to a producer who is hedged) and may signal that a forward price contract may be more appropriate.
- Basis can be used to determine the potential benefit of storage. This information combined with storage cost estimates, allows producers to make well-informed decisions about whether or not to defer the sale of their crop.

## CHAPTER 4: GOVERNMENT PROGRAMS AND THEIR INFLUENCE ON MARKETING DECISIONS AND USING BASIS INFORMATION

The new farm bill entitled the “Farm Security and Rural Investment Act of 2002” has a duration of 6 years covering the 2002-2007 crop years. The initial text in this chapter draws heavily from numerous sources including the expansive information on the 2002 farm bill and its components found at:

USDA Main: <http://www.usda.gov/farmbill/>

USDA-FSA Information: <http://www.fsa.usda.gov/pas/farmbill/>

NC State University: <http://www.ag-econ.ncsu.edu/faculty/piggott/farmbill.html>

University of Georgia: <http://www.ces.uga.edu/Agriculture/agecon/agecon.html>

Clemson University: [http://cherokee.agecon.clemson.edu/ag\\_policy.htm](http://cherokee.agecon.clemson.edu/ag_policy.htm)

The focus of this section deals with the Commodity Programs title of the bill and expressly the 3-tier “safety net” income support programs as they apply to the three principal commodities covered in this publication; corn, wheat and soybeans. Specifically, the safety net components to be examined are:

1. Direct Payments (DPs) (or Fixed Payments)
2. Target Price-based Counter-Cyclical Payments (CCPs)
3. Loan Deficiency Payments (LDPs) (or Marketing Loans)

Up front it is important to state the authors recognize the important contribution the government programs make to producer net income; particularly the “safety net” features. This publication is limited to discussing the pertinent issues that affect marketing and does not explain the intricacies of the provisions. Much additional detail is available at the above listed web sites (and others). The objective here is to examine how the safety net provisions interact with and affect the marketing decision.

Important distinctions among these three features are how payments are coupled to actual price movements and actual production. The Direct Payments (DP) are based on historic yields and rates are set by law, and are completely decoupled from actual price and production in a given year. Counter-Cyclical Payments (CCP) are coupled to national average price over the marketing year but decoupled from actual production. Marketing Assistance Loans and Loan Deficiency Payments are coupled to a USDA estimate of current local price, as measured by the posted county price, and actual production.

### *Direct Payments (DP)*

DP rates are fixed through 2007. These payments are decoupled from actual price and actual production in any given year. In short they will be received regardless

of what and how much is produced. The rate for a commodity is fixed over the life of program.

Table 4.1 Direct Payment Rates

<b>Commodity</b>	<b>2002 farm bill (2002-2007)</b>
<b>Wheat (bu)</b>	\$0.52
<b>Corn (bu)</b>	\$0.28
<b>Soybeans (bu)</b>	\$0.44

The amount a producer would receive for each commodity is determined as follows:

$$(Base\ Acres \times .85) \times Payment\ Yield \times Direct\ Payment\ Rate$$

*The lesson is that direct payments are received regardless of actual plantings, production or market price movements. Thus, there is no price or production risk. Since these payments come regardless of what is actually produced and are fixed by law, direct payments are not a factor in marketing decisions. This income guarantee can impact economic factors for producers indirectly such as cash flow, land rent, and land values.*

#### Counter Cyclical Payments (CCP)

CCPs are a new addition in the 2002 farm bill but are nearly identical to the deficiency payment system in farm programs prior to 1996. CCPs are decoupled from production, but not from national season average price. The CCP rate is set with the following formula:

$$CCP\ Rate = Target\ price - "Effective\ price"$$

The effective price is equal to the higher of:

1. Effective price = (National average market price) + (DP),
- or
2. Effective price = (National loan rate) + (DP)

The maximum CCP occurs if season average market price plus DP is at or below the loan rate (LR) plus DP. For example, the 2002 wheat effective price would be the higher of:

1. LR (\$2.80) + DP (\$0.52) = \$3.32

or

2. National market year average price (\$2.40) + DP (\$0.52) = \$2.92

In this example, the effective price is \$3.32. Given the target price of \$3.86, the CCP rate would be \$0.54 per bushel. The maximum CCP rates are shown in Table 4.2

Table 4.2: Maximum Counter-Cyclical Payments and Target Prices<sup>1/</sup>

Commodity	Maximum CCP Rate <sup>1/</sup>		Target Prices	
	2002-03	2004-07	2002-03	2004-07
Wheat (bu)	\$0.54	\$0.65	\$3.86	\$3.92
Corn (bu)	\$0.34	\$0.40	\$2.60	\$2.63
Soybeans (bu)	\$0.36	\$0.36	\$5.00	\$5.00

<sup>1/</sup> National Average Price at or Below National Loan Rate Plus Direct Payment Rate

*Can You Effectively Protect CCP Payments Against Shrinkage?*

Since the introduction of the CCP payments there has been a significant amount of attention and questions being raised by producers concerning whether they can effectively hedge the CCP. Some of the interest has stemmed from brokers encouraging producers to engage in strategies that attempt to lock-in the CCP. This section discusses the merits of this strategy.

The CCP program provides producers protection against low national season average prices (NSAP) as another facet of the safety net. The CCP is announced at the end of the marketing year for the crop. The CCP has the characteristics of a European put option; that is it can be thought of as a put option exercisable only on the last day of the marketing year. The premium is paid for by the government (it is free to the producer) and the payoff function depends on how the NSAP compares with the loan rate (LR), the direct payment (DP) and the target price (TP). The payoff function for the CCP on the last day of the marketing year can be shown to be generally as:

$$CCP = \max \{ 0, (TP - DP - \max[LR, NSAP]) \}$$

To make this payoff function more transparent, consider the case of soybeans where the payoff function can be broken down and tabulated as follows:

<b>CCP Payoff Value for Soybeans at End of Marketing Season</b>	
<b>PAYOFF VALUE</b>	<b>CONDITION</b>
0	NSAP > \$5.36;
\$5.36 - NSAP	\$5.00 < NSAP < \$5.36
\$0.36	\$5.00 < NSAP

This example shows for the case of soybeans that the CCP is capped at a maximum of \$0.36. The potential of receiving a CCP can be thought of as the producer being given an asset, a European put option, at the beginning of the marketing year that may or may not have intrinsic value on the last day (the end of the marketing year). The CCP should be viewed as an asset given to the producer at the start of the marketing year whose value hinges to the projected national season average price at the end of the marketing year and how it compares with the LR, DP, and TP.

There are two key characteristics of this asset, from the prospective of risk management that influence whether a producer can effectively hedge or protect the value of this asset:

1. First, the payoff at maturity depends on the value of the NSAP for which there is no futures market, and
2. Second, the CCP is only exercisable at the end of the marketing year

The fact that there is no futures market that trades the “NSAP” means that there is no underlying futures market that allows a producer to effectively offset the price risk associated with the NSAP. In order to hedge price risk effectively, there must be an underlying asset that is traded on the futures market that is strongly correlated with the asset one is trying to hedge. The stronger this relationship the more effective is the strategy at offsetting the risk. Hedging cash corn prices can be done reasonably well with corn futures markets since cash corn prices and futures prices for corn are highly correlated. To hedge the CCP one would ideally want to have a futures contract for the NSAP but there simply is not one. Importantly, the futures contracts that trade on the Chicago Board of Trade (CBOT) represent the futures price of the underlying commodity on the contract expiration date not over the entire season average price. This distinction of the difference between the futures price on a given day versus the season average is critical in assessing the hedge effectiveness of using the underlying futures and options markets to hedge the CCP.

The second characteristic of the CCP being a European style put option brings up issues of cost effectiveness. European options can only be exercised on their maturity date. Since a European option can only be exercised on their maturity date only, one would expect that an American option (our typical options) would normally be more expensive as the European. This difference in cost increases the further out from maturity. The important thing to note is that using strategies that involve American style options to try and hedge the CCP involves paying for the ability to exercise the option at any time. Therefore, the strategies that involve using American options to hedge the CCP not only suffer from not being highly correlated with underlying asset (the NSAP), they also involve purchasing the ability to exercise over the marketing year which is not required in protecting this asset whose payoff can only be exercised at maturity.

*The lesson is that CCP payments are decoupled from production and national average market price movements affect the level of final payment. Because CCP is based on national average season price over the marketing year, there currently is no effective means of hedging the CCP from shrinkage (i.e., there is futures market that trade the national season average price. Not only is trying to hedge the CCP likely to be ineffective it is likely to be cost prohibitive given the structure of this asset whose payoff*

*is determined at maturity only (end of the marketing year) and cannot be exercised or captured through the marketing year.*

### *Loan Programs and Loan Deficiency Payments (LDP)*

The underlying price support feature of the 2002 farm bill is the marketing loan program. Loan program benefits are coupled to local prices as determined by the USDA and available on all actual production. As in the past, marketing loans themselves are non-recourse loans. As such, the producer obligation is limited to repayment at the lower of the “Posted County Price” (PCP) or the loan principal plus interest. Producers also retain the ability to simply forfeit the commodity in repayment of the loan.

### *Nonrecourse or “Regular” Loan Program*

Producers can place an eligible commodity under the loan immediately after harvest. Once a commodity is placed in the loan, producers receive the loan rate on all bushels placed under loan. Loans are for a maximum of nine months. Forfeiture of the commodity is not considered a “marketing loan gain” for payment limitation purposes. This is important to remember if an operation is reaching the payment limit. There are three ways the loan can be subsequently satisfied:

1. Repay the loan plus interest and storage;
2. Repay and claim the loan gain; and
3. Forfeit the commodity.

If the PCP is below the local loan rate, crops may be redeemed and loans satisfied at the PCP. If the crop is redeemed at less than the loan rate, a “loan gain” results. An example would be that if the PCP in Iredale County, North Carolina for corn is \$2.00/bu and the local loan rate is \$2.22/bu, then a producer could redeem corn from the loan and gain \$0.22/bu loan gain.

If the PCP is above the local loan rate, crops may also be redeemed and loans satisfied prior to maturity. If a crop is redeemed, when PCP is above the loan rate and the loan satisfied by paying loan principal plus interest, no loan gain results. An example would be if the PCP in Iredale County, North Carolina for corn is \$2.32 and the local loan rate is \$2.22, a producer could redeem corn from the loan by repaying the \$2.22 value borrowed plus interest.

The marketing loan program is available to producers at any market price. There is a \$75,000 per producer limit on all marketing loan gains and the “Three Entity” rule continues to apply. In the regular loan program, a PCP can be locked in once for 60 days and the loan repaid anytime in the 60 days at that locked-in PCP. If not repaid in the 60 days, the locked-in PCP expires and loan can be repaid at that day’s PCP.

LDPs are available only when PCP falls below the local LR. When an LDP is available, producers may choose to receive the equivalent of the loan gain in the form of a “Loan Deficiency Payment” and subsequently hold or sell their crops in lieu of participating in the regular loan program.

The loan program and LDPs are available until the “final loan availability” date for the covered commodity. These dates are when all outstanding loans must be satisfied and any available LDP claimed.

These dates are:

1. Wheat – March 31 after harvest,
2. Corn and Soybeans – May 31 after harvest.

*The lesson is that the loan program provides effective price support at the loan rate. It is essentially a “free” put option with the strike price at the loan rate. The loan deficiency payments and/or marketing loan gains are coupled to local prices and actual production.*

#### Loan Rates (LR)

LRs are set for 2002-2007 with declining rates for wheat and corn in 2004 and beyond (Table 4.3). LRs are set for each appropriate county across the U.S. and may differ for adjacent counties. Table 4.4 illustrates selected county-level LRs within the region.

Table 4.3 National Loan Rates 2002-07 <sup>1/</sup>

Commodity	Loan Rate	
	2002-03	2004-07
Wheat (bu)	\$2.80	\$2.75
Corn (bu)	\$1.98	\$1.95
Soybeans (bu)	\$5.00	\$5.00

Table 4.4: Selected County-level Loan Rates in GA, SC and NC. <sup>1/</sup>

Commodity	National Loan Rate 2003	Screven County GA	Iredell County NC	Kershaw County SC
Wheat (bu)	\$2.80	\$2.45	\$2.50	\$2.50
Corn (bu)	\$1.98	\$2.23	\$2.22	\$2.19
Soybeans (bu)	\$5.00	\$5.05	\$5.14	\$5.04

<sup>1/</sup> Source <http://www.fsa.usda.gov/dafp/psd/>

#### Beneficial Interest Issues

A producer must retain “Beneficial Interest” in the covered commodity to enter the crop in the loan program or be eligible to receive an LDP. Beneficial Interest means the producer must retain:

1. Control of the commodity,

2. Risk of loss, and
3. Title to the commodity.

Choice of marketing strategies and contracts can affect loan program access and receipt of LDPs (Table 4.5). Traditional strategies such as delayed pricing (deliver and transfer title now and set price later) have become less utilized as they result in the loss of beneficial interest to the producer.

Table 4.5: Choice of cash marketing strategies & contracts can affect Beneficial Interest

Contract/Strategy	Beneficial Interest lost
Cash Forward Contract	At delivery
Basis Contract	At delivery
Deferred Pricing	At delivery
Futures Hedging	At cash sale
Put Option	At cash sale
On Farm Storage	At cash sale
Commercial Storage	At cash sale

*The lesson is producers must have “Beneficial Interest” in the covered commodity to enter the loan program and receive an LDP or loan gain. There is a \$75,000 per producer limit on all marketing loan gains and the “Three Entity” rule continues to apply. Access to the LDP terminates on the final loan availability date.*

*Posted County Price (PCP) Determination*

PCPs are calculated each week day by USDA for all relevant counties in the U.S. For corn, wheat and soybeans, the PCP is calculated by taking the cash price in two terminal markets (often one is an export market) less an annual and daily (additional) adjustment as determined by the USDA. These two adjusted prices are compared every day (Mon-Fri) and the higher becomes the PCP. The local loan rate less PCP (if PCP<LR) is the LDP in effect the following day. PCPs and LDPs for any relevant US county can be found at the USDA-FSA web site:

<http://www.fsa.usda.gov/dafp/psd/default.htm>

The intent is for the PCP to reflect local market price conditions. The idea for this is so that producers can receive a net price equal to the loan rate. While this is the objective, it is often the case that the PCP is not equal to the local price and may be at times significantly different. If the PCP is below the cash price it works to the producer’s

advantage enabling them to capture a net price above the loan rate if they take an LDP payment on the same day as selling in cash market. The converse is also true if the PCP is above the cash price it works to the producers disadvantage resulting in net price that is below the LR.

We can establish some useful relationships that help to explain these potential differences in PCP and cash prices. The PCPs and the local cash price can be represented as follows:

$$\begin{aligned} \text{PCP} &= \text{Terminal Cash Price} + \text{Annual Adjustment} + \text{Daily Adjustment}, \\ &= (\text{Futures Price} + \text{Terminal Basis}) + 2 \text{ Adjustments} \end{aligned}$$

$$\text{Cash Price} = \text{Futures Price} + \text{Local Basis}.$$

As the formulas indicate the futures price is common to both the PCP and cash price. Further futures price appears as the factor that would explain the majority of day-to-day variations in both the PCP and cash price. If one looks at the difference between the PCP and cash price we arrive at the following formula:

$$\text{PCP} - \text{Cash Price} = [\text{Terminal Basis} - \text{Local Basis}] + \text{Daily Adj.} + \text{Annual Adj.}$$

Since supply and demand conditions may vary between the terminal markets and the local market we would expect to see some differences in the basis in the terminal and local markets on a daily basis that the daily adjustment attempts to offset. Furthermore, the annual adjustment may not completely capture the cost of transport linkages between the two markets on any given day. Therefore, deviations of the PCP and the cash price that are often observed can be attributed to significant differences in basis between the terminal and local markets that are not offset by two adjustments on a daily basis.

Differences between the local cash price and the PCP can be observed as short-term deviations that can be explained by unanticipated changes in demand and supply in the respective terminal and local markets that were not fully offset by the adjustment mechanisms. In general, the PCP is meant to serve as a reasonable proxy for the local cash prices in each county. As shown in the formulas above this cash price can be thought of as the futures price plus local basis. As the data in this publication support, the greatest source of potential variation in the cash price stems from variation in the futures prices rather than the local basis.

Analyzing LDPs as a potential revenue source amounts to projecting PCP levels. By definition there is an inverse relationship between the PCP and LDP. If the PCP falls further below the loan rate then the LDP increases. The converse is also true. If the PCP increases closer to the loan rate then the LDP falls. Since the PCP is a proxy for cash prices it follows that this same inverse relationship holds true for cash prices and the LDP. Since the greatest source of variation in cash prices can be attributed to changes in the futures prices, one could use futures seasonality to explore when LDPs would most likely be highest. In simple terms because of the relationships described above, lower futures prices leads to lower cash prices, which should also mean a lower

PCP, lower PCP means higher LDP. Drawing the more simple relationship reveals, lower futures means a higher LDP.

Earlier, indices of futures price levels were presented and discussed (Figures 3.1-3.3). Using these data, one can observe when futures prices tend to be lower during the marketing year. From this one can arrive at a qualitative indication of the propensity for the PCPs to be lowest and, thus LDPs to be highest. Careful examination of the futures indices would indicate that low PCPs and thus higher LDPs would tend to be in:

1. Corn – September through November (Harvest)
2. Wheat – May through July (Harvest)
3. Soybeans – October through November (Harvest)

*The lesson is that the potential level of an LDP will be closely but inversely related to the historic trends in futures price seasonality. Review of the data over the past several years would indicate that the PCP is typically weakest at or just following harvest for corn, wheat, and soybeans.*

### **How Do Government Programs Impact Producer Marketing Strategies?**

The challenge to the producer who is maximizing profits subject to price uncertainty is to achieve the highest revenues available to them at the lowest possible cost. Revenues come from crop sales and government program payments. As indicated earlier, producers have no influence over the level of DPs or CCPs they receive. However, they can decide when to collect the LDP if one is available. Therefore, one can set a goal of maximizing crop revenue (selling at high futures prices and a strong basis) and also maximizing LDP income. This is complex in that futures and cash prices move in opposite directions from the LDP level. In other words, lower prices mean higher LDPs. How, then, can one manage these two opposing forces? One way to explore this is to look at the combined impact of market strategy performance when LDP levels are added. The objective is to sell when prices are high and claim the LDP when it is high. This often means separating the decisions into two points in time.

Exploring a simple pre-harvest soybean pricing example sheds some light on how market strategies interact with LDPs. Four basic strategies will be utilized to ascertain these relationships. They are:

- a. Cash sale at harvest;
- b. Forward Contracting for harvest delivery (locking price and basis levels);
- c. Hedging with futures until harvest (locking in price level in futures); and
- d. Hedging with put options until harvest (establishing a price floor in futures).

Some of the basic market assumptions for the illustrative soybean example are as follows for the pre-harvest timeframe.

- Strategies are evaluated some period prior to harvesting either pre-planting or during the growing season;

- November soybean futures (S-NOV) are \$6.00;
- The local loan rate (LR) is \$5.00;
- Local basis at harvest is assumed to be \$0.25 under (-\$0.25) and subsequently ends with an actual \$0.25 under (-\$0.25) basis;
- A November put option with a strike price of \$5.80 can be purchased for \$0.30 (S=\$5.80, P=\$0.30)
- To keep things simple the PCP is assumed to do its job accurately with the PCP reflecting the local price (i.e.,  $PCP = \text{Local Price} = \text{Futures} + \text{Basis}$ ) on a daily basis.

### *Marketing Strategy Performance without Including LDPs*

Figure 4.1 illustrates the net price a producer would expect to receive in the absence of LDPs across the various strategies at various futures price levels. (Note: the horizontal axis is potential final futures prices and the vertical axis displays the resulting net price from the market.) We can summarize our findings as:

- a1: Cash sale at harvest results with lower cash prices received as futures prices fall and vice versa.
- b1: Cash forward contract effectively locks the price received regardless of final futures prices or basis (note b1 and c1 yield the same result).
- c1: The futures hedge effectively locks the price received regardless of final futures prices if the basis is as expected (note b1 and c1 yield the same result).
- d1: The put option provides a floor at lower futures prices while allowing for higher prices to be received as futures prices increase.

Because the expected basis of \$0.25 under (-\$0.25) actually occurred, the two fixed price strategies (b1 and c1) yielded approximately the same result. (Futures commissions and other transaction costs would yield a slightly lower result for the hedge as compared to the cash forward contract.) As will be shown later in Figures 4.5-4.7 this is not the case if there is a change in expected basis, which affects the performance of the hedge since it is still subject to basis risk whereas the forward contract is not.

The price realized hedging using a put option is lower than the fixed price strategies for futures price levels below \$6.30. This reflects the \$0.30 premium paid for the option. However, for futures price levels below \$5.80 (the strike price for the put) hedging using the put option outperforms cash sale at harvest. As realized futures price moves lower, the option strategy mimics the performance of the fixed price strategies. It becomes the second highest performing strategy (b1 and c1 are equally better); second only by the amount of the option premium paid. Also, as realized futures continue to fall, the option yields increasingly better results than the cash sale at harvest strategy.

As realized futures prices increase, the option mimics the performance of the cash sale at harvest strategy, coming in a close second again by the amount of the premium. As realized futures continue to increase, the option yields increasingly better results than the fixed price (futures hedge or cash contract) strategies. This is because the fixed price strategies lock futures (or cash) price levels when the strategy is placed

while the option allows for the capture of the higher prices if final futures are much higher.

A longer-run assertion is that a strategy that yields a consistent close second place each time it is used will, over repeated implementation (or marketing years in this case) yield the best results from the standpoint of consistency and a risk management standpoint. A good analogy can be taken from sports. If a NASCAR driver never wins any one race but always finishes a close second he would likely be the Winston Cup champion and be money winner for the season. Thus, while the option strategy is never the single best strategy over the spectrum of possible futures price for a single marketing year (if futures prices increase then cash sale at harvest is best; if futures prices decline later then fixing the price now is the best) over repeated years it is extremely effective since it consistently performs well.

*The lesson is that options are a powerful tool for price risk management. They imitate the risk protection properties of fixing the price in a declining market while allowing for gain in an increasing market. Regardless of price direction, options will result in a second place finish to the ultimate "best" strategy. It follows that, in the longer term, option purchases would over time, through repeated implementation, yield good results from a risk management standpoint.*

### **Adding the LDP to the Mix**

When LDP's are present the crop revenue will be the combination of the LDP receipts plus the market value obtained through the marketing strategies employed. In the following examples we will explore the combined impact of LDP's and market strategy receipts over a range of potential price outcomes under three scenarios:

1. When the harvest time futures (S-NOV) are near the loan rate at pre-harvest when strategies are being formulated (e.g. soybean futures at \$5.00),
2. When harvest time futures (S-NOV) are well below the loan rate at pre-harvest when strategies are being formulated (e.g. soybean futures at \$4.20), and
3. When harvest time futures (S-NOV) are well above the loan rate when the strategies are being formulated (e.g. soybean futures at \$6.50).

When initial prices are near the loan rate of \$5.00 and LDP receipts are added to determine the total of price and government payments, the strategy performances can change rather dramatically as shown in Figure 4.2. When realized prices proceed to levels above the loan rate (\$5.00), the LDP disappears and the results of marketing strategies simply revert back to those shown in Figure 4.1.

If futures prices subsequently fall to lower levels, cash sale at harvest provides an outcome similar to the put option illustrated in Figure 4.1. As a result, the loan program is often referred to as a "free" put option. It provides a floor at the loan rate and allows for realizing higher prices if they occur.

LDPs are added to the futures hedge and cash forward contract as prices fall. Effectively, these strategies at lower prices are retaining the fixed price that was locked in with either a forward contract or the futures hedge (\$4.75), and the LDP is adding to the results. The combination of a fixed price strategy and the LDP available at low

prices creates a “2 for 1” situation. That is, when the market falls below the fixed price, the forward contract or futures hedge provides “1 to 1” protection. Furthermore the LDP also provides “1 to 1” protection when it becomes available. Thus, any price decline below the loan rate creates a 2 for 1 return. For each 1 cent downward movement of the realized futures the net price received increases by 2 cents. Results at low futures prices yields an environment where the return is well above the prevailing price. However, at higher prices, the locked-in \$4.75 prevails and the LDP goes away. The two fixed price strategies are capped for realized prices at higher levels.

The most interesting strategy is perhaps the put option. As prices fall, the LDP adds to the floor set by the option, much like with the futures hedge or cash forward contract. This is, again, effectively capturing “2 for 1.” Note, however that in the range of lower realized futures prices the option result falls slightly below the fixed price strategies (by the amount of option premium paid). At higher realized prices, the option allows the producer to capture the higher market prices that occur. In the upper price ranges the option performs much like the strategy of cash sale at harvest. Again, it yields less than the cash sale strategy by the amount of the premium paid and substantially better than the fixed price strategies.

Over the entire range of futures prices examined, the option yields a bowl-shaped or “U-shaped” result. This can be interpreted as knowing at strategy inception the “worst” one would do is receive the minimum set by the bowl bottom (\$4.70 per bushel in this example). At any other futures price, *higher* or *lower* the option yields better results. Clearly, this is a powerful potential strategy for reducing price risk.

A final point to note about alternative strategies, the LDP, and price risk is that from a revenue standpoint producers are essentially in the odd situation after either forward contracting or hedging with futures or options, to then wish for lower realized futures prices that fall below the loan rate, thereby allowing them to receive the “2 for 1” deal. This is an obscure and unintended phenomenon that comes about as a result of the current farm program.

Figure 4.3 illustrates the performance of marketing strategies when the pre-harvest futures price levels are well below the loan rate, in this example \$4.20. If prices subsequently fall, the cash sale at harvest strategy holds a steady result because the LDP increases to offset the lost market revenues. Furthermore, falling realized prices below the \$4.20 level shows that hedging with either futures or a put option or forward contracting capture the “2 for 1.” If subsequently prices rise, the option and cash sale at harvest strategies perform similarly to one another separated by the amount of option premium paid. Hedging using futures prices and forward contracting takes a significant turn for the worse however, as LDP is lost and price is fixed at the lower level, if futures prices move higher coming into harvest time. At these lower price levels and with a stronger likelihood of prices increasing the cash sale at harvest or hedging with a put option should prevail as the preferred strategy.

Figure 4.4 illustrates the performance of marketing strategies when the pre-harvest futures price levels are well above the loan rate, in this example \$6.50. The various marketing strategies perform as illustrated in Figure 4.1 because at higher price levels there is no LDP in effect. The ‘bowl shaped’ pattern is only apparent at local price levels near the loan rate. In this example with an assumed basis of \$0.25 under when futures prices get below \$5.25 this will trigger an LDP. The bottom of the bowl will be

longer (or flatter for a larger range of futures price values) the higher the pre-harvest futures are from the loan rate. At these higher price levels and with a stronger likelihood of prices declining the forward contracting, or hedging with futures or a put option should prevail as the preferred strategy.

*The lesson is when a large range of potential futures prices and LDPs are considered, the put option strategy yields a “U-shaped” result at realized local prices close to the loan rate. This strategy then affords knowledge at strategy inception of what the “worst” one would do. That is, to receive the minimum set by the bowl bottom. At any other price, higher or lower the option yields better results. From an income perspective it comes in a consistent second at either end of the futures spectrum (high or low). Not being best at either extreme is the price one pays (the premium) for being consistent regardless of price outcome.*

*After comparing our four basic strategies and taking into account market conditions and LDPs, buying a put option rises as being the most powerful strategy for risk management and income objectives. This occurs at price levels at or below the loan rate because the 2-for-1 gain takes effect.*

#### *Effect of Basis Change on Strategy Results without LDPs*

Some marketing strategies can be affected by the actual basis being stronger or weaker than what was expected while some strategies are not affected. For example, cash forward contracts lock the local price (both futures and basis) while hedging with futures or put options locks only the futures price while leaving open basis risk. Cash sale at harvest is also subject to basis risk. Since the LDP is reflective of distant cash markets plus adjustments, the LDP is assumed to not be affected by local basis conditions but may be affected by the basis in the distant cash market.

#### *A Strengthening Basis*

If the local basis strengthens we would expect strategies that did not lock the basis to benefit. For example, keeping with the soybean example with the basic market assumptions above using a pre-harvest futures price of \$6.00 as was shown in Figure 4.1 with one fundamental change; a basis strengthening.

- Harvest basis is expected to be the historic \$0.25 under (-\$0.25), but, actually basis turns out to be \$0.05 under (-\$0.05) (a strengthening of 20 cents);

Figure 4.5 shows the results of the stronger basis. The primary effect is that the strategies that did not lock local basis benefit from the strengthening of 0.20 cents. The cash sale at harvest, futures hedge and the option strategy results all shift upward reflecting the \$0.20 improved basis. To make this clear, Figure 4.6 shows the impact of this strengthening in basis for the strategies that are impacted, namely, the hedge with futures and put option and the cash sale at harvest without taking into account the LDP receipts. Figure 4.6 can be contrasted directly with Figure 4.1 (the strategies that are shown in with the dotted lines in Figure 4.6 are the same as shown in Figure 4.1 so this contrast is made clear). Note the cash forward contract is not shown in Figure 4.6 as it is unaffected by a change in the basis.

Turning attention back to Figure 4.5, notably, the results of the cash forward contract are lower than the futures hedge because the forward contract locked the basis at the historic expectation of \$0.25 under. One final point to note is that strengthening in basis is only beneficial to strategies at realized futures price levels that are greater than the loan rate less the basis. This is because a strengthening in basis at price levels below the loan rate is fully offset by an equal reduction in the size of LDP. This characteristic means that at pre-harvest price levels below the loan rate one should prefer to hedge using futures rather than forward contract since there is no apparent basis risk as long as the realized prices remain below the loan rate.

#### *A Weakening Basis*

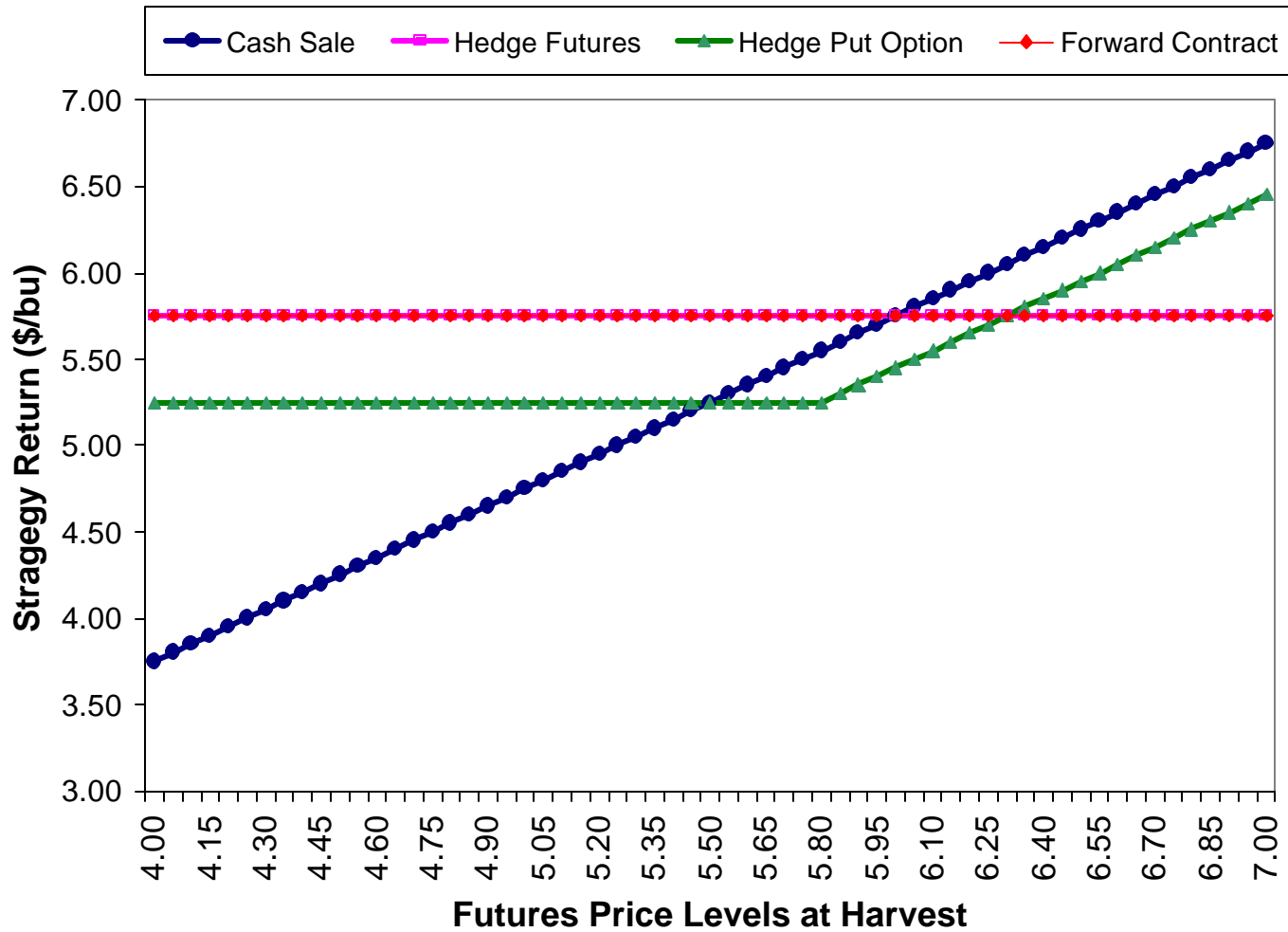
If the basis weakens one would expect strategies that did not lock the basis to perform worse than expected. For example, keeping with the soybean example with the basic market assumptions above and a basis weakening as follows:

- Local basis at the time of examination is expected to be the historic -\$0.25 under (-\$0.25), but, actually basis turns out to be \$0.40 under (-\$0.40) the futures (a weakening of 15 cents);

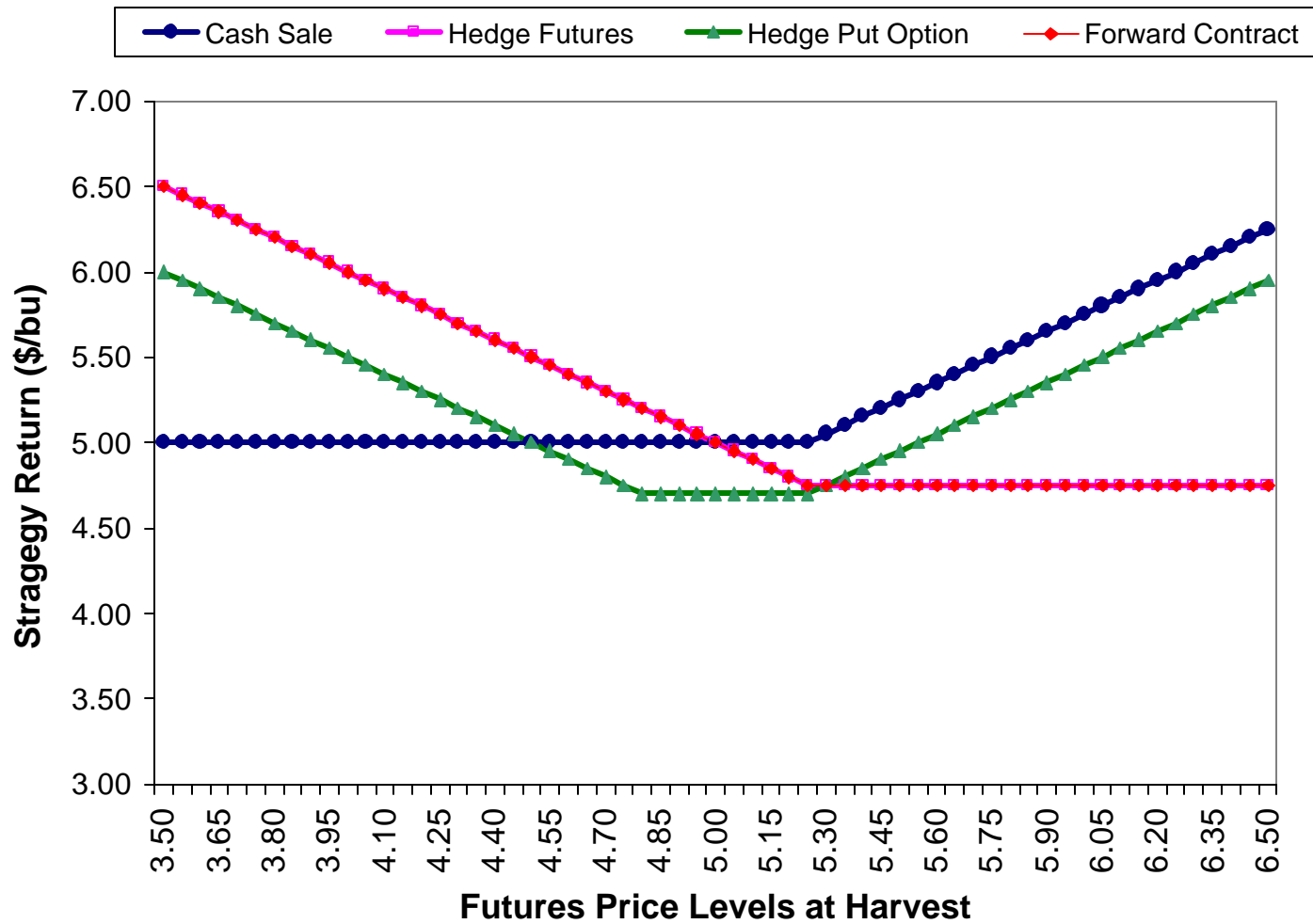
Figure 4.7 shows the results of the weaker basis. The primary effect is that the strategies such as the forward contract that locked in the local basis benefit by having done so. The cash sale at harvest, futures hedge, and the option strategy returns all shift downward, reflecting the -\$0.15 less-than-expected cash price. In this case, the results of the cash forward contract are higher than the futures hedge because the cash forward contract locked the basis at the historic expectation of -\$0.25. One final point to note is that weakening in basis has an adverse impact on strategies at realized futures price levels that are greater than the loan rate less the basis. This is because a weakening in basis at price levels below the loan rate is fully offset by an equal increase in the size of LDP. This characteristic means that at pre-harvest price levels below the loan rate one should prefer to hedge using futures rather than forward contract since there is no apparent basis risk as long as the realized prices remain below the loan rate.

*The lesson is that if your expectation of local basis when a strategy is placed is different from the actual basis that occurs, results of the marketing strategies will be less or more than expected for strategies that do not lock the basis. The degree to which strategies will yield different results depends on the exposure of the strategy to basis risk. Regardless these differences will only be apparent at realized futures price levels above the loan rate less basis. This is because a weakening (strengthening) in basis at price levels below the loan rate is fully offset by an equal increase (decrease) in the size of the LDP.*

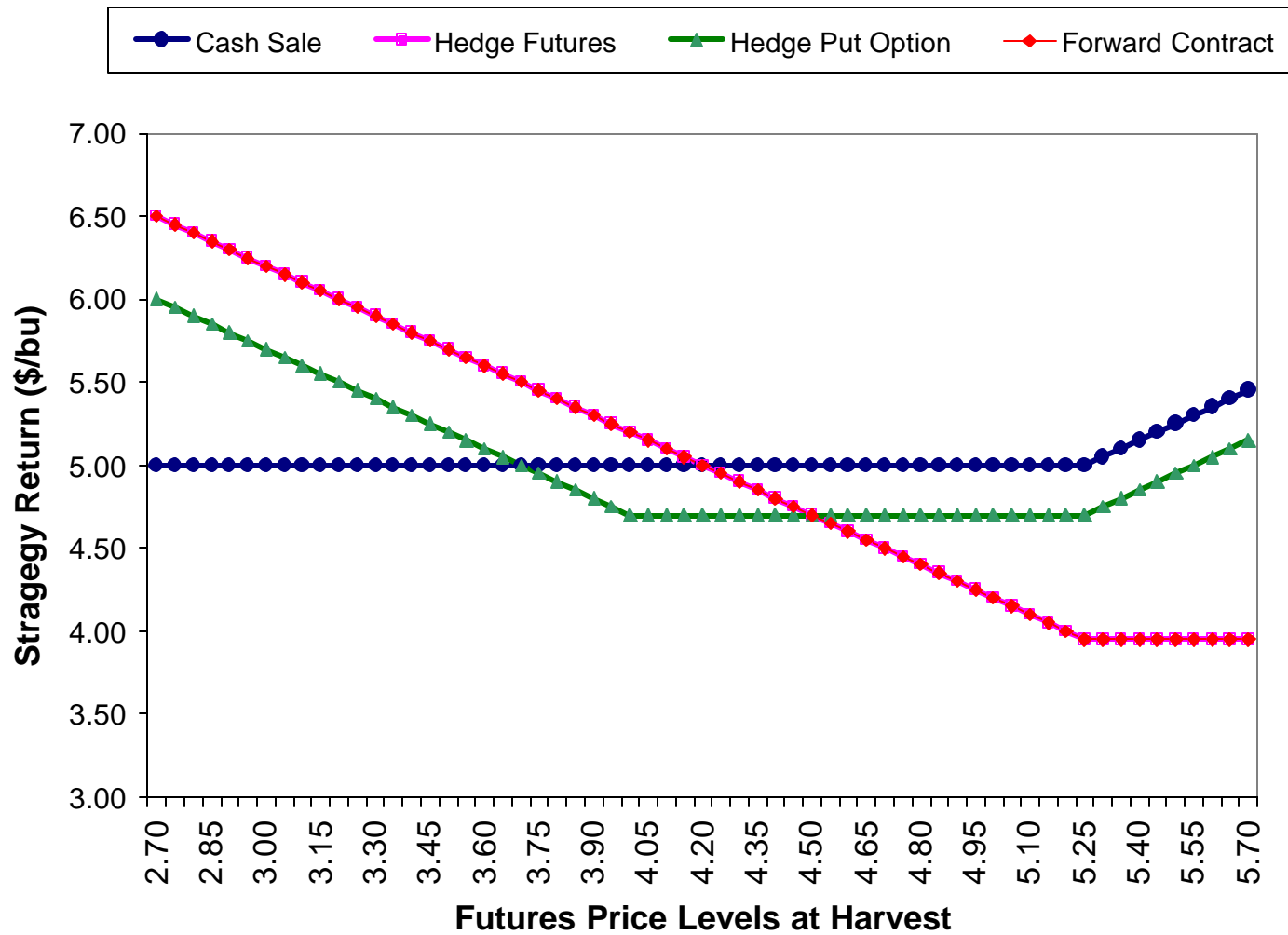
**Figure 4.1: Returns From Marketing Strategies in the Absence of LDP Receipts:  
 Pre-harvest: S-NOV Futures \$6.00, Put Option (S=\$5.80, P=\$0.30), Basis at  
 Harvest -\$0.25**



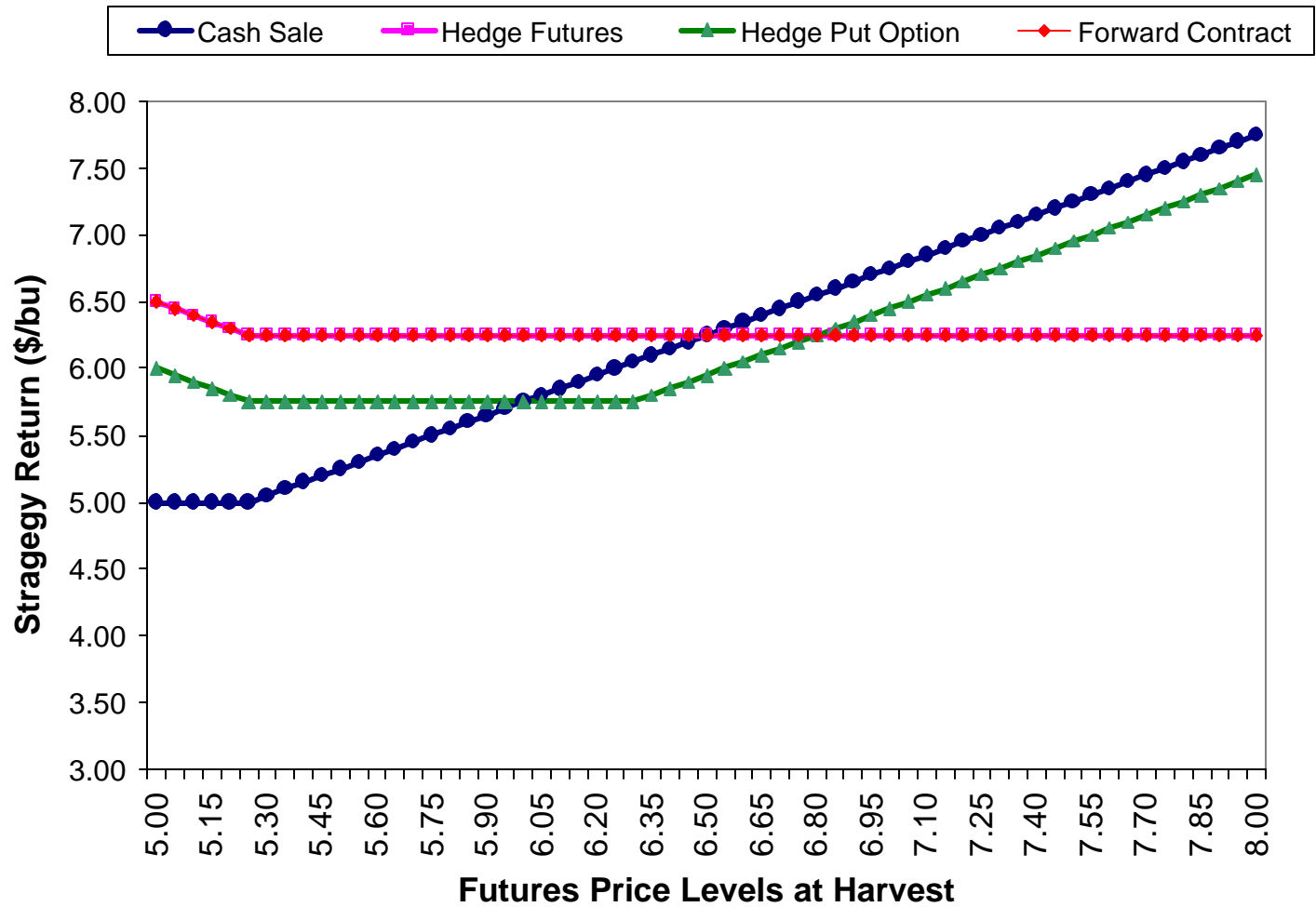
**Figure 4.2: Returns From Marketing Strategies with LDP Receipts: Pre-harvest S-NOV Futures \$5.00, Put Option (S=\$4.80, P=\$0.30), and Basis at Harvest -\$0.25**



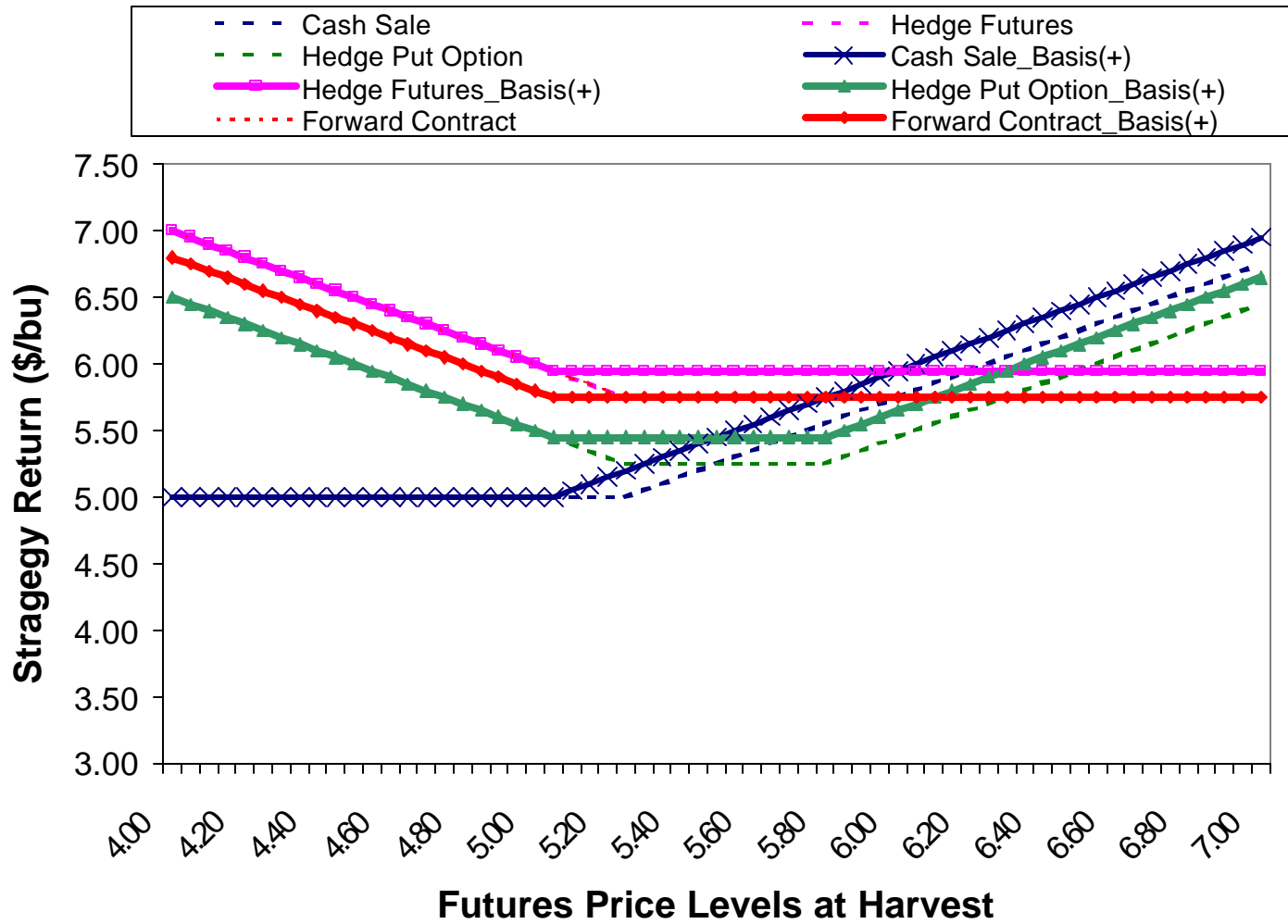
**Figure 4.3: Returns From Marketing Strategies with LDP Receipts: Pre-harvest S-NOV Futures \$4.20, Put Option (S=\$4.00, P=\$0.30), and Basis at Harvest -\$0.25**



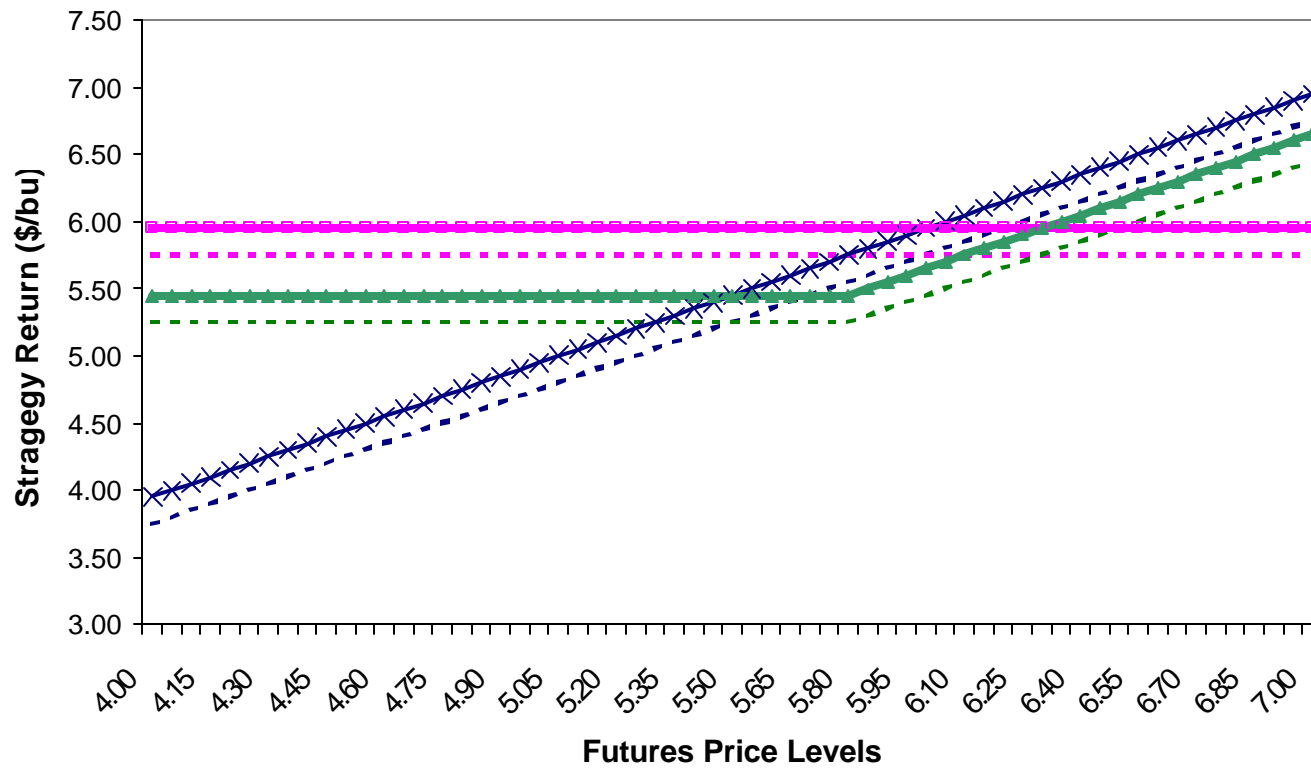
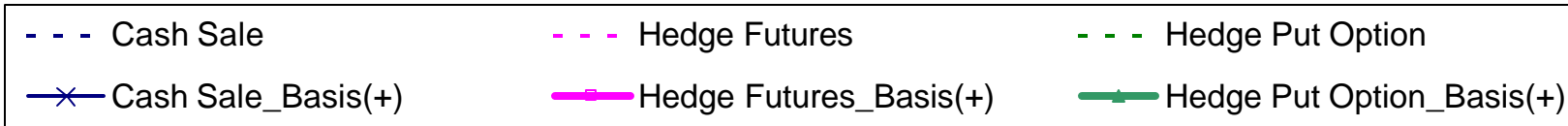
**Figure 4.4: Returns From Marketing Strategies with LDP Receipts: Pre-harvest S· NOV Futures \$6.50, Put Option (S=\$6.30, P=\$0.30), and Basis at Harvest -\$0.25**



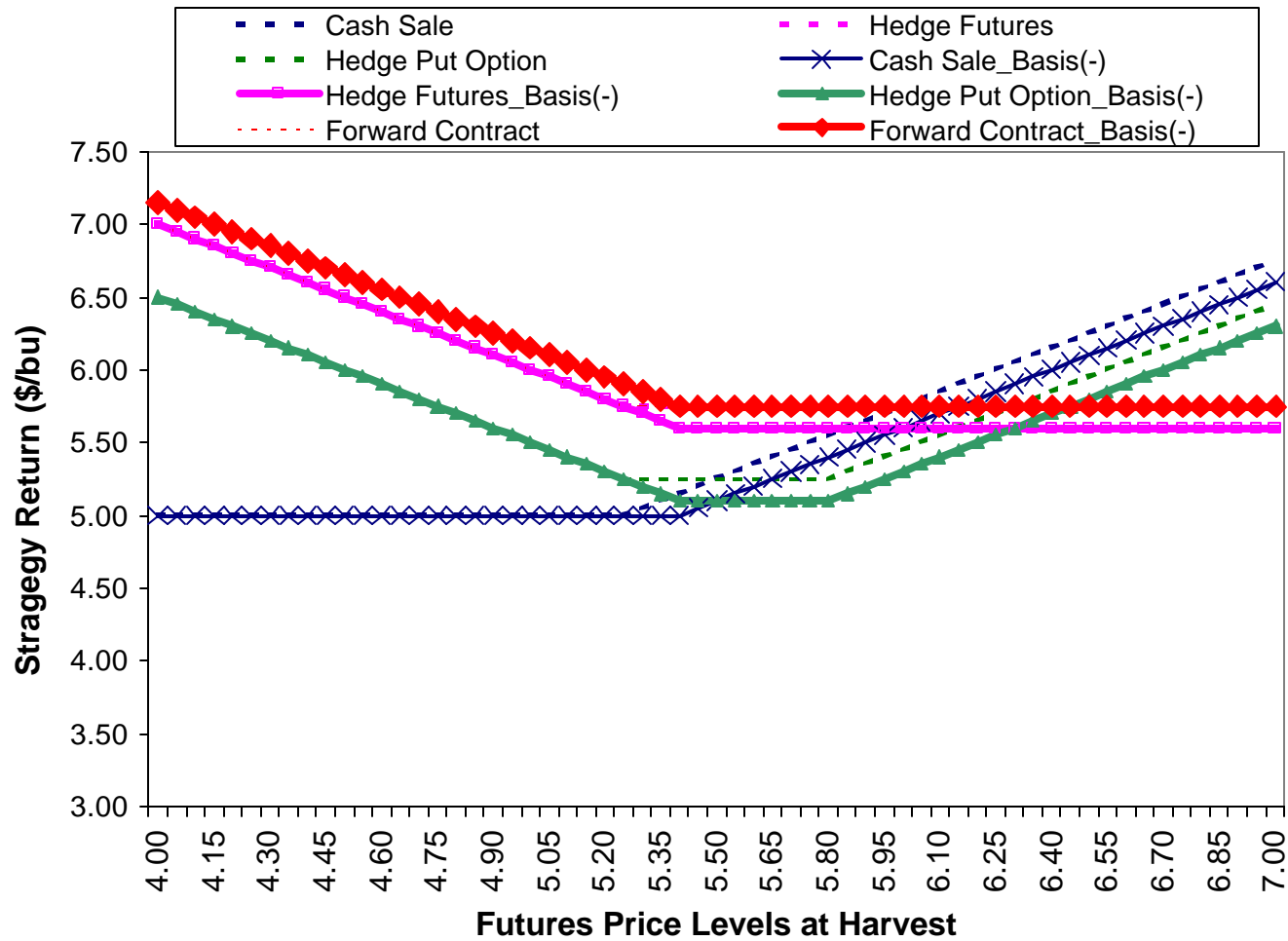
**Figure 4.5: Returns From Marketing Strategies with LDP Receipts: Pre-harvest S·NOV Futures \$6.00, Put Option (S=\$5.80, P=\$0.30), and Basis at Harvest -\$0.05 Compared with an expected -\$0.25 (Strengthening)**



**Figure 4.6: Returns From Marketing Strategies without LDP Receipts, S-NOV  
 Futures \$6.00, Put Option (S=\$5.80, P=\$0.30), and Basis at Harvest -\$0.05  
 Compared with an Expected -\$0.25**



**Figure 4.7: Returns From Marketing Strategies with LDP Receipts: Pre-harvest S·NOV Futures \$6.00, Put Option (S=\$5.80, P=\$0.30), and Basis at Harvest -\$0.40 Compared with an expected -\$0.25 (Weakening)**



## Summary Key Points

Based on the information in this chapter the following summary statements characterizing important factors that can lead to making more informed and effective risk management decisions can be made:

- Of the three basic forms of safety net features included in the 2002 farm bill, DPs, CCPs and LDPs, only one, the loan program or LDPs, has significant impact on marketing decisions. DPs and CCPs will accrue to the producer and it is either nonessential or cost prohibitive to attempt to protect the received levels.
- Loss of beneficial interest occurs at different times for various marketing strategies. It is essential that producers preserve beneficial interest in their commodities prior to capturing the LDP. Producers need to have a clear understanding of the nature of the pricing instruments they are using to retain the ability to acquire an LDP.
- The potential level of an LDP will be closely but inversely related to the historic trends in futures price seasonality. Review of the data over the past several years would indicate that the PCP is typically weakest at or just following harvest for corn, wheat, and soybeans.
- When a large range of potential futures prices and LDPs are considered, the put option strategy yields a “U-shaped” result at realized prices close to the loan rate. Producers would receive at worst the minimum price set by the bowl bottom. At any other price, higher or lower, the option yields better results.
- After comparing our four basic strategies and taking into account market conditions and LDPs, the purchasing of a put option strategy rises as being the most powerful strategy for risk management and income objectives. This occurs at price levels at or below the loan rate because the 2-for-1 gain takes effect below the loan rate.
- The lesson is that if your expectation of local basis when a strategy is placed is different from the actual basis that occurs, results of the marketing strategies will be less or more than expected for strategies that do not lock the basis. The degree to which strategies will yield different results depends on the exposure of the strategy to basis risk. Regardless these differences will only be apparent at realized futures price levels above the loan rate less basis. This is because a weakening (strengthening) in basis at price levels below the loan rate is fully offset by an equal increase (decrease) in the size of the LDP.

## **APPENDIX**

Supplemental tables documenting the historical price basis for Georgia, South Carolina, and North Carolina for corn, wheat, and soybeans over the period 1997-2002 complement this publication. These tables have been made available electronically (in Excel spreadsheet format) for 47 soybean locations, 54 Corn locations and 33 wheat locations within the region. This information can be found at:

<http://www.ag-econ.ncsu.edu/faculty/piggott/handbook.htm>.

The following locations by state and commodity are available for downloading...

(please turn the page for table)

<b>SOYBEANS</b>	<b>CORN</b>	<b>WHEAT</b>
	<b><i>North Carolina</i></b>	
BARBER ROSEHILL1 ROSEHILL2 CRESWELL DUNN ELIZABETH CITY GREENVILLE1 GREENVILLE2 KINSTON LUMBERTON MT. ULLA NORWOOD PANTEGO WILLIAMSTON COFIELD FAYETTEVILLE RAEIGH	BARBER CANDOR COFIELD LAURINBURG ROSEHILL1 ROSEHILL2 MONROE1 MONROE2 NASHVILLE ROARING RIVER STATESVILLE CHADBOURN CRESWELL DUNN GREENVILLE1 GREENVILLE2 KINSTON LUMBERTON NORWOOD PANTEGO WILLIAMSTON	
	<b><i>Georgia</i></b>	
DECATUR SUMTER MITCHELL BULLOCH BURKE LAURENS WASHTON CALHOUN SOUTHWEST SOUTHEAST CENTRAL NORTH	DECATUR SUMTER MITCHELL BULLOCH BURKE LAURENS WASHTON CHATUGA SCOULAR SOUTHWEST SOUTHEAST CENTRAL NORTH	DECATUR SUMTER MITCHELL BULLOCH BURKE LAURENS WASHTON CHATUGA MOBILE SCOULAR SOUTHWEST SOUTHEAST CENTRAL NORTH
	<b><i>South Carolina</i></b>	
ANDERSON; JOHNSTON FLORENCE HAMER LYNCHBURG BENNETTSVILLE LAKE_CITY LATTA LITTLE_ROCK VANCE ALLENDALE MANNING ALCOLU ORANGEBURG ORANGEBURG_2 ESTILL KERSHAW CHARLESTON	JOHNSTON FLORENCE HAMER LYNCHBURG BENNETTSVILLE LAKE_CITY; LATTA LITTLE_ROCK VANCE ALLENDALE MANNING ALCOLU ORANGEBURG ORANGEBURG_2 MONETTA SUMTER ESTILL CASSATT CHARLESTON KINGSTREE	ANDERSON JOHNSTON FLORENCE HAMER LYNCHBURG BENNETTSVILLE LAKE_CITY LATTA LITTLE_ROCK VANCE ALLENDALE ALCOLU ORANGEBURG ORANGEBURG_2 ESTILL CHARLESTON COLUMBIA CASSATT KINGSTREE