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THE HAFED EXPERIENCE – WHEAT HEDGING ON THE NCDEX

by

Ann E. Berg

A Preliminary Report

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Wheat Hedging on the NCDEX

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Ann E. Berg, an international commodity specialist, is a former exporter and commodity futures trader who served on the Executive Committee of the National Grain Trade Council, and was twice elected to the Board of Directors of the Chicago Board of Trade. She is Commodity Hedging Expert to the FMI India Commodity Futures Market Project.

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FMI, 7735 Old Georgetown Rd, Suite 310, Bethesda, MD 20814, USA, Tel: 301-215-7840

FMI, 208 Keshava, Bandra-Kurla Complex, Bandra (E), Mumbai 400 051, India, Tel: 22-6710-9102

Introduction

On February 27, 2007, the Forward Market Commission (FMC) of India banned new listings of wheat futures contracts and declared trading in all open contracts subject to liquidation only. Wheat futures trading, according to some, enabled "hoarders" to accumulate large long positions, causing wholesale food inflation. The Government of India will review the issue of wheat futures trading for several months before the FMC decides whether to allow its resumption.

The HAFED apex cooperative of Haryana State in India had effectively been hedging its wheat by using the NCDEX wheat futures contract. Because the FMC has banned this futures contract, HAFED wanted to determine whether it could use an alternative mechanism, particularly the Chicago Board of Trade (CBOT) wheat futures contract, to hedge its cash wheat purchases accumulated from farmers during the harvest season.

This paper examines both the successful HAFED hedging experience, and whether the CBOT wheat futures contract can provide an effective hedging alternative for HAFED

HAFED

HAFED is an apex cooperative institution of farmers established by the government in the state of Haryana. Besides acting as a wheat procurer under the Minimum Support Price (MSP) scheme for the Government of India (GOI),[1] it also acts as a buyer, input supplier and credit extender for wheat producers in Haryana. HAFED began using the NCDEX wheat contract after its launch in July 2004 as a standard "short hedger," i.e., it sold futures contracts (short) on the NCDEX against its cash (long) purchases from farmers. Below is a chart of its activities for wheat procured outside the MSP:

Ten metric tons equals one contract of wheat on the NCDEX platform

Year	Qty purchased MT (physical wheat)	Qty hedged MT (short futures sales)	Qty delivered MT (against futures short)
2004-05	70000	4770	10
2005-06	31814	35710	13300
2006-07	107043	81450	20860

Source:HAFED

The chart reveals that HAFED rapidly increased its use of the wheat futures contract and the delivery mechanism over the three crop years as it became more sophisticated in its use. During 2006-2007, HAFED was able to "lock in" a net profit of Rs. 108 per quintal after deducting storage, interest, VAT, and transportation charges.[2] The profits reveal how HAFED, after only two years of exposure to futures trading, was able to hone its hedging skills: taking advantage of the substantial carrying charge between the April and May harvest months and December, it chose to place its short hedges in the deferred month, thus achieving the maximum price for the crop cycle. Because NCDEX had accredited HAFED's warehouses for delivery registrations under the wheat contract, HAFED was able to deliver its stored wheat in its own warehouses in satisfaction of its short position, earning storage and avoiding additional

[1] 8.41 lac MT of wheat during 2006-2007.
[2] Detailed in a presentation made to the Abhijit Sen Committee in May 2007.

logistical expenses. Such a transaction would have been impossible in the Indian cash market since trading beyond 11 days forward, is technically impermissible. Given HAFED's relative inexperience in risk mitigation and the novelty of futures trading, the results demonstrate a remarkable achievement for HAFED.

HAFED described the benefits derived from futures markets:

- Auditable records of sales prices – i.e., futures transactions
- Aggregation of small purchases
- Quality assurance - achieved by strict assaying methods by registered warehouses
- Liquidity
- Price stabilization

HAFED's Hedge executions

MSP + Bonus of Wheat (April 2006)	700
Mandi, VAT & Transportation Charges	110
Interest & Storage Charges (for 8 months - i.e., up to Dec 2006	72
Cost of MSP Wheat in Dec 2006	882
Selling Rate of Wheat in Dec 2006 on NCDEX (Rs. 1017 – Rs. 27 expenses)	990
Net Profits per Quintal	108

Source: HAFED

The advantage of acting on behalf of farmers, HAFED listed as follows:

- Bundling of small lots to hedge on futures
- Oversight of cleaning, packing and weighing
- Payment of fees: taxes, storage, assaying and sales
- Advance payments to farmers

HAFED stated that the average wheat farmer in Haryana produced about 50 quintals of wheat per year. If it had been able to return 80% of the 2006-07 profits back to its producing base, each farmer would have realized an additional Rs.4000 in income, a considerable sum for most.

Finally HAFED described the obstacles farmers faced in using futures directly:

- Farmers may not have hedgeable contract quantities (10MT)
- Registration with NCDEX, D-Mat[3] acct, PAN &Sales Tax Number required
- Security deposit with NCDEX required to trade
- Compliance with NCDEX rules necessary – quality quantity, delivery protocols, etc.

HAFED also explained how its deliveries of wheat had a leveling effect upon prices. Under the terms of the NCDEX contract, wheat cannot be redelivered in the same futures month. Because delivered wheat must therefore be carried (at an expense of Rs. 30/quintal per month) or loaded out to the best bidder, long futures holders tended to liquidate their positions toward the middle of each delivery month in order to avoid delivery. The activities by both longs and shorts caused the futures price to converge to the spot cash price.

HAFED's use of the NCDEX wheat futures contracts can be described as a textbook example of risk mitigation by short hedging. Futures hedging proved so successful for HAFED that it developed plans to act as an aggregator and distribute future profits from its hedging operations to its farmer members for the following year. HAFED reports that these plans were approved by the Haryana government. Its goal – as expressed in a meeting – was not necessarily to achieve greater profitability but to avoid losses that could be incurred by holding unhedged physical supplies of wheat.

The NCDEX Wheat Contract

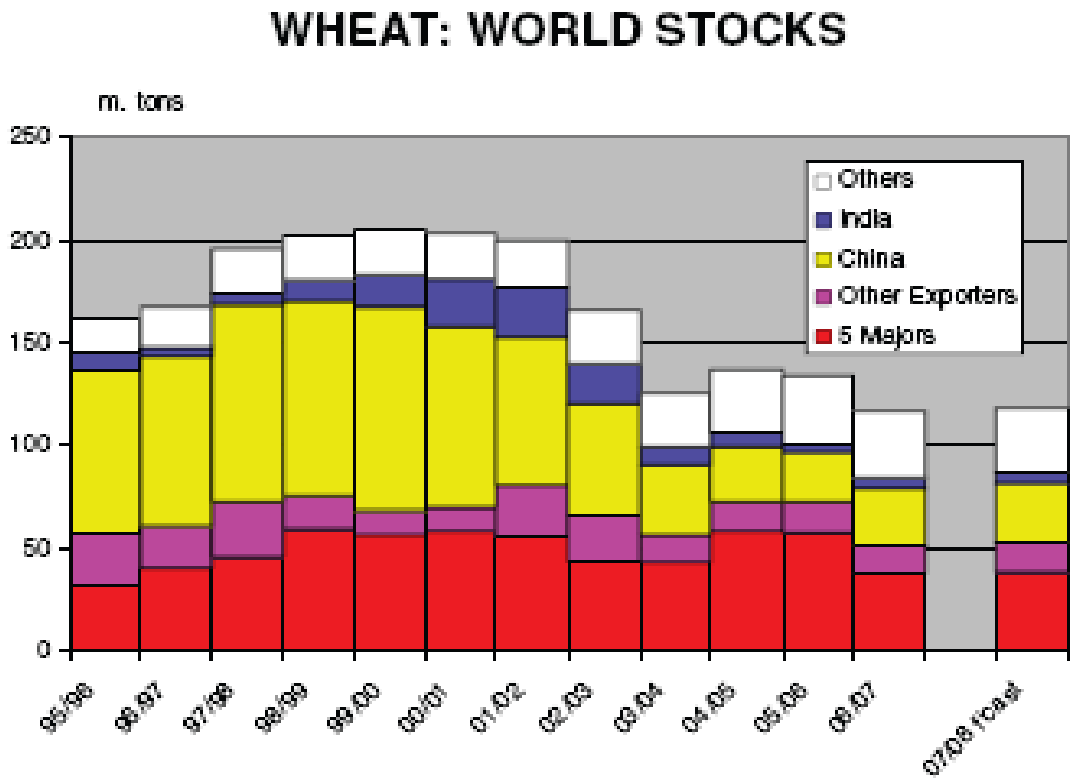
When NCDEX launched its wheat futures contract in July 2004, it was participating in a global trend toward commodity risk management on a regional level. Over the past decade, multiple commodity exchanges have launched in China[4], Thailand, the United Arab Emirates, Turkey, and several sites in Latin America and Eastern Europe. More are planned in Russia, Ukraine, Pakistan, the continent of Africa and Middle East countries. Although the Chicago Board of Trade, the world's oldest exchange, remains the benchmark for grains and oilseeds, a march towards national product offerings has been steady since 1992 when the Tokyo Grain Exchange introduced a yen denominated maize futures contract, traded in 100 MT lots with delivery based on Japanese ports. Several factors have contributed to the rise of national exchanges, including shifting centers of supply and demand, increasing basis risk between CBOT and regional crop prices and the desire by liberalized economies for nationally based, customized solutions in terms of currency, quality, quantities traded.

NCDEX designed its wheat contract to conform to Indian trading practices to achieve maximum participation on a national level. The contract is ten metric tons based on rupees per quintal, has multiple delivery points[5] and allows a one time delivery from the 15th to the 20th during all calendar months of the year. Although deliveries are physical, the final price settlement is configured from the spot cash market prices obtainable from multiple locations. For simplicity sake,[6] as of October 2006, all deliveries at all locations are settled at par. Also, in distinction from the CBOT Soft Red Wheat (SRW) contract, the NCDEX contract is based on White Wheat (WW), a medium variety that often bears little correlation with the soft variety. Both

[3] Dematerialized – the NCDEX warehouse receipts are negotiable instruments based on grade, not identity
[4] In the case of China, a second "rectification" by the government essentially restructured the exchange landscape by narrowing the number of exchanges down to three in 2000.
[5] Delivery points include warehouses at 13 locations in 8 states.
[6] Some futures contracts configure differentials based on transportation costs into delivery price settlements.

increased global wheat demand, particularly in the emerging Asian economies (except China), and reduced supplies, primarily in Australia, have contributed to a WW price surge. Like most fledgling contracts, initial volumes were light and built steadily each month. The contract experienced participation from diverse players; in addition to HAFED, major grain firms such as Louis Dreyfus Corporation, Cargill and domestic firms such as ITC along with small traders traded the wheat futures contract.

NCDEX launched the wheat contract at a favorable moment. As India has been liberalizing its economy and experiencing rising incomes, global wheat stocks have declined and wheat prices have become more volatile. The 2005-06 drought in Australia, an Indian wheat supplier, added to the price uncertainty. Furthermore, since India is the second largest wheat producer in the world[7] expecting a 74 million metric ton harvest this year, NCDEX was offering a much needed pricing mechanism for the nation, region and even the globe.



The above table shows the carry-out stocks of wheat for the last ten years. Wheat stocks have shrunken the most in India and China.[8] Source: International Grains Council

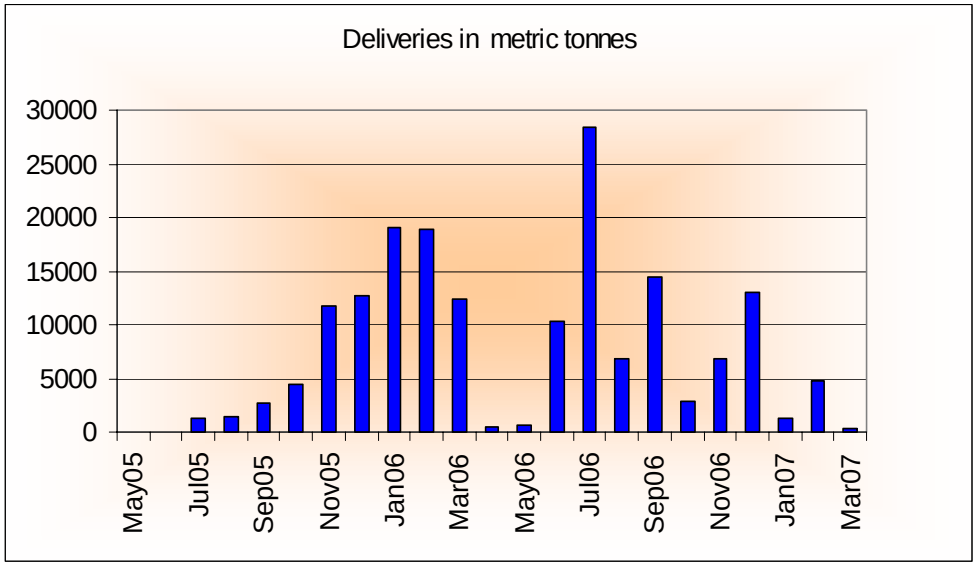
During a meeting with NCDEX, the Wheat Product Manager[9] described the effect of the government's ban on new wheat listings as equivalent to "a stadium clearing out." She listed several detrimental results from the action:

- Pall on overall market
- Contraction of open interest

[7] China is the number one producer at about 100 million metric tons.
[8] Chart source: International Grains Council
[9] Ms. Sanvali Kaushik, Vice President NCDEX

- Greater day trading and daily closeout of positions
- Reduced transparency
- Reversion to farmer reliance on state for direction
- Wider margins between farm and end-user prices

Furthermore, NCDEX believes that the Government intervention had undermined its own policy goals because it was using the futures price mechanism as a first line of defense against supply or demand shocks in Punjab and Haryana, which together produce 70% of India's wheat. Indeed, now that the government has announced potential imports or OTC options on imports of 2 million MT, it has no way of checking the tendered prices against the newly established white wheat benchmark.[10] Regarding the issue of manipulative activity, Ms. Kaushik replied that neither the exchange nor the FMC had detected any speculative long (with market pricing power) and that the long futures holders who stood for delivery were "scattered players."
In a reflection of how rationally the contract worked, the chart below shows the counter-cyclical occurrence of deliveries. During the March/April/May harvest time, when prices were lowest, deliveries were sparse due to the warehouses' desire to take advantage of the carrying charges in the market. Deliveries therefore took place when crops tended to attain their highest prices. HAFED employed this "buy low, sell high" strategy especially well in 2006, when it chose to place its short hedges in the December contracts making a tidy profit.



Source: NCDEX

Moreover, the following chart demonstrates how the contract was becoming integrated into the global wheat market. It shows the prices of various origin wheat delivered to India during the first week of April (shortly after the government announced it would import about 1.6 million metric tons) and the NCDEX wheat futures contracts[11] the day the ban was announced. All origin wheats are priced above the domestic Indian wheat price, with Russian wheat being the most competitive. Since the cost of moving the northern grown domestic wheat to the wheat-deficit South would be about $20-$30 per metric ton – the Indian prices reflect an

[10] On April 28, the FCI tendered for 800,000MT of wheat options. The response according to the *Economic Times* of India (May 2, 2007) was a "flop," as only two exporters submitted offers which involved designing both the strike prices and the option premia of the wheat delivered to India on a C&F basis.
[11] The Indian rupee/US dollar conversion rate used was 42.5 rupees per dollar.

equilibrium and/or discount price to the cheapest world wheat values. The sharp rise in Indian cash wheat prices after the ban[12] reflects the need for these prices to appreciate to attract additional supplies. During FMI's discussion with Professor Abhijit Sen, the head of the Committee charged with reviewing the wheat futures issue, Sen opined that the NCDEX contract was becoming a global mechanism.

(Prices as of) April 7, 2007	SRW (US)	ARG	FRENCH	RUSSIAN	NCDEX as of 2/7/07
	(in dollars per MT delivered C&F west coast Indian ports)				
MAR					225.00
APRIL	260.62	299.00	275.65	252.75	207.00
MAY	259.12	297.50	275.25	252.00	209.00
JUN	255.00	299.25	273.45	245.25	213.00
JUL	251.50	300.50	245.35	228.00	217.00
AUG	257.07	302.00	239.45	231.00	220.00
SEP	257.74	303.75	238.85	234.25	
OCT	264.72	303.75	240.25	239.25	
NOV	265.06	302.00	240.40	243.25	
DEC	267.15	302.50	242.05	248.25	

Source: Louis Dreyfus Commodities India Pvt Ltd

CBOT Soft Red Wheat (SRW)

The CBOT's wheat contract is the most heavily traded wheat futures[13] and has been used for decades as a global hedging mechanism. The contract is based upon soft red wheat, a variety used mostly in the manufacture of cookies, cakes and crackers, due to its low gluten content. SRW production is about 10 million metric tons in the US – about one-seventh of the WW production in India. The contract itself is based on 5000 bushels (136 MT) and is a warehouse receipt contract with delivery based in Toledo, Ohio.[14] Unlike the NCDEX contract, deliveries commence on the first day of the contract month and continue until the end of the month. Redelivery of the wheat is common and many spread traders take advantage of the long "roll" as the spot and deferred month narrow into the delivery month.[15]

Although the CBOT contract has worked as a hedge in the past, three major factors are diminishing its hedging utility: market structure, quality preference and basis risk.
Market structure in the CBOT wheat contract increasingly reflects the supply and demand in the Toledo delivery market rather than regional or global wheat conditions, as shown by the contract's tendency to trade at full carry from spot month to the deferred. For example, even though May is an end of crop year month and would normally trade a premium to the new crop month July, May 07 traded a full carry discount to July 07 ($.14) and saw heavy (7.7 million bushels) deliveries on first notice day. Toledo has 35 million bushels of wheat stocks, filling up most of the delivery market. This has caused the spot cash market to trade at a substantial discount ($.30 - $.40) to the spot futures[16] and has resulted in a perpetual contango in the market.

[12] Cash wheat prices rose in some areas between 20 and 40%.
[13] The Zhenzhou wheat contract in China has similar volume but the contract quantity is only 10 MT.
[14] Delivery can occur in Chicago and Burns Harbor Indiana, but is rare.
[15] Full carry from May to July on May 1 is about 14.5¢/bu and about 9.6¢/bu on May 20. Long spreaders (long May and short July) constantly "refresh" long dates in order to avoid delivery and capture the narrowing spread.
[16] The lack of convergence between the cash and futures is prompting the CBOT to examine and review the wheat contract design.

Regarding quality, soft red wheat cannot be used for bread making and as the world becomes richer, it is demanding better quality bread. In addition to the problems with karnal bunt – some levels of vomitoxin have been found in some SRW areas.

Finally, basis risk has surged with the explosion of bulk cargo freight rates. Since last year, many freight rates for handy and Panamax size vessels[17] have doubled. Recent charter activity shows rates US Gulf to India ranging from $55 to $70 metric ton, equivalent to about 25% of the commodity price. In an ironic reverse of globalization, the recent hikes in freight have made all commodity prices more responsive to regional or even domestic supply and demand imbalances than to global conditions. Viewed another way, regional imbalances half-a-world away are becoming increasingly remote in their price impact elsewhere.

Hedging – Plenty of Pitfalls

A futures transaction can best be described as a "proxy" transaction: much like a coin, a futures long or short is held until it can be exchanged for the real good. Although futures may be touted recently as the latest "investment" class, unlike equities, they involve no capital formation and, as serial instruments, must be "rolled" before expiry in order to be maintained. This maintenance, which involves offsetting the long or short in the spot month, and re-establishing it in a deferred month can be so costly that it negates the benefits of any hedging program. In addition, supply or demand shocks can cause a quantity mismatch for some hedging programs. Finally, the hedger's cash price and the futures price may be so divergent that the basis risk renders the hedge useless.

Rolling Forward - Backwardation vs. Contango

Futures contracts are configured into two arrangements – backwardation and contango. The former – first identified by the British economist John Maynard Keynes - displays a structure of spot market prices trading at a premium to the futures price and a downward stair-step pattern of future prices over a given time period. Contango is the opposite. Although Keynes observed nearly 80 years ago that backwardation was "normal," most regulators (and futures exchanges) beg to differ, since backwardation, although symptomatic of a fundamental supply shortage, can indicate a squeeze or potential corner of delivery market supplies. Since the CFTC's inception in 1974, both it and the US exchanges have worked together to constrain the trend toward backwardation, primarily through contract design. When the CFTC declared Toledo, Ohio an out-of-position delivery point for corn and soybeans in 1997 due to the steady shift of production and consumption to the Western United States, the CBOT reconfigured the two contracts into shipping certificate[18] instruments issued by barge loading stations along the Illinois River.

Today's futures markets commonly display contango configurations and most markets display both: grain markets, for example, typically exhibit contango – reflective of carrying charges - throughout most of the crop year and then revert to backwardation as supplies dwindle at crop year end. Calendar spread traders who arbitrage the old crop vs. new crop,

[17] Handy size vessels range from 25000MT – 35000mt, Panamax vessels range from 50000MT – 70000MT

[18] Shipping certificates, similar to promissary notes, are pledges to load out certain quantities of grain onto river barges within a designated time period based on the load-out capacity of the river terminal.

such as the July-December corn spread and the July-November soybean spread are keenly aware of their volatility, as the exposure in these spreads in some years exceeds that of the underlying flat price.

Backwardation (also called an inverted market) can be perilous to short hedgers. Indeed in 1995, during a US Midwestern drought, farmers sold hundreds of millions of bushels of corn on *hedge-to-arrive*[19] contracts which allowed them to "fix" their sales price to a referenced future, such as the July corn futures when the price reached a certain level, e.g., $3.00/bu. This strategy, however, caused farmers severe harm when the July futures soared to $5.00 - a $2.00/bu premium to the December contract. Since the farmers had contracted for fall delivery, they were forced to roll the July hedge forward buying in the July short hedge at $5.00 and selling the December at $3.00 – (the original price objective). This transaction incurred a $2.00/bu loss on the hedge.

Similarly, contango can strip money away from long hedgers that have to roll forward in markets characterized by steep carries. Indeed in the U.S., the CBOT wheat contract[20] causes concern among market players because, for months (some would say years), the cash price has traded at a steep discount to the futures and the futures prices reflect the full cost of carry, i.e., storage and interest. (For example, on April 26, May futures closed at $5.07 and July futures closed at $5.21 reflecting the full cost of carry at $.07/month.) This has caused much controversy among financial writers that have commented that such a steep contango prevents the now ubiquitous hedge funds from making any money in these commodities because the "roll forward," may end up costing 20% of the commodity price in a year. Whether hedger or speculator, choosing the right contract month is critical to the execution of a futures market strategy.

Quantity Mismatch

Hedges can also go wrong when producers hedge forward production and suffer a crop loss as in the following example.

> A farmer who normally grows 50,000 bushels of corn in the fall, hedges the crop in the preceding spring by selling 10 contracts (5000 bushels each) of December Corn futures at the CBOT for $3.00/bu. The transaction "locks in" $150,000 sales value.
>
> A nation-wide drought raises prices, slashes overall production and cuts the producer's harvest to 30,000 bu. December corn futures rise to $4.50 when the producer "buys in" the hedge. The sale and repurchase result in a $75,000 trading loss. The producer then sells 30,000 bushels of harvest to a local elevator for $4.30 for $129,000. Clearly the hedge in this case cost the producer dearly. The producer's net income totals $54,000 instead of $140,000 as anticipated (figuring the farm basis at -20 CZ).
>
> *Most farm advisors recommend that farmers use options to manage price risk because of the vagaries of production and the loss limit feature of options trading (options function similarly to insurance premiums –loss is limited to the purchase price). Worried*

[19] See http://www.cftc.gov/opa/speeches/opadial-55.htm

[20] The CBOT wheat contract is a warehouse receipt contract with a primary delivery point of Toledo Ohio and surrounding deliviery points of Maumee and Ottawa, Ohio. It has become a primary storage point for soft red wheat since the CBOT delisted it as a delivery point for corn and soybeans.

about a price decline, had the farmer bought 10 Dec Corn $3.00 put options (the right, but not the obligation, to go short at a specified price) for $.20/bu, the trading loss would have been limited to $10,000 [50,000 bu x $.20] and net income after the sale of the harvested maize would have been $119,000 [30,000bu x$4.30/bu =$129,000 -$10,000 = $119,000].

Basis Risk

The basis is the difference between the cash and futures price of a commodity. If the cash price is trading at a discount to the futures - then the basis is negative, if it is at a premium - then it is positive. Normally, for any domestic futures market, farm prices trade at a negative basis and export prices at a positive basis, reflecting the transportation costs to and from the delivery market.

On a global level, several factors impact basis levels including regional supply and demand, crop cycles, quality preferences, transportation costs (especially ocean freight) and intervention measures. The recent steep decline in the basis levels of Russian and Ukrainian wheat relative to US wheat is an example of a swing caused by shifting regional supplies. In the 1970's and 1980's, the Former Soviet Union was grain deficit and imported US wheat and corn at prices that equated to the CBOT respective futures market plus freight - equaling a positive basis of more than $1.00/bu or $37/MT . Because of the resurgence of wheat production in this former bread basket, the Russian wheat basis today is a discount to most other wheat origins and is the most competitive wheat delivered on a C&F basis to India.

Quality issues and preferences can have significant impacts on the basis. Because white wheat is a superior quality to soft red wheat and in high demand, it has experienced a noteworthy appreciation over the soft variety from an $18MT discount to a $55 MT premium.[21] The US soft red wheat crop has also suffered from another disadvantage – the USDA will not issue a phyto-sanitary certificate on wheat export shipments due to pockets of karnal bunt,[22] keeping the wheat at a discounted price.

Finally discretionary interventions into commodity markets can dramatically impact basis levels. Interventions such as embargoes or sudden tariffs and quotas cause large supply and demand shocks. When the Carter administration declared a US embargo on the Soviet Union in 1980, prices collapsed in the US markets (both cash basis levels and futures prices) and skyrocketed for grains delivered to Russian ports.

The above illustrates that hedgers need to know their markets before embarking on a risk mitigation program – (as do speculators in devising their money making strategy). Sometimes, abnormal configurations, such as heavily inverted old/new crop spreads have worked to other hedgers' advantage: Argentina and Brazil, which harvest corn and soybeans in the spring, often benefit from the counter-seasonal CBOT prices during the summer months; they can lock in short sales at high US prices while South American harvest pressure allows cheap cash purchases. The rise of Argentina and Brazil as agricultural giants and counter-seasonal hedging has helped smooth out the prices in the crop cycle. However, such an example is the exception to dealing with basis risk due to its unpredictability.

[21] This is the basis swing experienced in the Pacific Northwest white wheat growing areas but is also reflective of the global change.
[22] A wheat disease.

Conclusion

HAFED's use of the NCDEX wheat contract was a textbook case of a "cash long" using a short hedge to guard against losses and lock in an attractive post-harvest price. HAFED successfully used the NCDEX wheat contract because its wheat purchases met the quality and quantity specs of the futures contract, it owned accredited warehouses at which it could make delivery, and wheat prices were trading above the MSP. Also, HAFED stuck to the books in designing its hedging strategy: it bought wheat and hedged it in the contract yielding the highest price. Finally, HAFED was hoping to leverage the advantages of the NCDEX futures contract by distributing its gains to farmers. These gains involved more than just profits; they included educational, technological and societal advancements that would enrich the agricultural community of Haryana.

Given HAFED's prudent hedging strategy and the close fit and price correlation between the NCDEX wheat futures and wheat trading in India, this report does not recommend that HAFED use another global hedging mechanism, particularly the CBOT SRW contract, to manage local wheat volatility. Although the CBOT contract might at times correlate well with white wheat, its basis swing this past year of $70/mt move (from a discount to a premium), demonstrates how risky basis levels have become.[23] There are potentially some neighboring risk management centers – Ukraine and Australia – which could serve as hedging mechanisms in the future, but these could never replicate the NCDEX mechanism in reaching HAFED's goal as an aggregator, partner to producer and quality assurance provider. In addition, as most national exchanges tend to target domestic clients, they may not allow foreign participation in these centers.

Hedging can be risky. When there exists a disconnect between two hedging instruments in terms of quality, quantity, delivery positioning, regional supply and demand fundamentals, and cash and carry structures, then hedging can be outright dangerous.

Rather than instruct HAFED to find an alternative hedging mechanism, this report recommends that the HAFED success story serve as a model for other state cooperatives involved in agricultural merchandising throughout India. Indeed, other entities such as AP MARKFED (Hyderabad) and the Gujarat State Co-op Marketing Federation (Ahmedabad) have expressed keen interest in understanding and replicating HAFED's achievement in hedging and are eager to acquire the skills for creating risk mitigation programs in maize, chilli, cotton, castorseed, mustard seed, and groundnut (peanut) oil, as first products. Since each product has specific qualities and challenges in purchasing, storing, processing, etc., these cooperatives, as well as many others, could benefit from comprehensive training on the design and implementation of hedging programs.

Finally, the report strongly recommends continued efforts at persuading the GOI to embrace the NCDEX wheat contract for India. Because of the global shifting of wheat production and consumption, India has become a central pricing center for wheat, drawing supplies from the Black Sea region, Western Asia, Australia, Canada, Argentina and France. The GOI should view the NCDEX white wheat benchmark as a remarkable achievement – one that will enable India to seize its future as an agricultural superpower.

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[23] Recently (since April) the pendulum appears to be swinging the other way as SRW prices have rallied sharply.