Incorporating Spatial Grain Price Information in Marketing Plans: An Excel-based Spreadsheet Program

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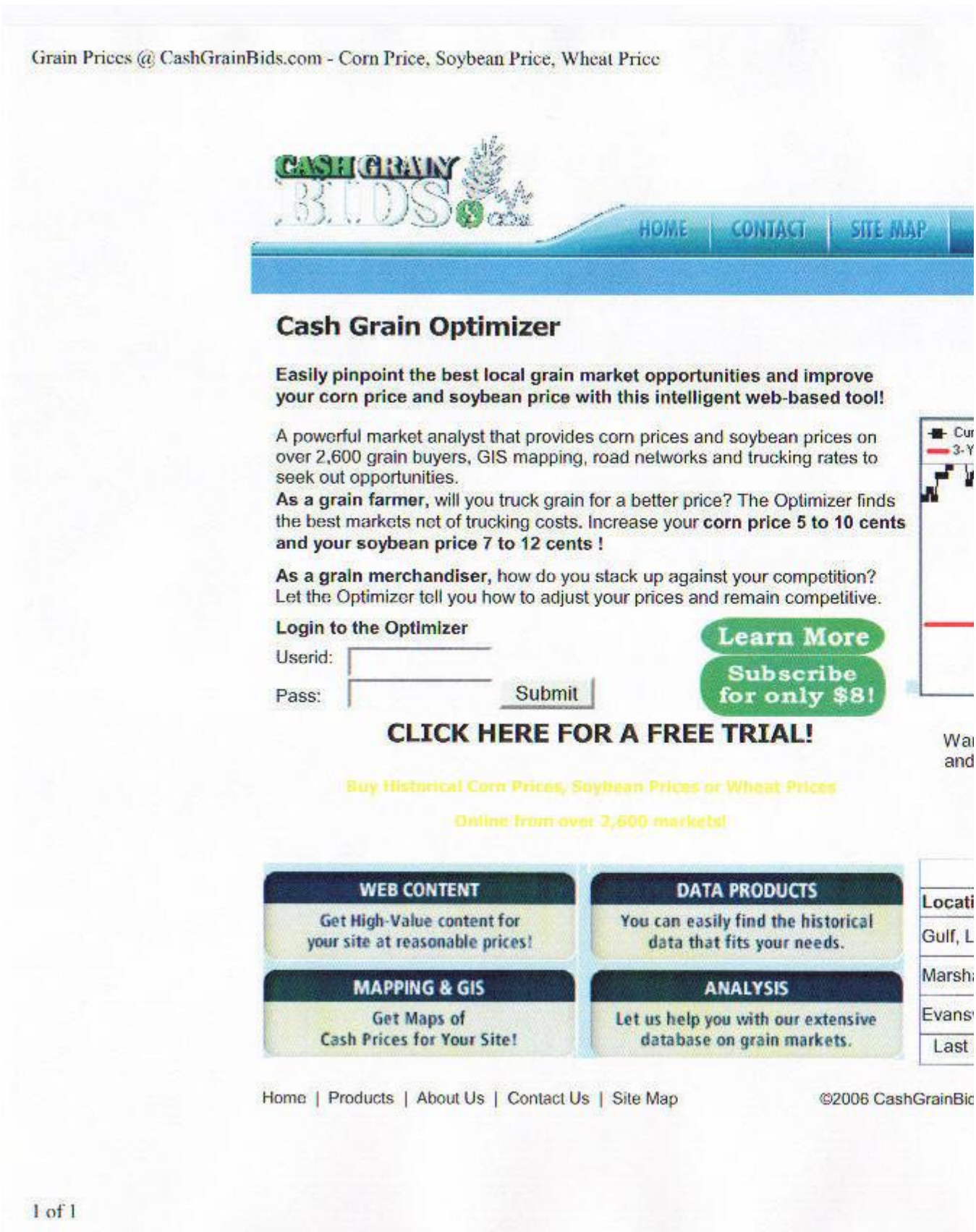
The information set available for use in marketing of grain has expanded significantly. Some of this influence is due to producer awareness and use of information search technologies via the internet. Other influences can be attributed to researcher's desire to further understand some spatial elements of price patterns.

The availability of grain price information can be attributed to several sources. Data Transmission Network(originally Scoular Grain) pioneered the use of high FM band transmission of specialized information. This transfer of information including futures price information and local price information was transmitted via captive terminals to subscribers beginning in the early 1980's.. This information is now available from DTN via the internet as well as captive terminals. AgDyta also(originally connected with ProFarmer/Pioneer) also makes this information available via the internet by subscription. The author obtains bid information from these and other sources.

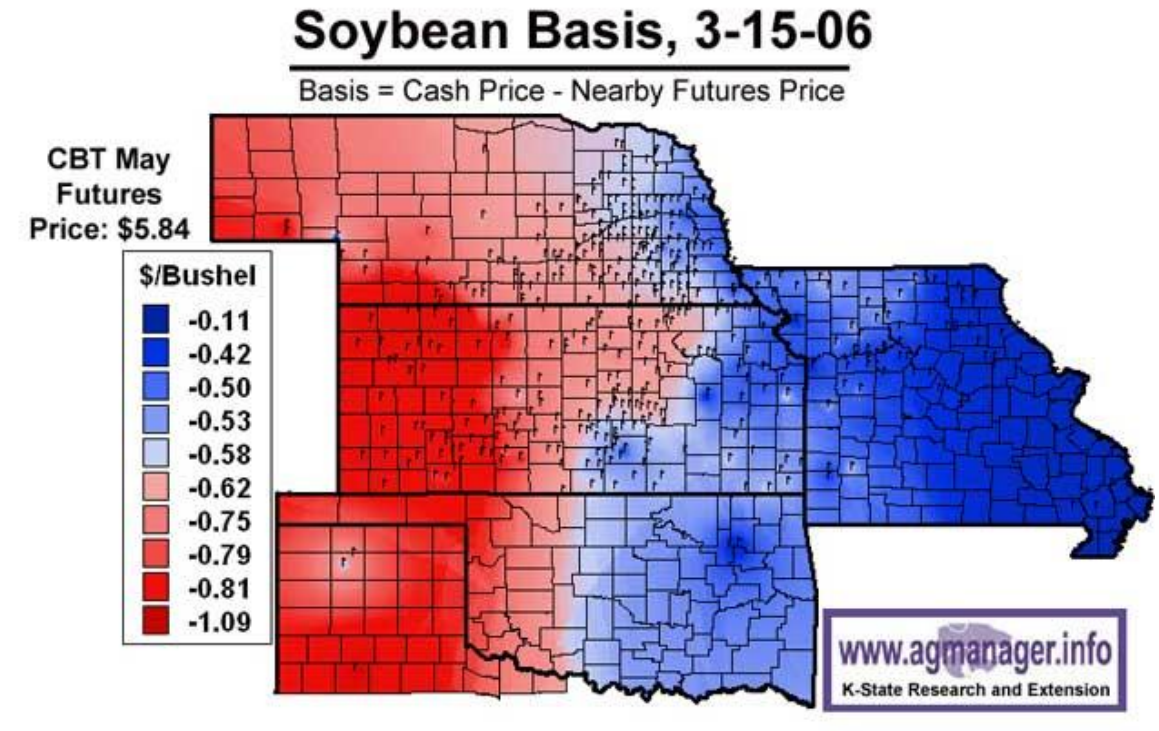
The development of futures and cash price index contracts has also influenced the availability of price information. The CRB index provides a way for producers to evaluate how general economic conditions such as inflation influences the overall level of commodity prices. The development of cash price indices for corn and soybeans at the farm level based on elevator quotes by the Minneapolis Grain Exchange(MCPI and MSI) utilize a set of information to form price indices. *FarmDoc* at the University of Illinois uses crop and livestock reporting service data summarized by region in Illinois to provide regional basis information. This information has been used by NcNew(Montana State University- Spatial Basis Report), Duyvetter(Kansas State University-*AgManager)*, and

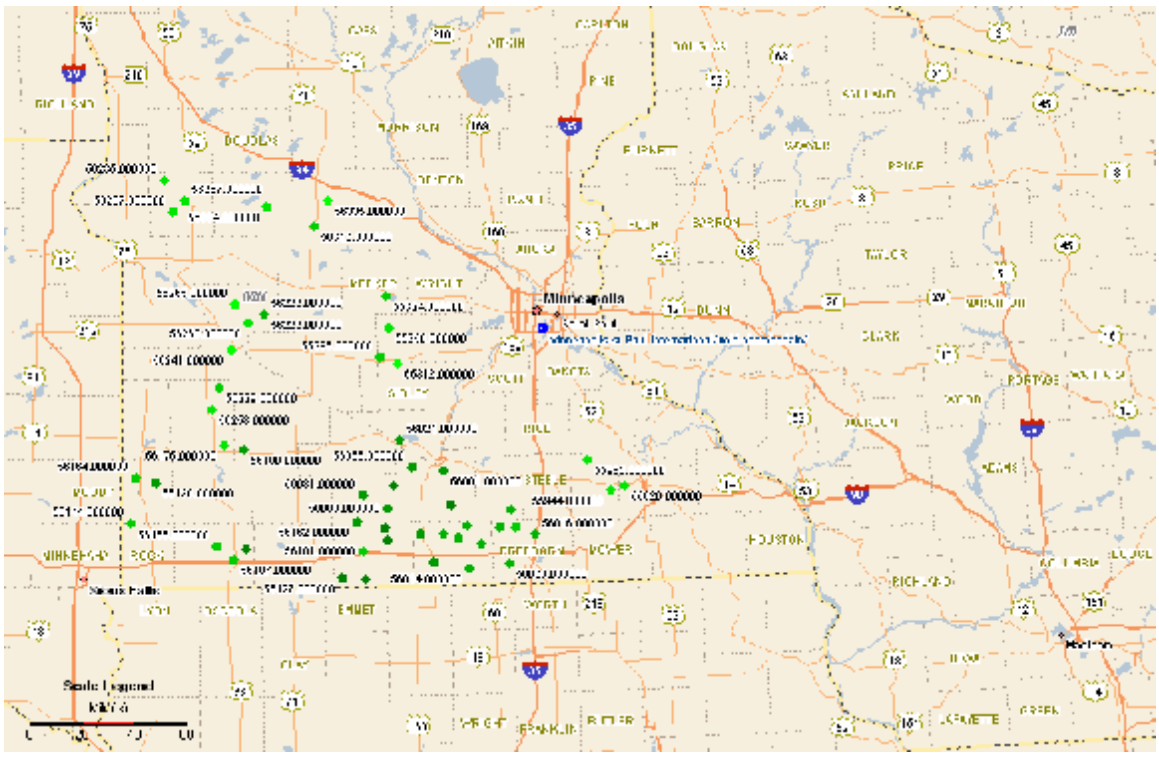
Babcock(*Card*-Iowa State University) and Nefstead(University of Minnesota-faculty website) to provide spatial grain price information to producers. These website products have been created to allow the producer to capture the full range of price opportunities available to them. Most of these sites feature a daily or weekly picture of the grain market in that state. The author has finished an Excel spreadsheet which will incorporate some spatial elements in a marketing plan. It imports data from spatial sites to perform "best" calculations. An example of the initial marketing plan worksheet follows without the spatial subset added.

Ultimately, spatial choice relate to contracts also. The mapping of new crop bids provides another picture of the choices available to the producer. Another aspect of maps is the seasonal nature of the changes incorporated in maps. Because of transportation costs and availability in the late fall/winter, the best bids migrate to the southwest and west central parts of the state of Minnesota. Active processor bids have also produced literal bullseyes on the maps, an example being Brewster with a new soybeans processing plans. Ethanol plants have changed the basis landscape also with new plants coming on line continuously. It is also possible to animate the maps with the use of *Quicktime* which allow tracking of incremental changes in a moving sequence. Kevin McNew-***Cashbids.com***- illustrates such a sequence on his website.



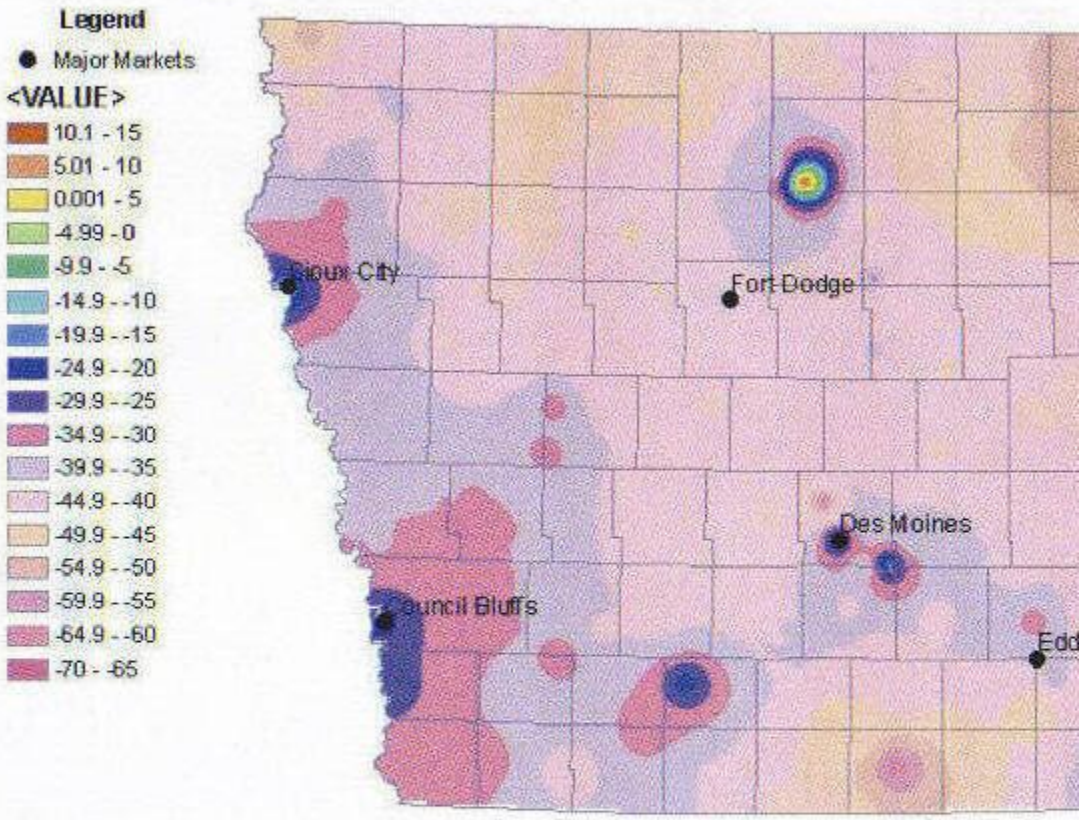
Figures 1& 2. Mapping Information





MAR 8, 2006 SOYBEAN BASIS

Basis Calculated from CBOT MAR futures Prices 572.3 cents per bushel



County: -- Select your county --

Figure 3. Excel Marketing Template

Corn:

Pricing Period	Method(s) of contracting / sale	Target % Priced In Period	% Priced Cumulative to date	Bushels In Period	Bushels Cumulative to date	Price In Period	Price Cumulative to date	Bush In Period
Prior to March15		30%	30%	38,500	38,500	$1.00	$1.00	38,500
Late Spring/ early summer		25%	55%	32,100	70,600	$1.00	$1.00	32,100
Harvest		20%	75%	26,000	96,600	$1.00	$1.00	26,000
Post-Harvest(Feb.)		25%	100%	31,900	128,500	$1.00	$1.00	31,900

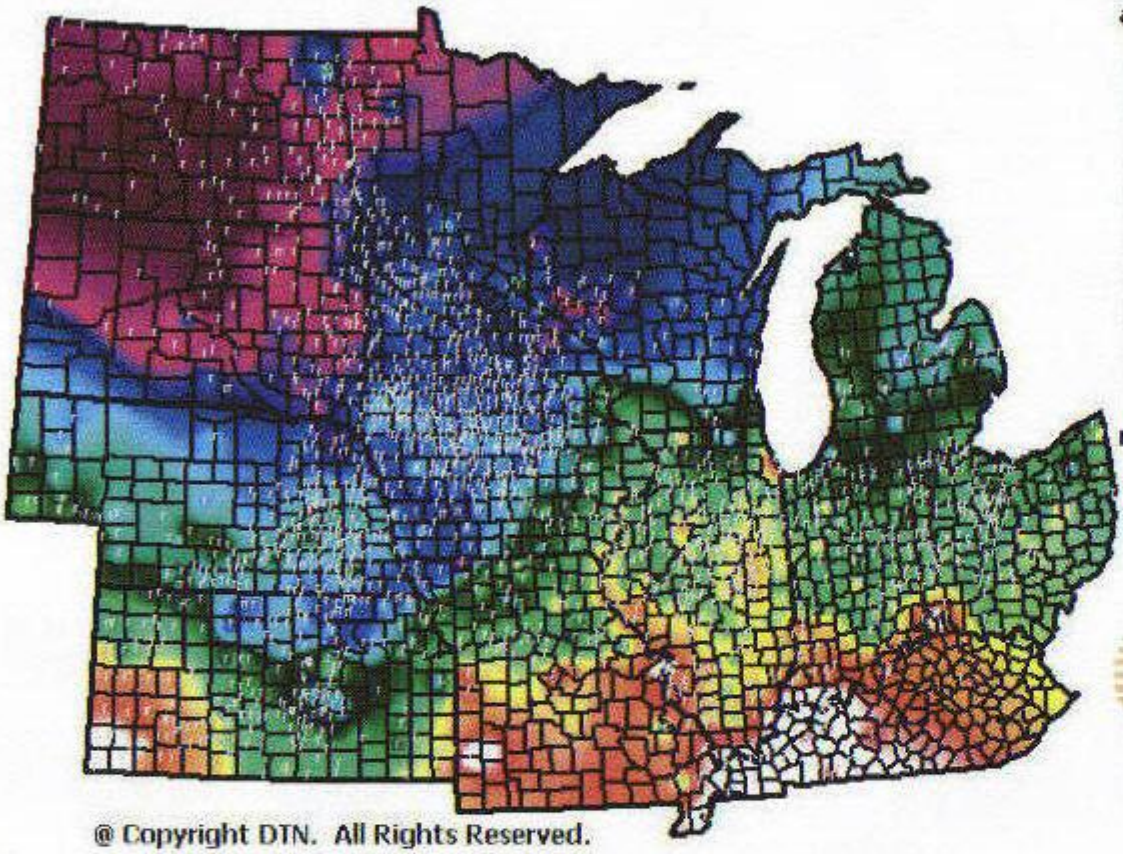
	Acres		Bu/acre	
Actual Production	1000	x	128.5	128,500
Total Bushels needed to fill pre-harvest contracts				70,600
Bushels needed to buy back to meet contract				0
Net cost to buy back bushels to fill contract needs				$0

Soybean:

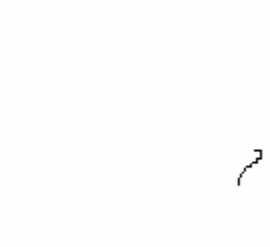
Pricing Period	Method(s) of contracting / sale	Target % Priced In Period	% Priced Cumulative to date	Bushels In Period	Bushels Cumulative to date	Price In Period	Price Cumulative to date	Bush In Period
Prior to March15		30%	30%	12,700	12,700	$0.00	$0.00	12,700
Late Spring/ early summer		25%	55%	10,600	23,300	$4.40	$2.00	10,600
Harvest		20%	75%	8,500	31,800	$4.60	$2.70	8,500
Post-Harvest(Feb.)		25%	100%	11,200	43,000	$4.85	$3.26	11,200

	Acres	x	Bu/acre	
Actual Production	1,000		43.0	43,000
Total Bushels needed to fill pre-harvest contracts				23,300
Bushels needed to buy back to meet contract				0
Net cost to buy back bushels to fill contract needs				$0

US Spot Corn Bid Map 03/07



Close



Each of these sources uses different spatial mapping software to display price information. FarmDoc displays charts or tables of regional basis information for display. An alternative is to download Excel spreadsheets for further use. *AgManager* and *Spatial Basis Report(U. of Montana)* use spatial software presumably from ESRI which allows the projection of spatial information via kriging methods. Kriging methods allow a view of basis deviations. Nefstead uses an ESRI product to display a pattern of point forecasts. Babcock(Card-Iowa State University) posts both old and new crop futures price and basis patterns. Nefstead (U. of Minnesota-faculty website)shows spreadsheet information for both new and old crop contracts.

Review of Literature on Price Information

Researchers have investigated the use of price information in making grain pricing decisions. Kenyon(1999) researched producer's ability to forecast prices. He concludes that "individual producers had a wide range of price expectations each year" and that these price expectations were "very skewed"(p.155) Producer price expectations were compared to Nerlove's adaptive expectations model which adjusts price outlook for the difference between last year/period difference between predicted and actual prices. Actual producer price expectations were not closely related to the adaptive expectations

model or the historical five year average of prices. Producers utilized both current local cash and futures price information to make expectations. There was a tendency to "underestimate the probability of large scale price changes". The use of November soybeans and December corn futures prices as forecasts of harvest prices is also not very good for the period of 1974-1991(Kenyon, Jones and McGuirk, 1993). Updated analysis from 1991 to 1998 indicates that the average forecast error for December corn in absolute terms is $.31 for December corn and $.65 for November soybeans.(Kenyon, 1998).

Tomek(1998) also analyzed commodity futures prices as forecasts of prices. He concludes that in accordance with the assumption of "efficient markets hypothesis" that futures prices contain all known information that have a bearing on prices and yet may provide poor forecasts of prices. Quantitative and empirical models do not improve forecast accuracy of futures prices.

Tomek(1998) also discusses forecasting of basis. There are a large number of basis relationships. One of these is intrayear basis which " *measures the incentive for carrying stocks to the end of the current year"*. Another is interyear basis which translates this incentive to carry stocks from one year to the next. The theorized change in basis over the yearly storage period according to Working,Tomek and others is related to the expected degree of convergence(c=0 if perfect), a proportion of the initial basis(d* B_i) and an error term which is assumed to be normally distributed. Forecasts of basis can be made with these relationships in the form of an equation: $B_t - B_{t+i} = c + dB_t + u$

In the later case, the size of inventory carried into the new year is dependent on the size of the previous crop and the expected size of the crop for next year. The basis provides "incentives or disincentives" for carrying a crop into the next period. The basis includes " the harvest quote of the nearby futures price and harvest cash price". This suggests that the basis will vary from year to year and explanation of these changes will be difficult. The expected values of suggested variables(often difficult to measure) will make basis forecasting difficult. As a result, the use of time series or naïve models have been used(Tomek, 1998).

Incorporating spatial elements into price or basis forecasts involves additional theoretical knowledge. Grain prices are thought to be related to the "law of one price". That is, the degree of competition for grain as a commodity causes elevators and other grain bidders to determine their bids on the basis of transportation costs to resale points and other immediate cost factors which may include storage for deferred delivery. Competition collapses the bids to resale minus cost of transportation. Early work on basis compilation at the University of Minnesota used Minneapolis cash prices minus transportation to estimate local basis before basis information became more widely available. This degree of competition in Minnesota has changed with elevator consolidation, changes in rail vs barge rates, crop production patterns, local supply and demand conditions, growth of livestock and further processing plants, shift in export customer orientation and other factors. Changes in these variables have affected traditional basis patterns making projections from historical information more inaccurate. Spatial forecasting models can improve the accuracy of basis predictions.

Applications of *Spatial* Information: Lessons from Precision Agriculture

Spatial analysis has been used in conjunction with precision agriculture in recent years. The use of yield maps has identified areas of high and low yield. This has allowed the use of techniques such a variable rate fertilization to adjust for different field conditions.

Paradigms have changed in this area. The focus on uniformity has changed. Different field management techniques can now to targeted to different areas of a field depending on data from yield surveys. Differences in product quality are also becoming better understood. It is known that oil content for soybeans is significantly lower in Minnesota than Illinois or , more distantly, Brazil. Mapping product quality will change purchasing patterns for processors seeking certain traits. Increasing yield potential by managing a unique geographic grid is being researched (Hurley et al).

How *Spatial* Price or Basis Information can Affect Marketing Plans

The availability of spatial price information can increase the average price received by producers. The first way in which this occurs is greater precision of the "where to market" questions. Spatial price information allows searching for highest bids in the cash or spot market. Data from Minnesota elevators for March 4,2005 confirm that the average spot bid price for selected elevators for corn varies from $1.68/bu to $1.89; soybeans from $ 5.55 to $5.97(new soybean processor bid) for eight regional locations. New crop corn prices varied from $1.80 to $2.09; new crop soybean prices varied from $5.58 to $5.94 for eight regional locations.

After adjusting for transportation differences, these differences result in gains of over $.10 for corn and over $.25 for soybeans. Extending this variation over an entire crop season yields even greater gains. A footnote at the bottom of the Excel Spreadsheet presented later calculates the Net gain over the entire crop.

Another way in which spatial information assists in developing marketing plans is among the choice of marketing options. The comparison of the use of forward contracts vs. hedging as a method of locking in prices relying on forward contract basis knowledge vs. harvest spot basis. These comparison would be different with different geographic locations. The narrowest forward basis may be determined spatially and differs from harvest basis. It is possible to forward contract at locations different from spot delivery locations.

Still another way which spatial knowledge of prices and basis can alter a marketing plan is the use of hedging in which the gain or loss is related to the change in basis. The spatial change in basis over the year varies over locations in Minnesota and other states by viewing basis deviation data. Hedging then becomes a stronger or weaker option/ component of a marketing plan depend on your physical location. The absolute gains in basis from 2004 appears to be over $.10 for corn and over $.15 for soybeans.

Spatial information can also help to allocate crop sales to time periods of the marketing year. By determining when basis patterns and prices change over the crop season, the information provided can help to decide how much to sell at what times during the year. Refinement of this choice helps to raise the weighted average of price.

Figure 4. Michigan State University Template-Ferris.

Corn:

		Target						
Pricing Period	Method(s) of contracting / sale	% Priced		Bushels		Price		Bush
	Insert the Best Spatial bid	In Period	Cumulative to date	In Period	Cumulative to date	In Period	Cumulative to date	In Period
Prior to March15		30%	30%	38,500	38,500	$1.00	$1.00	38,500
Late Spring/ early summer		25%	55%	32,100	70,600	$1.00	$1.00	32,100
Harvest		20%	75%	26,000	96,600	$1.00	$1.00	26,000
Post-Harvest(Feb.)		25%	100%	31,900	128,500	$1.00	$1.00	31,900

	Acres		Bu/acre	
Actual Production	1000	x	128.5	128,500
Total Bushels needed to fill pre-harvest contracts				70,600
Bushels needed to buy back to meet contract				0
Net cost to buy back bushels to fill contract needs				$0

Soybean:

		Target						
Pricing Period	Method(s) of contracting / sale	% Priced		Bushels		Price		Bush
	Insert Best Spatial bid	In Period	Cumulative to date	In Period	Cumulative to date	In Period	Cumulative to date	In Period
Prior to March15		30%	30%	12,700	12,700	$0.00	$0.00	12,700
Late Spring/ early summer		25%	55%	10,600	23,300	$4.40	$2.00	10,600
Harvest		20%	75%	8,500	31,800	$4.60	$2.70	8,500
Post-Harvest(Feb.)		25%	100%	11,200	43,000	$4.85	$3.26	11,200

	Acres	x	Bu/acre	
Actual Production	1,000		43.0	43,000
Total Bushels needed to fill pre-harvest contracts				23,300
Bushels needed to buy back to meet contract				0
Net cost to buy back bushels to fill contract needs				$0

Figure 5. Revised MSU template

Corn:

		Target						
Pricing Period	Method(s) of contracting / sale	% Priced		Bushels		Price		Bush
		In Period	Cumulative to date	In Period	Cumulative to date	In Period	Cumulative to date	In Period
	Best Spatial -copied							
Prior to March15		30%	30%	38,500	38,500	$1.00	$1.00	38,500
Late Spring/ early summer		25%	55%	32,100	70,600	$1.00	$1.00	32,100
Harvest		20%	75%	26,000	96,600	$1.00	$1.00	26,000
Post-Harvest(Feb.)		25%	100%	31,900	128,500	$1.00	$1.00	31,900

	Acres		Bu/acre	
Actual Production	1000	x	128.5	128,500
Total Bushels needed to fill pre-harvest contracts				70,600
Bushels needed to buy back to meet contract				0
Net cost to buy back bushels to fill contract needs				$0

Soybean:

		Target						
Pricing Period	Method(s) of contracting / sale	% Priced		Bushels		Price		Bush
		In Period	Cumulative to date	In Period	Cumulative to date	In Period	Cumulative to date	In Period
	Best Spatial- Copied							
Prior to March15		30%	30%	12,700	12,700	$0.00	$0.00	12,700
Late Spring/ early summer		25%	55%	10,600	23,300	$4.40	$2.00	10,600
Harvest		20%	75%	8,500	31,800	$4.60	$2.70	8,500
Post-Harvest(Feb.)		25%	100%	11,200	43,000	$4.85	$3.26	11,200

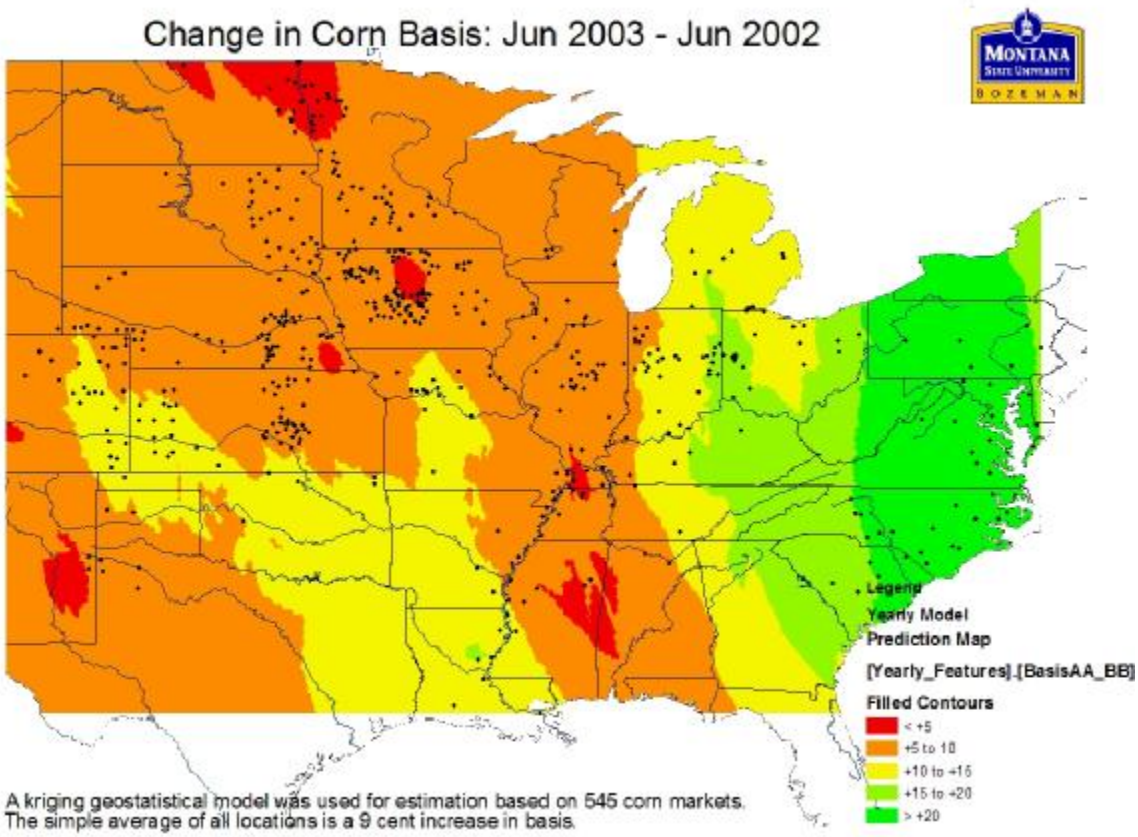
	Acres	x	Bu/acre	
Actual Production	1,000		43.0	43,000
Total Bushels needed to fill pre-harvest contracts				23,300
Bushels needed to buy back to meet contract				0
Net cost to buy back bushels to fill contract needs				$0

Integration of Spatial Data Into A Grain Marketing Plan

The process of integration of spatial price information into Excel-based marketing plan templates involves the identification of relevant price bids and geographic coordinates identifying the location of these bids. The data used in this example are available from Cashbids.com and are indicative of price conditions in the relevant regions of Minnesota. The data capture process includes downloading of price information from this electronic source into an Excel spreadsheet. A transportation algorithm using truck transportation costs is used to adjust the stated bids to a net price at each location. The net bids are then plotted using Business Map Pro or an equivalent spatial mapping program to identify geographicalliy the highest net bid by location.

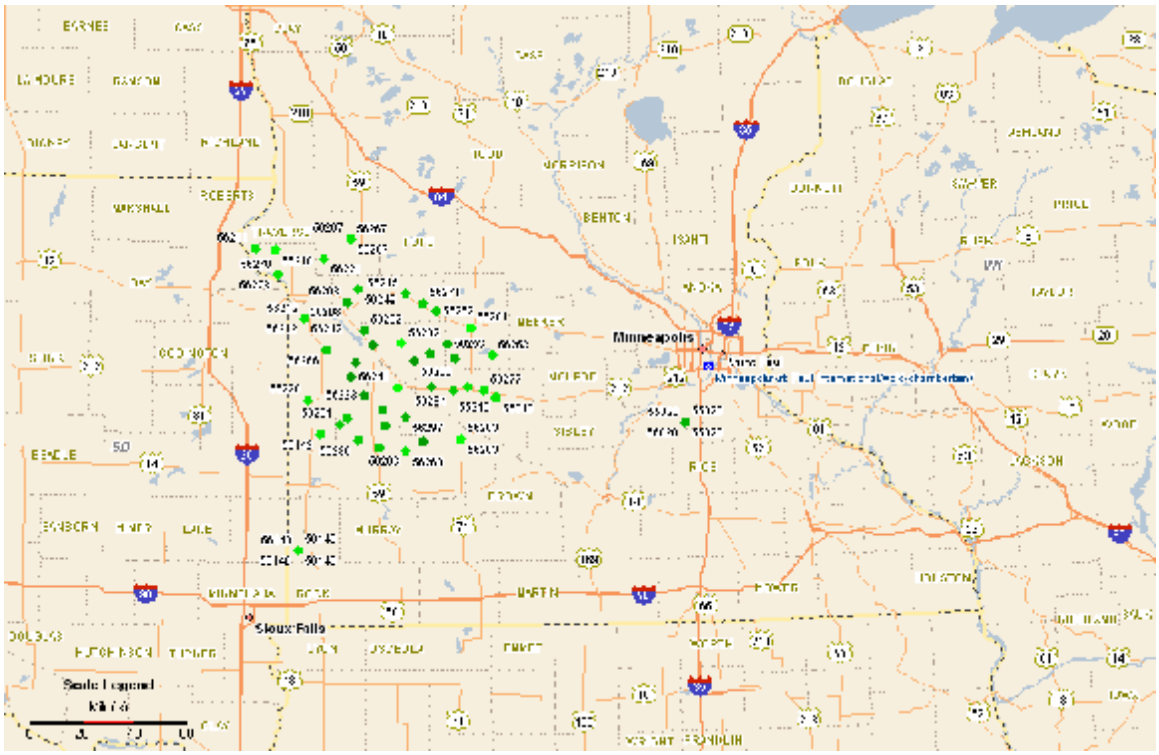
The Excel template is shown in Figure 1. It calculates the highest net bid for a 50 mile radius around Montevideo, Minnesota for both corn and soybeans. The calculations at the bottom of the spreadsheet calculate the impact on a 500 acre grain farm which produces 250 acres of corn and 250 acres of soybean Figure 2 shows the Business Map template that plots the net prices to identify the highest geographic location.

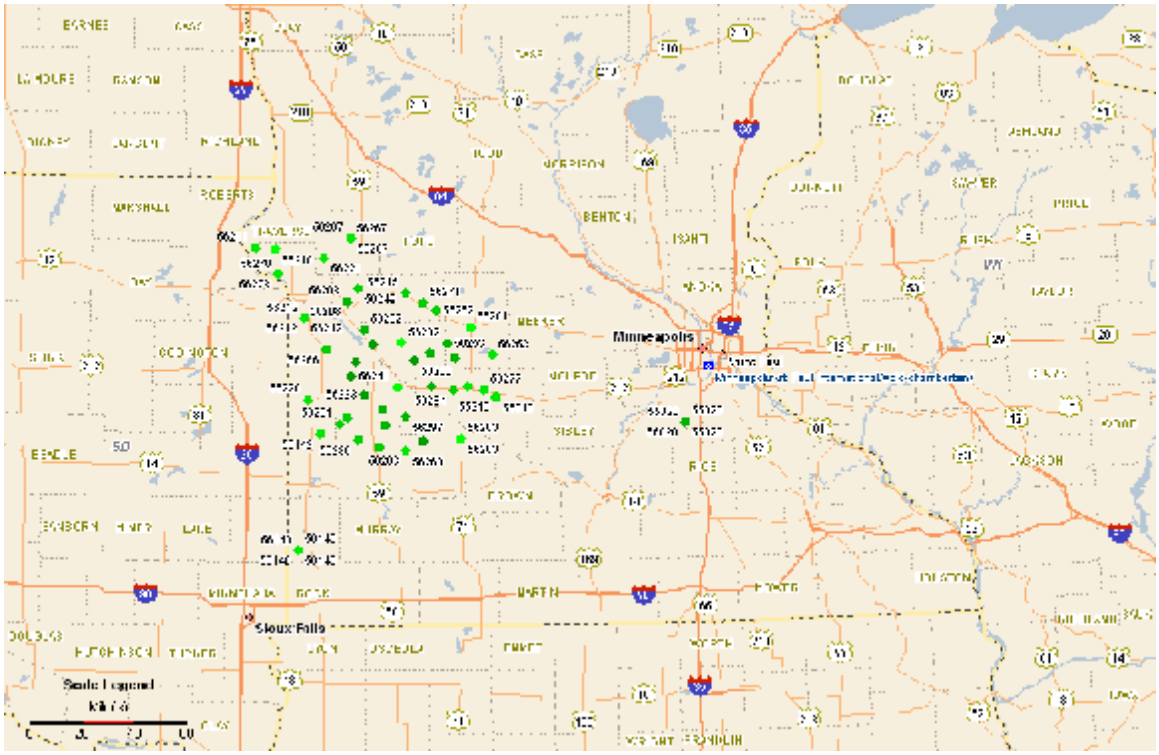
Figure 1. *Change in Basis for Corn*



Zip Code	cornnew	cornspot	cornbasis	sb new	sb spot	sb basis	hrs bid	hrsbasis	
56265	2.12	1.94	-0.59	5.42	5.16	-0.71		4.48	-0.2
56265		1.97	-0.56						
56295	2.06	1.88	-0.65	5.31	5.12	-0.75			
56218	2.09	1.91	-0.62	5.37	5.19	-0.68			
56223	2.12	1.94	-0.59	5.38	5.17	-0.7	4.45	4.43	-0.2
56241	2.16	1.98	-0.55						
56260	2.5	1.96	-0.57	5.73	5.14	-0.73			
56283	2.14	1.96	-0.57	5.42	5.16	-0.71		4.48	-0.2
56262	2.05	1.92	-0.61	5.33	5.13	-0.74			
56232				5.46	5.27	-0.6			
56232	2.15	1.94	-0.69	5.57	5.32	-0.72	4.48	4.57	-0.2
56232	2.07	1.85	-0.68	5.38	5.2	-0.67	4.4	4.53	-0.1
56222	2.1	1.96	-0.57	5.38	5.15	-0.72		4.34	-0.3
56245	2.13	1.95	-0.58	5.42	5.16	-0.71		4.48	-0.2
56285	2.15	1.96	-0.57	5.38	5.14	-0.73	4.24		
56297	2.12	1.93	-0.6	5.43	5.17	-0.7	4.38	4.29	-0.
56208					5.17	-0.7	4.51	4.51	
56249	2.06	1.93	-0.6	5.31	5.12	-0.75			
56256	2	1.94	-0.59	5.31	5.12	-0.75	4.46	-0.23	
56229	2.11	1.93	-0.6	5.42	5.16	-0.71	4.48	-0.21	
56271	2.09	1.98	-0.55	5.35	5.13	-0.74		4.38	4.
56282	2.07	1.93	-0.6	5.38	5.15	-0.72	4.34	-0.35	
56215	2.17	1.98	-0.55	5.45	5.13	-0.74	4.34	-0.35	
56252	2.12	1.97	-0.56	5.37	5.13	-0.74			
56281	2.1	1.96	-0.57	5.38	5.15	-0.72	4.34	-0.35	
55020	2.11	1.93	-0.6	5.42	5.16	-0.71	4.48	-0.21	
56284		1.96	-0.57		5.14	-0.73	4.24	-0.45	
56284	2.15	1.96	-0.57	5.38	5.14	-0.73	4.24		

Soybean Net Bids





This worksheet assists the producer in selecting the "best" marketing alter
certain forecasted variables such as price and basis direction.

To determine price and basis direction, the producer should reference other
information such as price charts and localized basis charts on other parts of
website.

"best" marketing alternative:

	Price Direction	up	"=>	up	Then L store/s
				down	store/h
	Basis direction	strengthening	"=.	strengthening	store/h
	Best alternative is	*store/sell forward contract*		weakening	store/s
f			**corn**		
		Store/hedge	Store/forward contract	Store&sell put option	Store&
	futures	2.27	2.37	2.3	
	basis	0.35	0.32		
	Net	1.92	2.05	2.3	
	premium cost/bu			0.23	
	delivery cost				
	Interest	0.06	0.06	0.06	
	margin/trans.cost	0.01	0.01	0.01	
	storage months	9	9	9	
	total storage cost	0.1816	0.1896	0.184	
	total cost	0.1916	0.1996	0.194	
	net price	1.8584	2.1004	1.876	
**********	Code:	1	3		

corn

Price Direction	**Basis direction**		then"best" alternative=
store/sell basis contr	*strengthening*	*weakening*	
down	store/hedge	store/sell forward contract	
up	store/sell cash	store/sell basis contract	

Step 5: Describe your plan

Corn:

Pricing Period	Method(s) of contracting / sale	Target % Priced In Period	% Priced Cumulative to date	Bushels In Period	Bushels Cumulative to date	Price In Period	Price Cumulative to date	In P
Prior to March15	*Insert Best Spatial Bids*	30%	30%	38,500	38,500	$1.00	$1.00	3
Late Spring/ early summer		25%	55%	32,100	70,600	$1.00	$1.00	3
Harvest		20%	75%	26,000	96,600	$1.00	$1.00	2
Post-Harvest(Feb.)		25%	100%	31,900	128,500	$1.00	$1.00	3

	Acres		Bu/acre	
Actual Production	1000	x	128.5	12
Total Bushels needed to fill pre-harvest contracts				7
Bushels needed to buy back to meet contract				
Net cost to buy back bushels to fill contract needs				

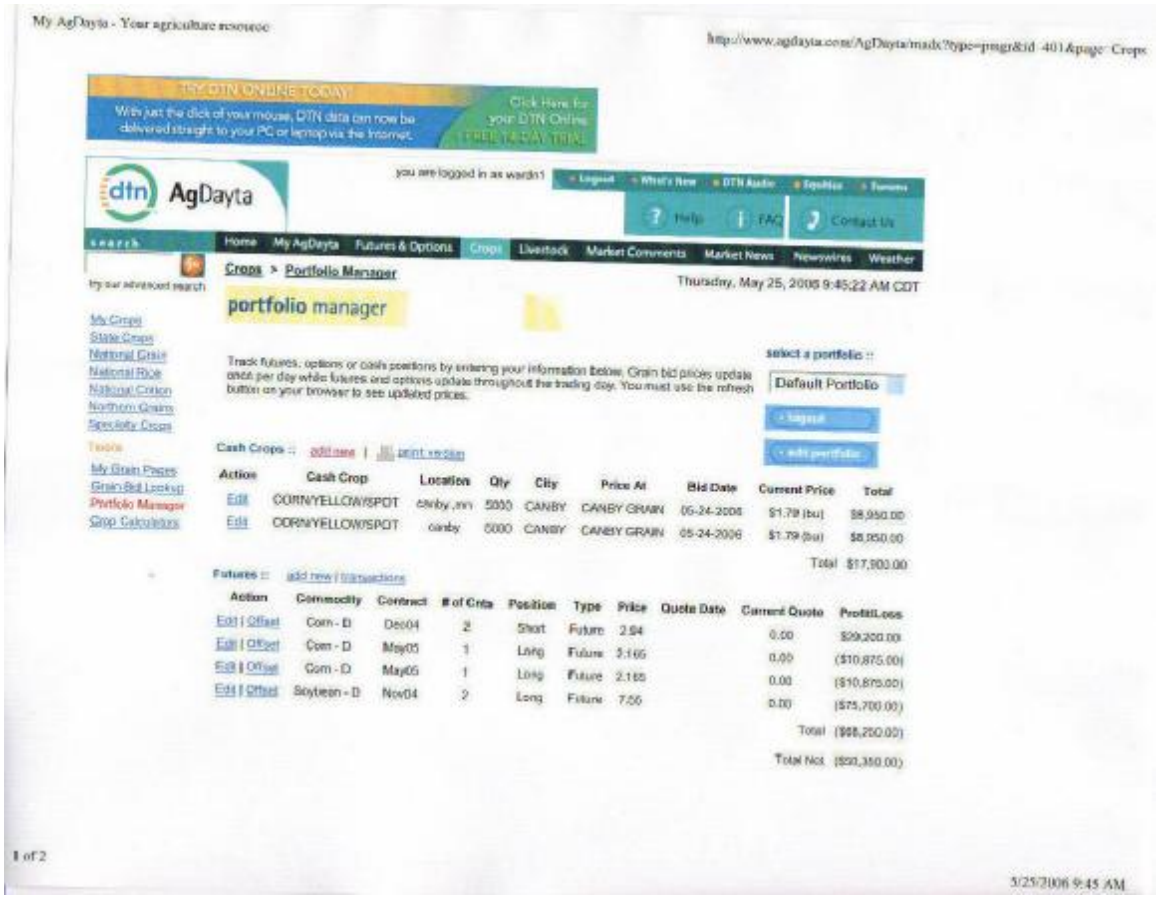
Soybean:

Pricing Period	Method(s) of contracting / sale	Target % Priced In Period	% Priced Cumulative to date	Bushels In Period	Bushels Cumulative to date	Price In Period	Price Cumulative to date	In P
	Insert Best Spatial Bids							
Prior to March15		30%	30%	12,700	12,700	$0.00	$0.00	1
Late Spring/ early summer		25%	55%	10,600	23,300	$4.40	$2.00	1
Harvest		20%	75%	8,500	31,800	$4.60	$2.70	
Post-Harvest(Feb.)		25%	100%	11,200	43,000	$4.85	$3.26	1

	Acres	x	Bu/acre	
Actual Production	1,000		43.0	4
Total Bushels needed to fill pre-harvest contracts				2
Bushels needed to buy back to meet contract				
Net cost to buy back bushels to fill contract needs				

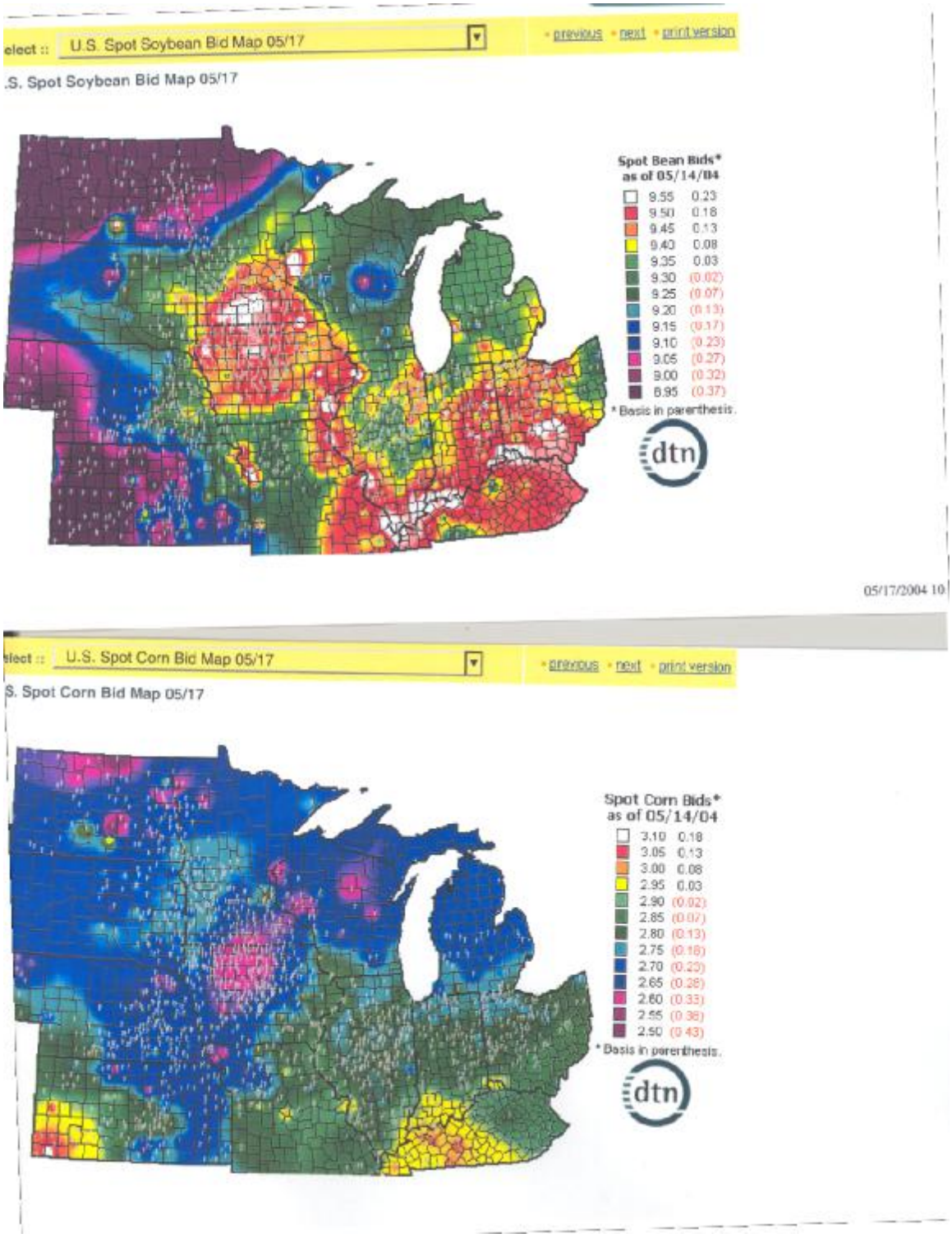
Another alternative to the sequence described previously is the use of Web-Based technology in the search for the best bids. AgDayTa has an option which allows the user to search for best bids on insert those bids as well as futures prices in a Portfolio for grain. The author includes this option as an illustration only in Figure 5. It should be noted that this is a recordkeeping program only and does not optimize or calculate other financial aspects such a Net Bids.

Figure 6. AgDayta's Portfolio on the Web.



Spatial Price Information is published on AgDayta, with source data from DTN as shown on the next page.

Figure 8. DTN spatial price information



Case of a Sample Farm in Southwest Minnesota

The final part of this pattern incorporated spatial data in a marketing spreadsheet adapted from Michigan State University. The TCR2000 spreadsheet summarizes a 300 acre farm with 200 acres of corn and 100 acres of soybeans. Production expected in 2005 is 33,000 bu of corn and 4000 bu of soybeans. Using the best bids for this location of Marshall, Minnesota; the gross revenue increases by $3600 for corn and $8400 for soybeans using spatial information to calibrate the marketing program for 2005. Exclusive of government programs, this represents a gain of 14.3% in revenue.

Summary and Conclusions

This paper summarized the importance of spatial price information in improving a marketing plan. The use of spatial information refines marketing choices by identifying existing and potential opportunities for cash and forward bids *net* of transportation cost, helps to determine the returns from marketing alternatives from hedging or forward contracting and assists in *allocation of crop sales to time periods of a marketing year*. A case example shows the impact of this information on final revenue totals. Information on spatial patterns is available on the author's website(***www.apec.umn.edu/wnefstea***) and in other states for the sources mentioned earlier.

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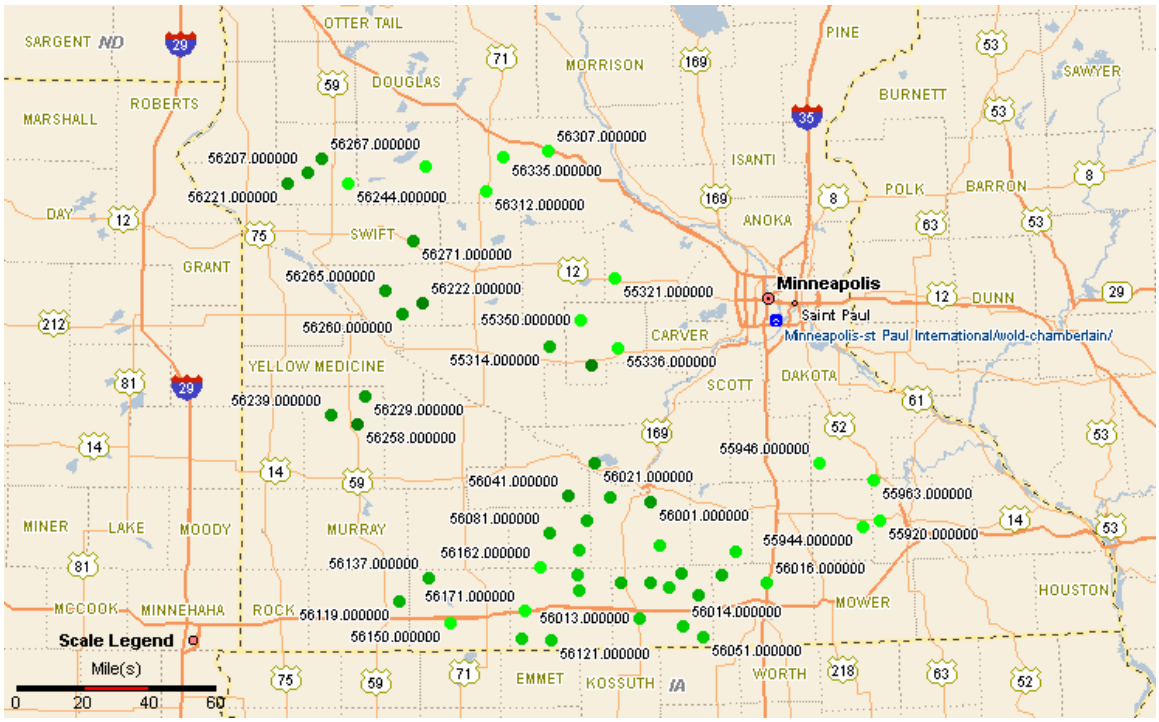
5. Sources of Market Information- Kevin McNew –Montana State University and CashGrainBids.com, Kevin Duyvetter- Kansas State University; Jake Ferris- Mich State University, Bruce Babcock- Iowa State University.



Example of Mapping of Price Bids- Authors website.

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