

4. Why Producers Should Consider Managing Supply Chain Risk

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Michael Boland provides information to agribusinesses and cooperatives for use in analyzing alternative managerial decisions. This information is made available through a variety of outlets including case studies, applied publications, scholarly journals, and industry meetings. He has written over 60 case studies and has lectured or worked in more than 50 countries. Mike also serves as associate director of the Arthur Capper Cooperative Center where he teaches director leadership programs in 14 states. He teaches courses in agribusiness policy and strategy, and international agribusiness and has led student study trips in more than 15 countries including a study tour of Southern Africa in December 2009. He recently returned from three weeks of lecturing in Saudi Arabia and other countries in the Middle East.

Abstract/Summary

Professor Boland will present an overview of drivers of change in the retail agronomy and grain origination industries in Great Plains, present data to show estimated farm income over fertilizer costs for past five years for different cropping systems, and discuss new risk management programs that several ag retailers are developing that would allow a producer to price their inputs and sell their grain simultaneously to help a producer manage supply chain risk.

Why Producers Should Manage Input Supply Chain Risk

2009 Risk and Profit Program

K-State Alumni Center

Presented by
Michael Boland

August 23-24



My 2008 Risk and Profit Presentation

- We discussed the changing dynamics in agricultural input markets and the evolving relationship you have with your agronomy and energy suppliers.
 - Require more information from you to help maintain retailer's Daily Position Reports on agronomy (not just grain)
 - Less competition in Great Plains in ag retail
 - Exit of ADM, private firms, etc.
 - New risk management programs being developed by ag retailers
- What happened since last August? Over \$170 million of fertilizer inventory write-downs by retail fertilizer dealers.
 - Conservative number??
 - Co-ops with a lot of fall crop business were hit hardest

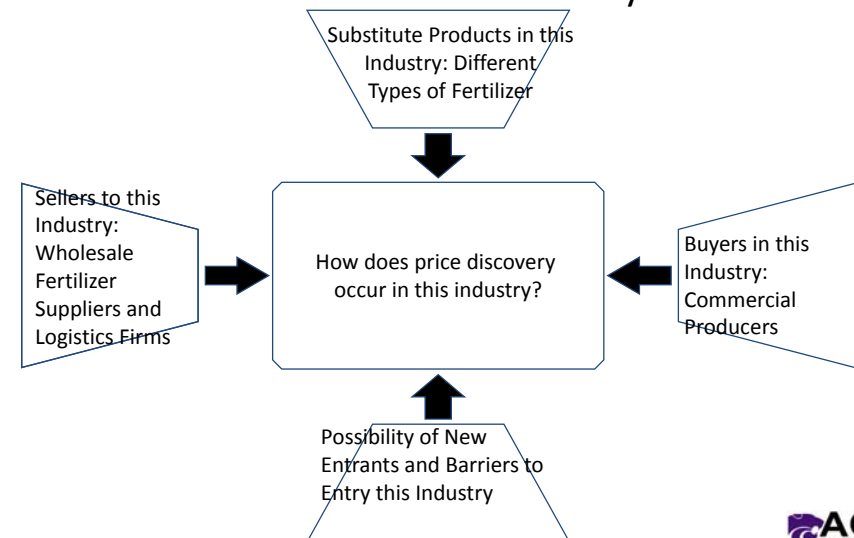


2009 Risk and Profit Objective

- Update and present an overview of issues that are driving changes to the retail agribusinesses in Great Plains.
- Discuss alternative risk management programs for fertilizer
- Analyze these programs and how they would have performed since January 2003
- Notes
 - I jump back and forth between using "agribusiness retailers", "dealers", and "cooperatives." In Kansas, most (but not all) agribusiness retailers are cooperatives. I am talking about the same entity!



Five Forces Model of Competition: Retail Fertilizer Dealer Industry

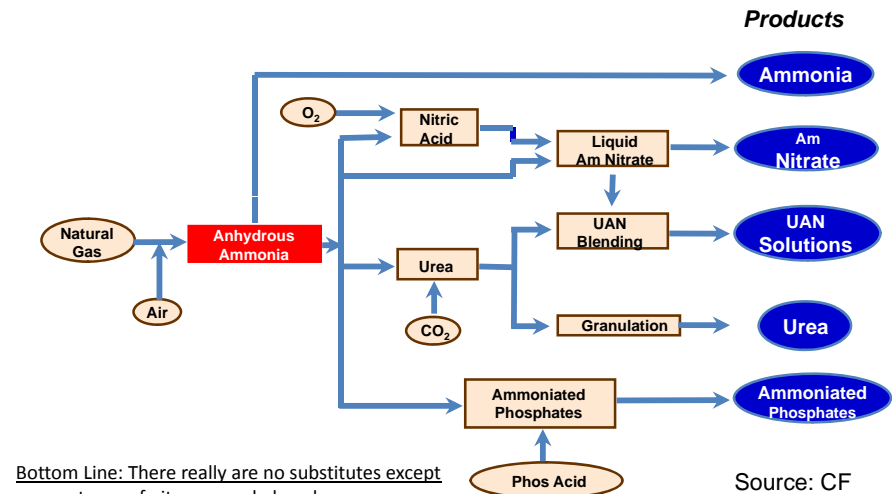


Wholesale Fertilizer Suppliers and Logistics Firms

- Phosphates
 - MAP/DAP: Mosaic and PCS – 35% exports (India, Latin America)
 - Potash: PCS, Mosaic – 80% imports (Canada)
- Nitrogen
 - Ammonia: Mosaic, PCS, Agrium, CF, Terra, Koch – 50% imports (Trinidad and Tobago)
 - Urea: CF, Agrium, Terra, Mosaic, PCS, – 70% imports (Canada, eastern Europe, China, Venezuela)
 - UAN: Terra, CF, PCS, Koch – 30% imports (Canada, Russia, eastern Europe)
- Nitrogen plants are built near natural gas supplies (near Gulf ports) and transported to consumption points (corn, wheat, other crops). Price of energy is a major source of price volatility
- Phosphate plants are built to utilize imported and domestic supplies of phosphate rocks, ammonia, and sulfur (Florida and Texas coast)
- Key inputs in fertilizer manufacturing are globally traded products and affected by transportation costs, exchange rates, policy decisions, and other uncontrollable factors, and are increasingly becoming concentrated.
- Bottom Line: Retailers have little or no negotiating ability with wholesalers who are pushing risk back onto the retailer. Vertically integrated operations have advantages in transfer pricing.



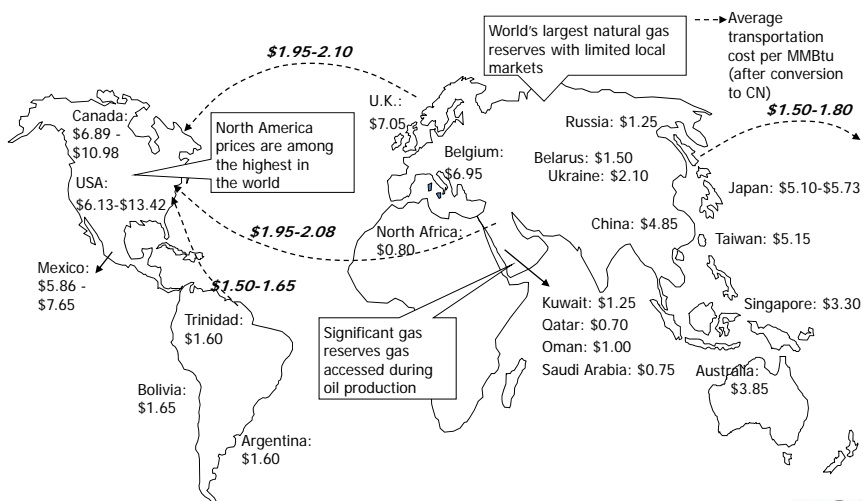
Substitute Products



Source: CF



Loss of U.S. nitrogen production has lengthened the supply-chain, increasing supply risk



Source: CHS, Inc. (Spring 2008)



Possibility of New Entrants and Barriers to Entry in Retail Fertilizer Dealer Industry

- Number of firms continues to decline nationally (USDA)
- USDA data suggests that market share of cooperatives is increasing in retail agribusiness industry (agronomy, energy, feed, grain) for farmer-owned cooperatives (CHS, MFA, TN Farmers, Growmark)
- Non co-ops include Agrium (Crop Production Services-east coast, eastern Corn Belt, SW Kansas), Simplot (Upper Midwest and Pacific NW), Helena Chemical (national), Wilbur Ellis (western US, ND, MI, TX)
 - CPS is a product of three mergers,
- Some large producers are trying to go direct to the wholesaler.
- Barriers to entry exist in services (cost of application equipment, labor, cost of compliance), facilities (regulations, volume), and learning curve (not an industry where you see lots of entry and exit patterns).
- Bottom Line: New entrants in retail agronomy operations are not likely to surface except existing firms who are increasing their footprint and trying to obtain economies of size.



Buyers in this Industry: Commercial Producers

- Purdue University data suggest that there are two typical distribution channel to producers
 - Wholesaler-retailer-producer channel that is not as transaction oriented, but more attuned to timeliness of service and individual solutions.
 - Wholesaler-distributor-producer channel where producers require simpler solutions and are more transaction-oriented which puts more pressure on margins. This channel includes distributors who do not provide services, but simply disaggregate large volumes of inputs in a warehouse or similar facility.
 - Wholesaler-producer channel exists for some large producers.
- Regardless, fertilizer application is intensely seasonal with short periods in the fall and spring and producer decision-making is often close to planting time.
 - Retailers must buy six to nine months in advance and no opportunity to hedge
- Bottom Line: Producers desire a local solution which is often decided upon in a short window of time. Retailers must anticipate demand six to nine months ahead.



How does price discovery occur in this industry?

- A transaction occurs six to nine months prior to a producer actually buying and using the product
- The retail fertilizer dealer has some negotiating ability (based on volume and product formulation) and has more than one buyer to purchase from
 - Various price sheets exist from industry associations but no information on volumes for those prices
 - No cooperative assets exist (Farmland sold Coffeyville assets, CF was sold)
- Exchange rate risk is huge in the last five years with the weakening of the US dollar which made imports more expensive and the volatility in energy prices
- No way for a retail dealer to hedge the transaction
- Lender requires collateral for the purchase and when inventory values change, the “margin” requirements change
- Not generally huge risks (as I discussed last year) because the US historically had a large domestic ammonia and urea production presence which has changed in the last five years.
- Bottom Line: Dealers have little influence over the price paid for fertilizer and passes that cost onto producers.



An Issue for Producers

- Risk management programs exist for energy and grain (except durum wheat)
 - Seed and chemical prices appear to have more stability in pricing
- Given the volatility, fertilizer dealers are essentially speculators
 - But producers own many of these retail operations because they are cooperatives.
 - Does a producer really want their dealer to engage in speculative behavior putting the cooperative assets (and hence, the producers equity, at risk?)
 - Despite best intentions by dealers, fertilizer inventory write-downs in 2008 and 2009 were a result of speculation due to inability to hedge fertilizer.
- All co-ops are required by lenders to have a position report on grain.



Policy Issue for Boards of Directors

- Did this industry have an “Olympic Year” or will the future be more volatile?
 - Yes and Yes
- Writing down fertilizer inventory means two things
 - A decline in income due to inability to maintain margins
 - Inventory is an asset which has a corresponding change in liabilities or equity. The lender borrowed money to the dealer at the market rate which was higher earlier in the year
 - Write-off comes against income (if positive) which means less income available for equity redemptions or purchase of new assets or equity (if income is negative) which means a change in solvency (e.g., accounting identity must hold)
- Many Kansas cooperatives have aggressive asset purchase plans for projected increased future grain volumes and must either use current income or leverage the balance sheet to pay for the new assets.
- What should the retailer do?

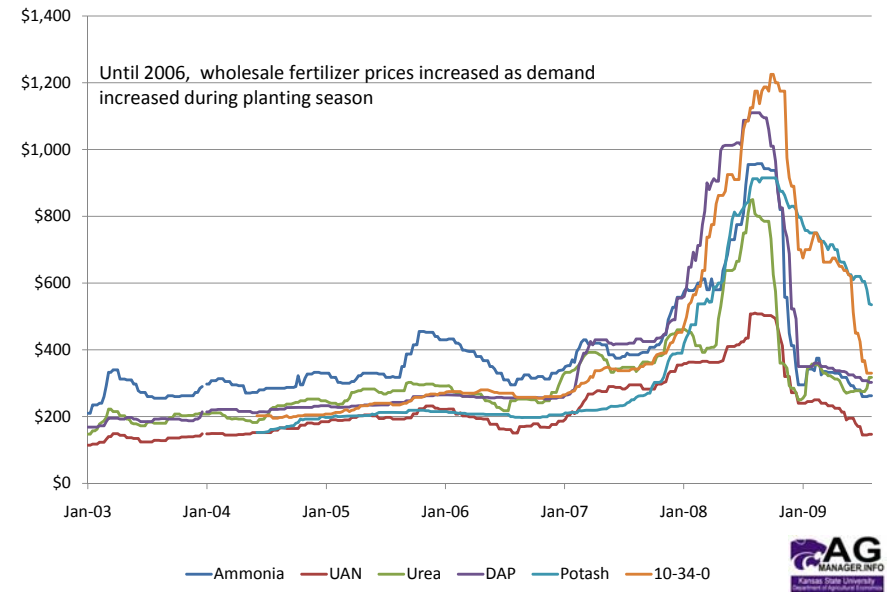


What are other co-ops doing?

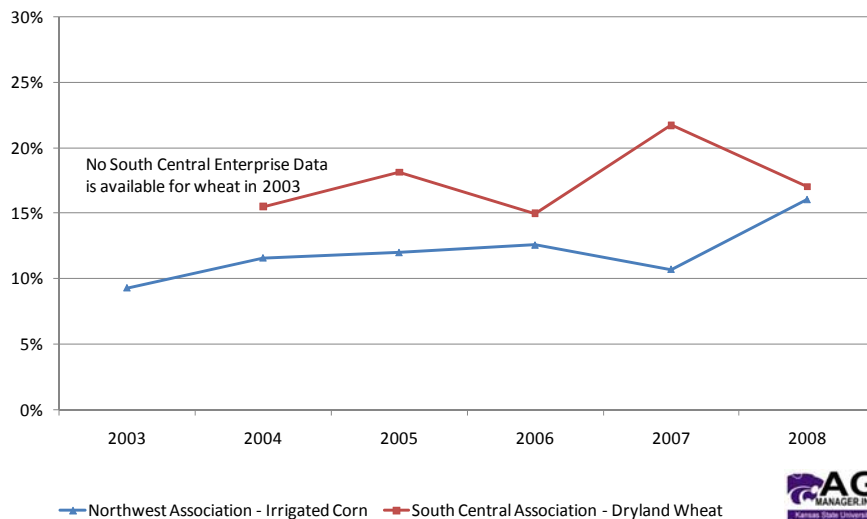
- Aggressive risk management education programs
 - Everyone in the organization promotes education with producers
 - Provide local solutions
 - Includes crop insurance package (revenue assurance)
 - Quick adoption – more than a few co-ops had no write-offs
 - 80 to 85% of producers have adopted fertilizer risk management programs linked with grain sales in these organizations
- Incorporating financing into the solution
 - Different interest rates for different packages
 - Makes good business sense
 - Prepayment on some fertilizer helps working capital during periods when it is needed
- Requires a different mindset



Nominal Weekly Southern Plains Fertilizer Prices



Percentage Contribution of Fertilizer and Lime to Gross Income for Kansas Farm Management Association Members for Dryland Wheat and Irrigated Corn



How will industry respond in the future?

- Short-run impact
 - Dealers lay in less inventory to avoid “making same mistake”
 - Causes problems in the supply chain and less supply available in a Just In Time industry (intense seasonality issue)
 - Stressed balance sheets in some retailers
 - Daily Position Reports for entire operation – better risk management in the future
- Long-run impact
 - Industry structure suggests some restructuring is inevitable including mergers (between retailers), acquisitions (one retailer buying another, regionalization), joint ventures of agronomy operations, etc. to achieve better position and deeper footprint.
 - Lenders demand stronger balance sheets (increased demand on retailers to be more profitable in the future to finance new assets)
 - Increased need for risk management tools and risk management education



Is it possible to analyze the impact of risk in the fertilizer supply chain?

- Find a way to hedge fertilizer
 - Most preferable option (risk is lowest) but no futures market exists
- Forward contracting at some price
 - Difficult because the key input in manufacturing is extremely volatile due to factors beyond the control of the wholesaler and unlikely to devise a “fair” contract and significant premium for basis risk would be included.
- Take a position and then aggressively try to sell fertilizer as quickly as possible using prepaids.
- Do nothing and maintain existing method of understanding historical patterns in fertilizer prices (e.g., price was lower in the fall and increased over the winter as demand increased)
 - Difficult because of the imported fertilizer issue and volatility in energy prices
 - This is the riskiest option
- Find some alternative
 - Lots of ‘experiments’ going on to provide some risk management solutions
 - Dollar cost averaging is one solution



An Analysis of Three Options

- Hedging Weekly Model (not available)
 - Provide insight as to possible impacts of risk
 - Weekly wholesale fertilizer prices and CBOT (corn) and KBT (wheat) futures
 - Ability to lock in a margin
- Base Model of buying fertilizer during planting season and selling grain at harvest
 - Widely used by many producers as it provides flexibility
 - Easily understood
- Dollar Cost Averaging Model
 - Each month, pay for 1/12 of the fertilizer used and sell 1/12 of the grain.
 - Spread is known at that time and offers some management against higher prices



Dollar Cost Averaging Model – common practice in 401k plans, etc.

- Determine an amount of grain and fertilizer needed for that grain that you want in that program
 - Put money into a “margin” account
 - Needed by the retailer because the fertilizer is collateralized with their lender and the collateral is lost once it is applied by the producer
 - Many co-ops have demand deposit type programs or CD’s
 - Producer required to have crop insurance
 - Each month the producer pays 1/12 of the fertilizer costs and receives 1/12 of the grain revenue
 - Price of fertilizer that day multiplied by 1/12 of the fertilizer volume applied
 - Price of grain that day multiplied by 1/12 of the expected grain volume
- Rationale
 - Wholesale fertilizer price is based, among many other things, on the Olympic average of the five weekly price quotes for fertilizer adjusted for the three previous weeks (four week average of the weekly Olympic average)

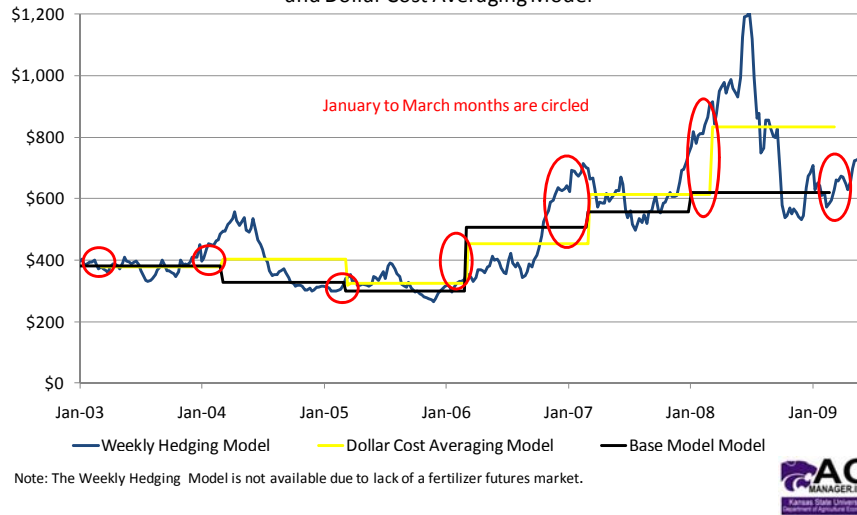


Irrigated Corn Model Assumptions

- Southwest Kansas irrigated corn
- Three agronomy options were considered
 - Custom Dry (urea, MAP), Custom Liquid (UAN, MAP) and
 - NH₃ + Dry Spread (anhydrous ammonia, MAP)
- An expected return per acre above each fertilizer costs for each agronomy option was calculated for the 2003 to 2008 time period using nearby corn price, Garden City cash price, an estimated yield of 200 bushels per acre, and Southern Plains fertilizer prices for ammonia, UAN, urea, and MAP (no potash was recommended in these three agronomy options) adjusted for delivery into Garden City. Government program payments were not included.
- Dollar cost averaging model assumes you start in first week in March and proceed over the year while the base model assumes you buy fertilizer in first week in March and sell grain in mid-October
- Little difference in return above fertilizer costs between the three agronomy options and only the NH₃ + Dry Spread options is presented.



Southwestern Kansas Irrigated Corn Revenue Per Acre Above NH3 Plus Dry Spread Fertilizer Costs for Nearby Futures Price and Southern Plains Fertilizer Prices: Base Model, Weekly Hedging Model, and Dollar Cost Averaging Model



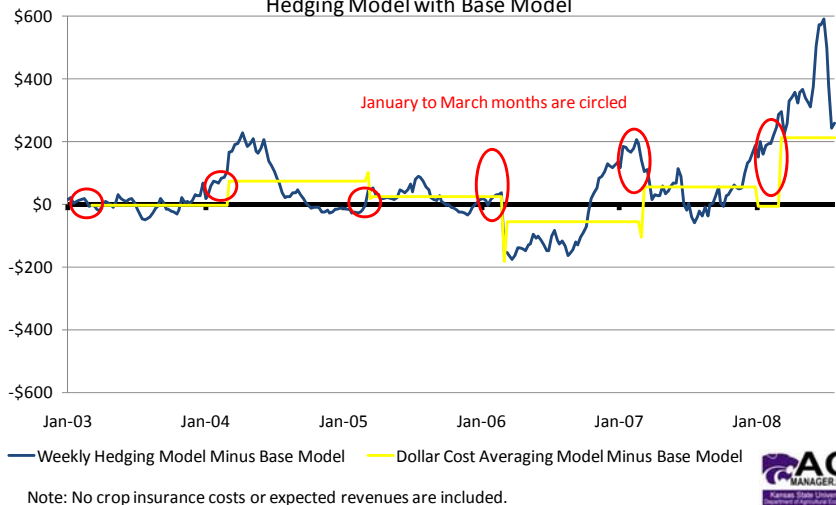
Description of the Data, \$/acre

Model	Mean	Standard Deviation	Coefficient of Variation
Traditional	\$447.21	\$120.74	26.86%
Dollar Cost Averaging	\$497.22	\$174.55	34.86%
Weekly Hedging	\$500.72	\$196.85	39.59%

As you would suspect, the Weekly Hedging Model and Dollar Cost Averaging Model is closer to one another with the Traditional Model having a lower mean and less risk as measured by the CV. None of this is surprising. The Dollar Cost Averaging Model is Patterned after the Weekly Hedging Model. There is no Statistical differences among the three models.



Southwestern Kansas Irrigated Corn Revenue Per Acre Above NH3 + Dry Spread Fertilizer Costs for Nearby Futures Price and Southern Plains Fertilizer Prices: Comparison of Dollar Cost Averaging Model and Weekly Hedging Model with Base Model



More Data Statistics

Model Statistics	Weekly Hedging Less Traditional	Dollar Cost Averaging Less Traditional
Sum of Deviations	\$14,848.73	\$8,859.69
Mean Deviation	\$51.03	\$31.42
Standard Deviation	\$127.21	\$68.98
Coefficient of Variation	249.31%	219.57%

Again, not too surprising. The mean deviations are greater because of the great increase in volatility especially during periods outside the March and October time Periods. The Weekly Hedging Model has the most variability and most profit. The Dollar Cost Averaging mimics some of the patterns one sees in the Weekly Hedging Model.

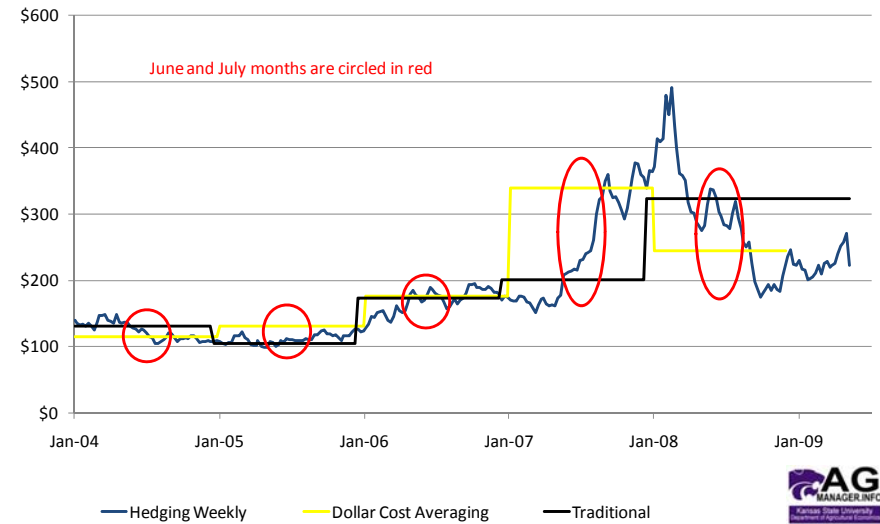


Dryland Wheat Model Assumptions

- South Central dry land continuous wheat production
- One agronomy option was considered
 - Summer preplant (anhydrous ammonia, MAP)
 - Winter top dressing (UAN)
 - Assumed five months between each application
- A weekly expected return per acre above fertilizer costs was calculated for the 2003 to 2008 time period using nearby wheat futures price, Hutchinson cash wheat price, estimated yield of 45 bushels per acre, and Southern Plains fertilizer prices for ammonia, UAN, and MAP (no potash was recommended) adjusted for delivery into Hutchinson. Government program payments were not included.
- Base model assumes fertilizer is bought in two transactions in current year and wheat sold in the following year.
- Dollar Cost Averaging Model begins in first week of July



South Central Kansas Dryland Wheat Revenue Per Acre Above Fertilizer Costs for Nearby Futures and Southern Plains Fertilizer Costs: Base Model, Weekly Hedging Model, and Dollar Cost Averaging Model



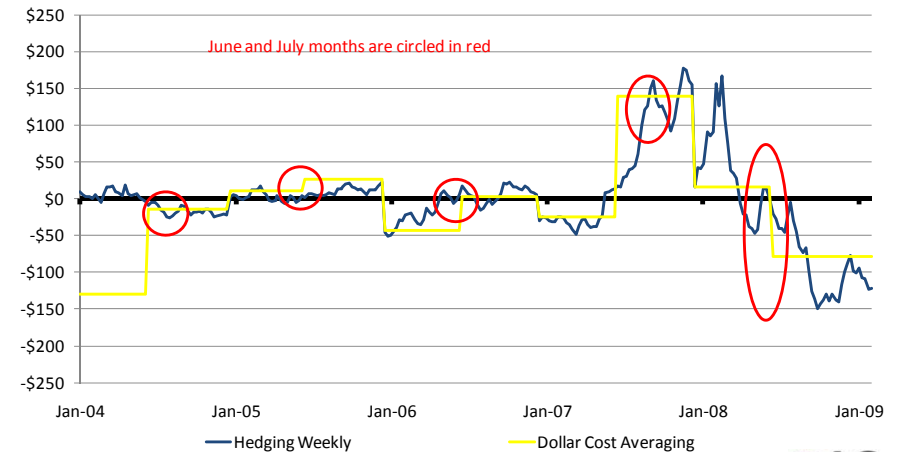
Description of the Data, \$/acre

Model	Mean	Standard Deviation	Coefficient of Variation
Traditional	\$179.01	\$71.11	39.72%
Dollar Cost Averaging	\$194.07	\$77.80	44.70%
Weekly Hedging	\$187.91	\$90.17	47.99%

As you would suspect, the Weekly Hedging Model and Dollar Cost Averaging Model is closer to one another with the Traditional Model having a lower mean and less risk. None of this is surprising. The Dollar Cost Averaging Model is Patterned after the Weekly Hedging Model which does not exist. There is no statistical significance between the three models.



South Central Kansas Dryland Wheat Revenue Per Acre Above Fertilizer Costs for Nearby Futures and Southern Plains Fertilizer Costs: Comparison of Weekly Hedging Model and Dollar Cost Averaging Model with Base Model



Base Model assumes fertilizer is bought in July and December of current year and wheat sold in following year in June.



More Data Statistics

Model Statistics	Weekly Hedging Less Traditional	Dollar Cost Averaging Less Traditional
Sum of Deviations	-\$1,745.68	-\$3,830.74
Mean Deviation	-\$6.23	-\$13.68
Standard Deviation	\$59.73	\$66.48
Coefficient of Variation	-958.00%	-485.95%

The sum of the deviations is less than zero suggesting that the Traditional Model did better, on average, during this time period. But there is a great amount of variability. There is no statistical difference between the three models.



Things You will be Hearing this Year

- Increased discussion of having a plan for purchasing inputs (e.g., like a marketing plan)
 - Fertilizer
 - Energy (these continue to exist)
 - Chemical and seed are not as important
- Risk management programs for fertilizer
 - Dollar Cost Averaging
 - Others?
- Discussion about the fertilizer write-offs at co-op annual meetings
- Oral vs. written contracts
- Likelihood of less fertilizer supply next year
 - Inventory levels were high and getting lower
 - Capacity has been reduced which implies less inventory in future



Future Research

- If your co-op is a natural extension of your farm business, it is only natural that they will want more information to help you achieve the best performance.
- Have a plan for purchasing inputs.



How would you like to buy fertilizer?

- At the end of the day, it is difficult (if not impossible) to predict the future price of a share of stock or the price of fertilizer today. Producers or retailers have to focus on cost efficiencies to be in the best position to handle price risk from inputs such as fertilizer or outputs such as grain.
- Retailers, especially cooperatives, may have different packages designed to better align themselves with their members' needs. The best package may be a combination of lower cost input financing, service, or other needs that a producer might have.

