INTERNATIONAL FOOD
POLICY RESEARCH INSTITUTE
sustainable solutions for ending hunger and poverty

Supported by the CGIAR

Modern Open-Source Intermediaries in Agricultural Markets in India

Work order # 4

Bill & Melinda Gates Foundation

June 30th, 2008

New Delhi Office

Contact persons:

Ashok Gulati, a.gulati@cgiar.org

Bart Minten, b.minten@cgiar.org

This report has been prepared and coordinated by Ashok Gulati, director in Asia, and by Bart Minten, Senior Research Fellow, both from the International Food Policy Research Institute, as well as by Professor Thomas Reardon of Michigan State University (MSU), co-director of the joint IFPRI/MSU program on “Markets in Asia”.
They were joined by Prof. Gopal Naik of IIM-Bangalore, for the analysis on the future exchanges in India (Chapter 2), Kanupryia Gupta, of the University of Delhi, for the analysis of the rural business hubs (Chapter 4) and Honglin Wang, of Michigan State University, for the analysis of the situation in China (Annex 1).

Table of Contents

Acknowledgements

This report would not have been possible without the generous time that several people accorded to us. While it is difficult to name them all, we would like to acknowledge especially the insights and the collaboration of:

- NCDEX: Mr. P.H. Ravikumar, Mr. Sanjay Kaul, Mr. Madan Sabnavis, Mr. Gautam Mukherjee, and Mr. Karati
- MCX: Mr. V. Shunmugam, Mr. Danish Hashim and Mr. Anjani Sinha
- National Collateral Management Services: Mr. Yuvraj Manish
- Member of parliament: Mr. Suresh Prabhu
- Indian Institute of Foreign Trade: Mr. Sudhir Kapur
- University of Delhi: Mr. Jatinder Bir Singh
- National Center for Agricultural Economics and Policy Research: Mr. Ramesh Chand
- SNX: Mr. Ravishankar, Mr. Chandrasekhar and Mr. Nair
- Safal Market: Mr. Azad Singh, Mr. Ajay Kumar and Mr. Pravin Jain
- Government of Karnataka: Mr. Nagaraja and his team
- Hariyali kisaan bazaar: Mr. Ajay Shriram, Mr. Vikram Shriram, Mr. Rajiv Sinha, Mr. Rahesh Gupta, and Mr. Arjun Uppal
- ITC: Mr. Shiv Kumar and Mr. Srinivasa Rao
- Aadhaar Retailing: Mr. Arvind Chaudhary and K Raman
- Reliance: Mr. Sanjeev Asthana and his team
- Mahindra and Mahindra: Mr. Vishu Garg and Mr. Vikram Puri
- Acme: Mr. Kevin Parker
- Cii: Mr. Jawaharlal K.
- Ministry of food processing: Mr Suvrathan and Mr. S.S.Chaval
- Sangha Seeds: Mr. Jang Bahadur Sing Sangha
- Asian Development Bank: Ms. Marzia Mongiorgi
- University of Beijing: Mr. Guansan Yang
- COFCO: Mr. Hui Huang, Mr. Long You, and Ms. Ying Su
- JICFO: Mr. Xu Chen
- DCE: Mr Jun Li, Mr. Weijun Wang, and Mr. Jing Pang
- As well as all the farmers that we visited and whom we had free discussions and interactions with in UP, MP, Haryana, Karnataka and China during our field visits.

Introduction

Smallholders in India, especially growers of fruits and vegetables, often realize only a small part of the final price paid by the consumer. Lack of access to formal sources of credit and market information along with poor storage and other physical infrastructure leave farmers little option beyond having to rely on value chains characterized by a large number of intermediaries. These intermediaries in turn end up capturing a disproportionate share of the value. In a promising development, India is currently experimenting with different models of modern and more efficient "open-source" intermediaries that can link a large number of smallholders to a market with many buyers.

This report studies the experience with these modern open-source intermediaries in India, explores the conditions for success and the drawbacks and limitations in their current functioning, and the potential of scaling up. The modern open-source intermediaries that are looked at are the commodity future exchange, the modern spot exchange and the rural business hubs. Well-functioning modern open-source intermediaries are important as they might reduce marketing margins and make trade more efficient and as they can be an alternative to market interventions such as price stabilization policies and may improve revenue and expenditure forecasting through a predictable and reduced subsidy bill of the government and might thus have significant impact on the poor.

First, we will look at the commodity future exchange. These exchanges trade futures contracts on commodities, such as trading contracts to receive something, for example rice, in a certain month. A rice farmer can sell a future contract on his product, which will not be harvested for several months, and guarantee the price that he or she will be paid upon delivery. A rice miller can then buy up the contract and guarantees that the price will not go up when it is delivered. In a broad sense, a commodity exchange is defined as an organized market place where trade, with or without the physical commodities, is funneled through a single mechanism, allowing for maximum effective competition among buyers and among sellers.

This type of commodity exchange protects the farmer from price drops and the buyer from price rises. Such a system is much more cost effective and market friendly than the commodity corporations (such as the Food Corporation of India) that governments often float to stabilize prices. The benefits of better price discovery for farmers would show up in production decisions such as crop choice, input use, and timing of harvest as well as in marketing decisions, such as storage and price negotiations. Commodity exchanges might also facilitate the development of aggregators and achieve better economies of scale through the increase of certified delivery centers and the elimination of margins once the delivery is made, potentially benefiting farmers as well as consumers. As commodity exchanges were only recently started up in India, we evaluated their performance based on different criteria, from their start-up until now.

Second, we look at some innovative spot exchange models that are currently emerging as an alternative to seemingly malfunctioning traditional agricultural markets. One of the unique characteristics of the modern spot markets is that they aim to separate out the different processes of physical handling, quality and quantity assessments, and financial settlements while these are all combined in a single spot transaction in traditional markets. We use case studies from the Bangalore area in the state of Karnataka as some of these modern models are currently being tried out there. This is not by accident as the state of Karnataka has the most progressive marketing legislation where regulators allow, among others, for the set-up of private wholesale markets as well as electronic auctions.

More in particular, we compare two models of emerging modern spot exchanges with the traditional system. Both of these models are characterized by allowing a large number of buyers and sellers to participate in modern transparent auctions. The first modern open-source exchange is an on-line virtual wholesale market (without any wholesale facilities), where after the on-line transaction has taken place, produce is shipped directly from the house of the seller to the place of the buyer. The second modern open-source exchange is an electronic auction system, which is linked to a physical wholesale market and modern wholesale facilities, where the produce is centralized for the transaction.

Third, the Rural Business Hubs (RBHs) are in general terms platforms all under "one roof" managed by a private company, with various services and products retailed or wholesaled to farm and rural households (output procurement, input wholesale, provision of extension and finance, and retail of consumables, as well as sometimes farmer and rural youth training, insurance, and health services). The RBHs address the services dearth in such a way that a rural hub or cluster of services are created that facilitate linkages over the supply chain, from farmer to wholesaler and processor, and on to processor, retailer, or exporter.

The RBH concept appears to be an appealing and feasible way to facilitate these linkages and address the services vacuum. They have the potential to increase access that small farmers, including women and rural laborers, have to more and better products and services than they can access in the traditional sector, and with lower transaction costs given the "one-stop shop" and the hub-and-spoke rural dispersal of the RHBs. They also have the potential to bring modern-sector expertise and competition into the local areas, helping to stir up innovation and upgrading in the traditional sector.

To date, there has been no systematic study of these three modern open-source intermediaries and this report aims to fill this gap. Given that we lacked the resources and the time to collect primary data to exactly and quantitatively evaluate the impact of modern open-source intermediaries on smallholders, this analysis is mostly based on qualitative observations, focus interviews, and case studies. In the different sections, we point out the problems with this approach and we plan to do more quantitative and econometric analysis based on primary data in the future. Largely descriptive, this report can thus only be considered as a first step in a better understanding of the impact of modern open-source intermediaries on the poor.

The structure of the report is as follows. In Chapter 1, we look at the international experience with respect to the modern open-source intermediaries. In Chapter 2, we discuss the experience of the future exchange, based on analysis of prices of products traded on the exchange as well as a on primary survey with farmers, processors and traders. In Chapter 3, we study the two modern spot exchanges, i.e. the online wholesale market and the electronic auction/wholesale market. Chapter 4 discusses the functioning and the impact of the rural business hubs. We finish with Chapter 5 where we evaluate the impact of the three modern open-source intermediaries on smallholders. We then discuss potential ways forward for these modern open-source intermediaries.

Chapter I

Review of international experiences

1. Introduction

In this chapter, we give an overview of the international experiences with respect to modern open-source intermediaries. The discussion is mostly focused on commodity exchanges given the relative dearth of international literature on the other modern open-source intermediaries that we look at in this report. We will therefore refer to the international literature on modern spot markets and rural business hubs in the respective chapters that treat these subjects.

It is important to note that agricultural commodity exchanges do not spring up automatically and that a number of preconditions have to be fulfilled before they can be used as an effective and successful instrument in agricultural marketing (Rashid et al., 2007; Shim, 2006). This has been shown in numerous settings. For example, while donors have supported the establishment of a number of commodity exchanges in different countries, there have however only been a small number of sustainable successes (Rashid et al., 2007; Carlton, 1984; Morgan, 2001; Brorsen and Fofana, 2001). In this chapter, we briefly review and bring together the international evidence to date on agricultural commodity exchanges. We compile the relevant literature and extract some lessons learnt. We do so with a special emphasis on developing countries and more in particular Asia.

The structure of the chapter is as follows. First, we give an overview of the commodity exchanges in the world and in Asia. In a second chapter, we discuss the benefits of commodity exchanges in theory and then look at practical experiences. In a third chapter, we evaluate the needed conditions for success. Then, we look at commodity exchanges and how they might affect smallholders and development. We finish with a case study of

China. We include this case study as it might be particularly relevant for India given that the Chinese agricultural economy is mostly driven by smallholders, as is the case in India.

2. Overview commodity exchanges

2.1. Commodity exchanges worldwide

The global trade in futures and option contracts is rapidly increasing each year. 15 billion futures and options contracts were traded in 2007 (Burghardt, 2008). Growth rates have steadily increased between 2004 and 2007 from about 5% in 2004 to 28% in 2007. Equity futures and options are the most powerful drivers for this growth. The share of commodities in this global trade has stayed rather stable and has hovered between 9.5% in 2001, to 8.1% in 2003, to 9.2% in 2007 (Burghardt, 2008). It is estimated that 1.4 billion commodity contracts were traded in 2007 on the 54 most important exchanges worldwide.

A disaggregated analysis shows how the agricultural sector is a major contributor to the growth in commodity contacts. 645 million contracts in agricultural commodities were traded worldwide in 2007 (Figure 1). This compares to 496 million in the case of energy and 256 million for metal products. The number of agricultural contracts traded grew by 32% between 2006 and 2007, equal to the average annual growth rate between 2001 and 2007. It is interesting to note that agricultural contracts grew much faster than the number of contracts in energy or in metals, the other commodities traded. The share of agricultural contracts in total commodity trade has thus increased over time, i.e. from 33% to 46% between 2001 and 2007 at the global level.

While the share of agriculture in the global futures and options volume only counts for about 3%, this used to be significantly higher in the early years of futures market operations. The number of agricultural contracts traded in 1960 was only about 3 million (compared to 645 million in 2007) but its share in all futures and options contracts was about 78%.[1] The share of agricultural contracts has quickly come down since the introduction of the futures contracts on financial assets in the 1970s (Shim, 2006).

Figure 1: Sectoral growth in the number of futures and option contracts traded, 2001-2007

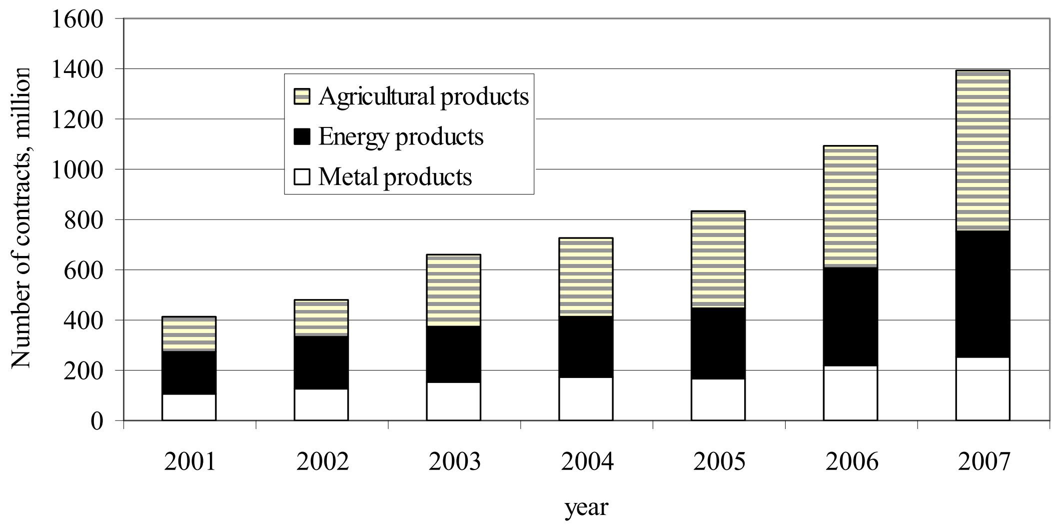


Table 1 gives an overview of the top 20 agricultural futures and options worldwide, ranked by the number of contracts traded in 2007.[2] Several trends emerge. First, the numbers of products that are most successfully traded on commodity exchanges are limited. For example, soyabean, soya oil and soy meal futures make up 8 out of the 20 top contracts and there are only seven different products in the top 20 (soya bean, corn, rubber, sugar, wheat, meat, pepper). Second, there is high concentration. The US (especially the Chicago Mercantile Exchange (CME)) and China (especially the Dalian Commodity Exchange (DCE)) count jointly for three quarters of the most successful contracts. Third, there has been significant growth in the trade of these commodities in the last year (potentially linked with the downturn of returns to financial assets). For example, the most important

[1] The establishment of modern futures markets in the US traces back to 1865 when the Chicago Board of Trade (CBOT) began trading grain futures.

[2] While DCE ranks number 1 in corn futures exchanges in terms of number of contract traded, this is not the case anymore when volume of trader is taken into account as each corn contract in DCE is only 10 tons while each corn contract in CME is 5,000 bushel (approx. 127 metric tons). In volume terms, the CME is thus much more important than the DCE. A similar reasoning applies to other commodity such as soybean.

contract, the soya meal futures on the Dalian Commodity Exchange, more than doubled in numbers traded in one year.

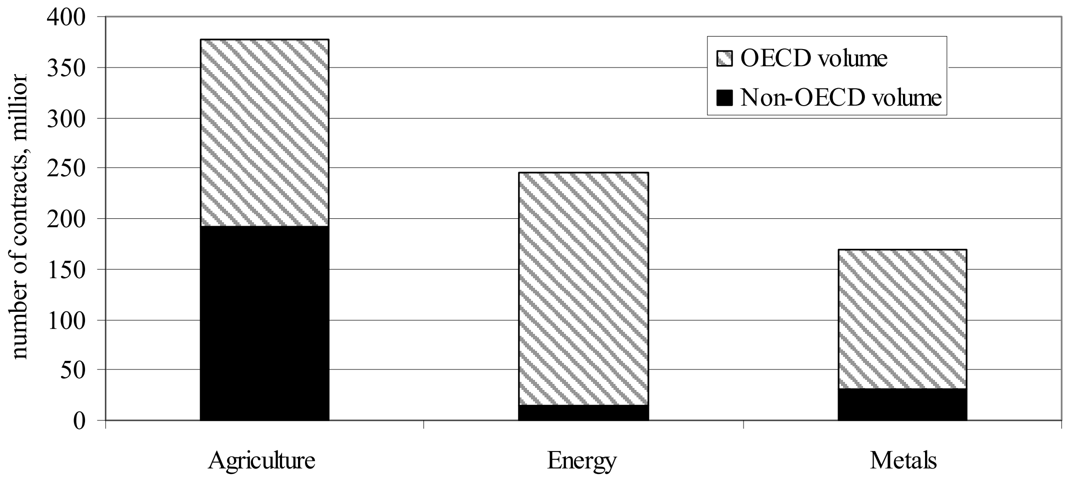
Table 1: Top 20 Agricultural Futures and Options Worldwide
Ranked by Number of Contracts Traded in 2007

Rank	Contract	2007	2006	% Change
1	Soy Meal Futures, DCE	64,719,466	31,549,669	105.14%
2	Corn Futures, DCE	59,436,742	67,645,036	-12.13%
3	Conn Futures, CME	54,520,152	47,238,893	15.41%
4	No 1. Soybean Futures , DCE	47,432,721	8,897,061	433.13%
5	White Sugar Futures, ZCE	45,468,481	29,342,066	54.96%
6	Rubber Futures, ZCE	42,191,727	26,047,061	61.98%
7	Strong Gluten Wheat Futures, ZCE	38,982,788	14,676,238	165.62%
8	Soybean Futures, CME	31,726,316	22,647,784	40.09%
9	Sugar # 11 Futures, ICE Futures U.S.	21,263,799	15,100,721	40.81%
10	Wheat Futures, CME	19,582,706	16,224,871	20.70%
11	Corn Futures, CME	14,691,277	11,317,388	29.81%
12	Soy Oil Futures, DCE	13,283,866	10,333,006	28.65%
13	Soybean Oil Futures, CME	13,170,914	9,488,524	38.81%
14	Non-GMO Soybean Futures, TGE	12,280,932	9,885,557	24.23%
15	Soybean Meal Futures, CME	12,213,315	9,350,043	30.62%
16	Live Cattle Futures, Cme	8,587,973	8,209,698	4.61%
17	Soybean Options on Futures, CME	8,215,582	6,042,797	35.96%
18	Pepper Futures, NCDEX	7,488,534	4,535,589	65.11%
19	Lean Hog Futures, CME	7,264,832	6,481,001	12.09%
20	Rubber Futures, Tocom	7,062,252	9,661,388	-26.90%

Source: FIA Data

Another important trend is the emergence of commodity exchanges in developing countries. Measured by contract volumes, nine of the world's twenty-two major commodity exchanges are now located in the developing world (Unctad, 2007). Interestingly, it is in agriculture that non-OECD countries have the biggest influence. It was estimated that in 2005, non-OECD countries were making up for more than 50% of the volume of trade (Figure 2). It is significantly less in the other sectors, accounting for only 6% in the energy sector and 18% for the metal products. Given the higher growth in the non-OECD countries, their importance is increasing very rapidly. Unctad (2007) estimates that the commodity exchanges in developing countries have experienced a rate of volume growth double to that of their more established counterparts situated in OECD countries.

Figure 2: OECD/Non-OECD volume by sector



source: Unctad, 2007

2.2. Commodity exchanges in Asia

There is a strong and growing Asian presence in the commodity exchanges worldwide. Eight of the world's top fifteen commodity future exchanges are located in Asia (Unctad, 2007). In commodity derivatives, it is estimated that the importance of the Asian markets accounted for 44% of the total in 2005 (Unctad, 2007). Table 2 gives an overview of the 8 biggest commodity exchanges in Asia. These 8 commodity exchanges are located in three countries: China, India and Japan. The three biggest exchanges are in China and they all have shown very high growth rates between 2006 and 2007, ranging between 47% growth for the Shanghai Futures Exchange to 54% growth for the Dalian Commodity Exchange. The Multi-Commodity Exchange of India (MCX) and the National Commodity and Derivative Exchange (NCDEX) in India are respectively the fourth and the sixth biggest exchange in Asia. NCDEX has shown negative growth between 2006 and 2007 as its activities are mostly focused on agricultural commodities and it suffered a loss after the banning in India of future trade in wheat, rice, urad and tur in the beginning of 2007. Two out of the three commodity exchanges in Japan had negative growth rates in 2007 while the third one (Tokyo Grain Exchange) showed only slightly positive growth (2.8%).

Table 2: Major commodity exchanges in Asia
(ranked by 2007 futures and options volume)

Rank	Commodity exchange	Country	2007	2006	% change
1	Dalian Commodity Exchange	China	185614913	120349998	54.23%
2	Zhengzhou Commodity Exchange	China	93052714	46298117	100.99%
3	Shanghai Futures Exchange	China	85563833	58106001	47.25%
4	Multi Commodity Exchange of India	India	68945925	45635538	51.08%
5	Tokyo Commodity Exchange	Japan	47070169	63686701	-26.09%
6	National Commodity & Derivative Exchange	India	34947872	53266249	-34.39%
7	Tokyo Grain Exchange	Japan	19674883	19144010	2.77%
8	Central Japan Commodity Exchange	Japan	6549417	9635688	-32.03%

Source: FIA data, 2008

3. Benefits of commodity exchanges: Theory and practical experience

3.1. The set-up of commodity exchanges

“Commodity exchanges” or “future exchanges” usually trade futures contracts on commodities, such as trading contracts to receive something, for example rice, in a certain month. A rice farmer can sell a future contract on his product, which will not be harvested for several months, and guarantee the price that he or she will be paid upon delivery. A rice miller can then buy up the contract and guarantees that the price will not increase when it is delivered. These types of futures contracts are traded on the commodity exchange by speculators as well as hedgers. Williams (2001) maintains that commodity exchanges should better be called “contract exchanges” as the trading activity on these exchanges deals with contracts that change between different agents on the commodity exchange.

In a broad sense, a commodity exchange is defined as an organized market place where trade, with or without the physical commodities, is funneled through a single mechanism, allowing for maximum effective competition among buyers and among sellers (Gabre-

Madhin and Goggin, 2005). The difference between a commodity exchange and a typical wholesale and terminal market is that an exchange creates a mechanism for price discovery to occur in an organized manner, through a system of price bidding and through a set of rules governing the products brought to the market, the market actors and the contracts between buyers and sellers (Gabre-Madhin and Goggin, 2005).

Futures exchanges can serve a number of functions. First, they constitute a major price discovery mechanism. Futures markets are still considered to provide one of the best forecasts of market prices because they embody the collective judgment of all traders and all the information that is currently available (Tomek and Robinson, 1991). These prices are discovered at a low cost through a highly efficient and transparent mechanism. This is a major benefit of futures exchanges as better price discovery will lead to better resource allocations.

Numerous studies in several settings suggest that futures markets appear to assimilate information effectively but short-term aberrations do exist (Garcia and Neuhold, 2004). However, future exchanges might not be perfect for several reasons (Tomek and Robinson, 1991): First, it is possible that ill-informed traders dominate price formation; Second, futures markets have often limits on the daily movements and prices might thus not be able to integrate all information immediately; Third, any market, and thus also a future market, is potentially subject to price manipulations and there is therefore a need for public regulation.

Second, futures markets provide a mechanism for producers and consumers to eliminate the risk of adverse price movements through hedging. The futures markets allow for a mechanism that would protect the farmer from price drops and the buyer from price rises. To use commodity exchanges effectively for hedging, a close relationship between futures and cash markets is required. For those that are hedging, an understanding of the basis, the difference between the future price and the cash price, is essential. The size of inventories and decisions to acquire or dispose of stored commodities are closely related to the basis

(Tomek and Robinson, 1991). Futures markets facilitate storage decisions by providing reliable estimates when storage decisions are made on the return to storage. This will then lead to an improved allocation of commodity stocks over time.

As traders are better informed to predict returns to storage, they are able to make better storage decisions which will presumably reduce the volatility in agricultural markets (Morgan, 2001). Empirical research on before and after comparisons, especially in the US where long price series are available, has shown that the introduction of futures markets generally leads to less volatility in agricultural prices between seasons but also monthly and weekly prices are shown to be more stable, potentially indicating more rational storage decisions (Tomek and Gray, 1970; Santos, 2002). While these analyses often do not imply causality as other marketing changes might have happened at the same time, there seems however to be consistent evidence from the literature that commodity exchanges are not associated with increased volatility.

Since the start of liberalization and structural adjustment in agricultural markets in developing countries, the role of commodity exchanges has received significant new attention as an important tool for spreading risks and for hedging (Larson et al., 2004). Price volatility is sometimes considered the most pressing issue facing producers of primary commodities in these countries (Morgan, 2001). This is especially important in those countries that might rely only a few commodities for most of their export earnings. Some authors have even gone as far as comparing the impact of futures markets with that of buffer stock schemes (Morgan, 2001).

Third, commodity markets also offer a possibility to speculate and to potentially benefit from changes in prices. While speculation on commodity prices is often badly viewed, speculators are however an essential part of commodity exchanges as they provide the necessary liquidity for the commodity exchanges to function well. Achieving liquidity for a successful future contract requires the balanced interests between both hedgers and speculators (Shim, 2006). Evidence generally indicates that speculation is beneficial for exchanges and its users as speculation triggers faster adjustment to new information (Rutten, 2007).

The general benefits of better price discovery for farmers would show up in production decisions such as crop choice, input use, and timing of harvest as well as in marketing decisions, such as storage and price negotiations. Commodity exchanges might also facilitate the development of aggregators and achieve better economies of scale through the increase of certified delivery centers and the elimination of margins once the delivery is made, potentially benefiting farmers as well as consumers.

Some of the benefits of commodity exchanges are discussed above. There are however also costs associated with establishing commodity exchanges. The costs relate to the setting up of the system, physically and virtually, and to assure adequate oversight. A major cost is also the launch of new contracts. When launching new contracts, significant investments have to be done by commodity exchanges in identifying user interests, design contract specifications, advertising, and marketing of the contract. On top of this, commodity exchanges and related brokers and banks must be willing to invest money in the initial period of trade as to ensure enough liquidity in the market. As we will show later, some of these costs are futile as the majority of the contracts fail. These contribute to the costs of the commodity exchange. On the revenue side and once contracts have gained momentum, commodity exchanges commonly make money through membership and transaction fees.

3.2. Conditions for success of commodity exchanges

Rashid et al. (2007) give an excellent overview of the different conditions that are necessary as to achieve success in agricultural commodity exchanges. Shim (2006) elaborates on the determinants of success in particular in developing countries. Success of commodity exchanges is globally found to depend on three preconditions related to commodity attributes, contract characteristics and the physical and policy infrastructure (Rashid et al., 2007). They will be discussed consecutively.

(a) Commodity attributes

While it is difficult to predict if specific commodities will succeed on the commodity exchange, there are however general determinants that can explain if a commodity is more likely to succeed than others (Rashid et al., 2007; Shim, 2006). Five attributes have been identified. They include (Rashid et al., 2007): continuously produced or storable commodities, required homogeneity of the product within a system of grades and standards, a large and active spot market, volatility on the spot market, and an appropriate market structure.

First, storability is often cited as an important determinant for success in commodity exchanges as most of the products that were initially traded on commodity exchanges were in this category. While the large majority of the products that are traded on these exchanges are still storable, some inroads have however been made for some perishables in some countries. These include for example pork bellies and orange juice concentrate in the US.

Second, to be successful, products have to be homogenous with respect to grades, quality, and standards. All product attributes have to be described in the contract and penalties are usually built in when the products that are delivered do not meet these standards. If quality standards for a specific product are not commonly used in a country, these objective standards will have to be developed as to make contracts successful. This is sometimes a challenge in some developing country settings.

Third, a large underlying spot market is important for four reasons (Rashid et al., 2007; Brorsen and Fofana, 2001). Large spot markets have the advantage: 1/ that there are more participants in the market and there is thus a higher likelihood that some of them would participate in the commodity exchange; 2/ that these participants allow the exchange to reduce its costs because of the economies of scale and make the trading in the contract then also more attractive; 3/ that there is a lower likelihood of collusion and market manipulation; and 4/ that better information is available to design relevant contracts.

Fourth, an important basic requirement for a commodity exchange contract to be successful is the presence of high price volatility in the spot market. This implies that commodities where the government is involved in price settings or in procurement (such as for some commodities in India), commodity exchanges will not function very well. Commodity exchanges are thus largely irrelevant in non-liberalized agricultural economies. This is still often the case in a lot of grain-based Asian economies.

Finally, Sim (2006) and Brorsen and Fofana (2001) argue that commodities that are characterized by market structures where a large number of buyers and/or sellers are missing, such as in the case of buyer concentration or of a high level of vertical integration, will less likely succeed as the more industries are integrated, the less need and incentive there exists to hedge.

(b) Contract conditions

Even when the pre-conditions for right commodity attributes are fulfilled, this still does not mean that these contracts will take off for sure. It is estimated in the US that only one quarter to one third of the contracts that were launched, actually succeeded (Garcia and Leuthold, 2004). Other people report that a rule of thumb in the industry is a success rate of one out of every ten attempts (Shim, 2006; Rutten, 2007). Rashid et al. (2007) emphasize two important preconditions for contracts to be successful: the contract should attract participants and contracts must prevent manipulations and balance interest.

Black (1986) identified three important characteristics for contracts to attract participants. First, there should be a close relationship of contract terms with the cash market trade. If there is not a close analogue of the future contract in the cash market, the contract will lose value for hedging. Second, contracts should have a small basis risk implying that costs related to transportation, storage and interest rates should be predictable. Third, an appropriate contract size is needed as to match the sizes that traders usually deal with in the cash market.

Contracts must be written in such a way that it does not favor sellers or buyers. If either one of them would feel that the terms of the contract were unbalanced, they would not be attracted to the contract, the number of participants on one side might not be sufficient and the contract would fail. Experience has shown that to mitigate squeezes in times of short supply, contracts should best allow for a range of qualities with premiums and discounts compared to the agreed upon price (Rashid et al., 2007). The more stringent specifications are in a contract, the less attractive a contract would be for hedgers who use the market for physical delivery. However, if specifications are too loose, the delivered product would not meet expectations of the buyer and there would thus be less interest by accepting parties.

Shim (2006) stresses the importance to have a clear distinctive edge with already existing contracts. As exchanges increasingly compete globally or locally with other domestic exchanges, an important characteristic for a contract to succeed is that it is sufficiently different from other existing contracts. If there is not enough difference with other contracts, the contract might have difficulty in attracting enough liquidity away from other more mature contracts (Shim, 2006).

(c) Market environment and public policy conditions

All the commodity exchanges in the world are private entities - except for China - but some enabling conditions in the public domain are necessary as to allow these commodity exchanges to flourish. These include physical infrastructure, an appropriate legal and regulatory capacity, a viable commercial and financial sector, and macro-economic stability.

First, three types of physical infrastructure are necessary to allow commodity exchanges to function well. They include a communication network, transportation infrastructure and storage facilities. Good communications facilities are needed for the traders as to be able to provide them with the needed information on the spot market. Transportation infrastructure must be available as to allow for predictable evaluation of transportation costs between locations. Storage infrastructure with facilities that allow the products to be stored in appropriate conditions is needed as to assure credible delivery of the goods at specific locations and specific times. This infrastructure must allow spot markets to give the right signals on quality, form, and price of specific products. If this information is not available, price discovery in the spot markets will be erratic and price risk will not be manageable in a futures exchange (Rashid et al., 2007).

Second, commodity exchanges must be supported by an appropriate legal infrastructure to support a reliable and credible system of grades and standards and contract enforcement (Rashid et al., 2007). To develop such a system, grades and standards that are commonly used in local trade and that are meaningful have to be objectively defined in the contract. Certification agencies are sometimes involved as to define these grades and standards objectively and to allow credible contract enforcement. Contracts have to be recognized by the legal system and an enforcement system has to be in place that will ensure that contract obligations are met.

An institution that is often needed is also a credible and working system of insurance (Rashid et al., 2007). If the costs for insurance against natural calamities or other risks are too high, then trade in futures may be too costly and unattractive. As exchanges compete increasingly at the global level, the particular regulation and legal structures in specific countries is crucial for an exchange to be able to compete.

While regulations are important, a common threat in countries (especially some developing countries) is government interference in the commodity exchanges. Governments actually sometimes shut down commodity exchanges as they are blamed for ills that they are usually not responsible for. This included, for example, the banning of the trading of wheat, rice, urad and tur in India after a rise in prices in January 2007 as well as the banning of potato, chana, refined soyoil and rubber for four months in May 2008 in an effort to control inflation. In the US, onions were banned from future trading in the late 1950s. In Indonesia, a commodity exchange was launched in 1999 but was suspended due to contract specific problems. On the other hand, the importance of appropriate legislation was shown in China where the government had to interfere to stop malpractices in the 1990s.

Third, a large financial sector is required. For an exchange to function well, a sufficient number of hedgers and speculators is needed. These need sufficient financial capacity to support credible trade. An exchange must also have access to a clearing house with sufficient capital to guarantee all transactions (Rashid et al., 2007). In the absence of a developed financial sector, there might not be enough capacity to support the establishment of a credible clearinghouse and to assure a large enough number of credible traders.

Fourth, macro-economic stability is an important precondition for success (Shim, 2006). Commodity exchanges are a mean to hedge against price risks. However, in situations where other types of risks might be prevalent, such as high and unstable inflation, political instability, etc., future contracts on commodity exchanges will lose their attractiveness and few agents would be willing to participate.

4. Commodity exchanges, development and smallholders: The evidence so far

International evidence suggests that smallholders in developing countries do not often have access to commodity futures markets directly. These smallholders lack know-how, do not have the collateral for margins, cannot easily monitor prices and execute transactions (Larson et al., 1998). Even the larger producers often trade rarely directly on the commodity exchange themselves. Surveys in the mature markets of the US commonly indicate that only between 5 and 10% of the farmers trade themselves directly on the commodity exchange (Rashid et al., 2007). However, US producers might indirectly benefit of the trade on commodity exchanges as local aggregators might offer pricing schemes to the farmers that include futures contracts on the commodity exchange.

Commodity exchanges have been successfully started up in a variety of emerging countries ranging from poorly to well-developed market situations. In most developing countries where commodity exchanges are functional, mechanisms for direct participation of the smallholders are currently not in place yet and more support is needed as to allow direct access. In some cases, producer organizations might play this role and allow them this access. On the other hand, there are mechanisms that have been put in place by the commodity exchanges in developing countries that allow the smallholders to gain *indirectly* from the activities by commodity exchanges (Unctad, 2007).

In their cross-country comparison, Unctad (2007) finds that commodity exchanges have the largest impact in these countries where it has been allowed the biggest scope to do so. They find that commodity exchanges in developing countries have had a significant influence on activities that are outside the normal scope of commodity exchanges, i.e. price discovery and risk mitigation. These impacts include facilitation of physical commodity trade, facilitation of financing, and market development. Activities in these areas have been developed by commodity exchanges especially in these countries that have problematic cash markets. The different benefits that commodity exchanges might entail are discussed in detail below.[3]

4.1. Price discovery

In a review of commodity exchanges in major emerging economies, Gross and Santana-Boado (2008) and Unctad (2007) find that most of the commodity exchanges fulfill their core functions of price discovery. To fulfill this role, two conditions have to hold. First, commodity exchanges have to reflect the prices that reflect supply and demand

[3] This synthesis relies heavily on a cross-country study that was recently conducted by Unctad (2007).

fundamentals. It is an important question if the prices generated on the commodity exchange reflect accurately market conditions. It is generally accepted wisdom that when volumes are large enough, futures markets usually incorporate most information efficiently and are thus good indicators (Garcia and Leuthold, 2004). Second, futures prices have to be disseminated widely as to fulfill their price discovery role. Most of the commodity exchanges in emerging economies do make significant efforts as to spread information on the realized prices in the futures platform (Unctad, 2007). For this, they use an array of channels, traditional as well as modern ones, including among others television, radio, newspaper, and SMS messages. Cell-phones in particular are quickly becoming an important mean to connect farmers to the information of future exchanges. For example, Unctad (2007) reports that in China, 410,000 SMS messages were sent out by the Dalian Commodity Exchange in 2006.

Gabre-Madhin and Goggin (2005) argue that this price discovery function on itself would already justify the role of the commodity exchange in emerging economies as reference prices are often difficult to obtain in these environments. While these services have clear benefits for the overall functioning of the agricultural economy, they are however hard to quantify given the difficulty of establishing a counterfactual.

4.2. Price risk management

Since the increasing liberalization of most of the agricultural markets, there has been an increasing interest on effective risk management strategies, especially so for developing countries as they sometimes depend on relatively few commodities for all their export earnings (e.g. Morgan et al., 1999; Larson et al., 1998). There have thus been big hopes for the development of futures exchanges as a mean to hedge risks in a market-driven way for these developing and emerging economies. It is important to point out that long-term studies show that the benefits from hedging comes not through better price realizations as price realizations depend on cyclical upturns and downturns (Rutten, 2007). However, the literature also indicates in general that risk reduction leads to better production choices by small farmers and thus higher profits and welfare.

Most evidence seems to indicate that the price risk management function seems to be the most problematic of the commodity exchange function and while it is been used for hedging, few smallholders currently use commodity exchanges for that purpose in these developing countries. Unctad (2007) reports that instruments for price risk management on commodity exchanges are mainly used by large commercial farmers and plantations in countries such as Malaysia, Brazil, and South Africa. They argue however that smallholders in these countries often operate within risk management schemes operated by the government and might thus have less use with relying on commodity exchanges. In chapter 3, we also find that commodity exchanges in India are used very little towards hedging purposes. Similar results are found in China (in annex 1). However, Rutten (2007) argues that the supply of reliable price information in developing countries in itself will already lead to better markets and thus higher welfare for small farmers, even when no systematic hedging takes place.

4.3. Facilitation physical commodity trade

Traditionally, exchanges have started in agricultural economies where agricultural markets were well-developed. Some argue that this is even a pre-condition for the start of successful commodity exchanges (Rashid et al., 2007). Interestingly, commodity exchanges have succeeded in environments where cash and spot markets were not well developed and they have thus challenged the existing paradigm. Moreover, there is now increasing evidence that indicates that commodity exchanges have in some cases actually contributed to a better functioning of the cash market through significant investments in this area (Unctad, 2007).

For example, Unctad (2007) argues that the Brazilian commodity exchange has helped in the integration of physical markets that were previously fragmented through the introduction of a range of trade instruments that dealt with spot markets, forward, options and rural securities. In India, certified warehouse infrastructure has been built up through the help of warehousing companies started up by the two major commodity exchanges. In South Africa, a delivery mechanism was developed that was widely accepted by the market (Unctad, 2007). In the contracts that are traded in the markets, commodity exchanges might further have developed a system of grades and standards that might not have existed before the introduction of the futures trading and that might then spill over in the cash market.

4.4. Facilitation financing

Different commodity exchanges have largely different experiences with the facilitation of financing. Some commodity exchanges are not involved at all in this activity. For example, commodity exchanges in Malaysia as well as in China have not developed any activities. On the other hand, exchanges in South-Africa, Brazil and India have on the other hand been crucial in facilitating finance based on receipts given by the commodity exchanges. South-Africa has developed silo-receipt based financing, Brazil developed a system of registration and securities that are traded on the agricultural commodity exchange, while commodity exchanges in India helped in obtaining loans from banks based on the receipts given out by the certified warehouses that they work with.

However, few of the exchanges have gone the whole way of an effective warehouse receipt system. In such as system, the warehouse receipts can easily be transferred so that farmers can transfer the speculative risk through the sale of receipts. Gabre-Madhin and Goggin (2005) argue that the chances of success of a warehouse receipt system are significantly higher if it can be linked with a commodity exchange. However, for such a system to be viable, an oversight mechanism needs to be in place that assures that specific licensing of warehouse operators, a tracking mechanism of owners of receipts, and well established legal rights for receipt bearers (Gabre-Madhin and Goggin, 2005).

4.5. Market development

Unctad (2007) identifies four market development impacts that are generated by commodity exchanges: (a) education and capacity building; (b) international trade facilitation; (c) ICT (Information and communication technology) upgrade and promotion; and (d) industry growth. Most of the commodity exchanges have placed a high value on education and capacity building of the agents involved in the value chain. For example, the Dalian Commodity Exchange in China initiated the “1000 villages and 10,000 farmers” program where farmers were educated on how to use the futures prices for their cropping decisions.

While this is an exception, commodity exchange are also interested in capacity building out of self-interest as it could benefit their business: First, exchanges train people on the functioning of the commodity exchanges as they could then be attracted to use them; Second, farmers that become familiar to the grades and standards used by the commodity exchanges might be better able to work with hedgers that participate in these exchanges (Unctad, 2007).

Commodity exchanges might help in the facilitation of international trade as they are a transparent platform to do national and international transactions in a good for which grades and standards are clearly established. International evidence indicates that commodity exchanges also might help in upgrading and the promotion of ITCs. Exchanges are at the forefront of extending modern technology to farmers including advice electronic-delivered services such as banking, insurance, weather information, etc. (Unctad, 2007). Finally, the development of exchanges creates new demands for all type of services related to broker firms, dissemination of information, the use of warehousing, etc. and might thus create employment and industry growth.

5. The case of China

Given that the agricultural economy of China is largely based on smallholders as in India and as China is seemingly ahead in agricultural development, there might be potential important lessons for the Indian commodity exchanges on how to adjust themselves to upcoming demands and to up-scaling. We therefore present a detailed case study on the commodity exchanges in China (a detailed write-up is added in Annex 1). We present a short write-up of the findings in this chapter.

When China started the first futures market in 1990, it was barely a byproduct of an agricultural wholesale market. In 2007, with total turnover 5.8 trillion US dollars, China's futures markets outweighed China's GDP (3.43 trillion US dollars) for the first time at the end of this year (Wang, 2008). The total turnover almost doubled within one year, and the trend is expected to be continued and total turnover is projected to reach 10 trillion US dollars in 2008 (Li, 2008). Agricultural commodities futures are major products in China's futures markets: they accounted for about 42% of total turnover in 2007 (2.4 trillion US dollars) and their share increased to 59.3% in the first quarter in 2008 (Zhang, 2008).[4] While more than 17 agricultural products were introduced into China's futures markets, only ten of them survived today. These are soybean, soybean meal, wheat, corn, palm oil, soybean oil, cotton, sugar, vegetable oil and mungbeans. Others like rice, peanuts, barley, coffee, sorghum, redbeans and rubber could not survive due to too much speculation in the futures markets. As indicated in section 1, China was in 2007 the largest futures markets for soybean meal in the world and the second largest and fourth largest futures market for soybean and corn respectively. The Dalian Commodity Exchange (DCE) has now become the second largest agricultural commodity exchange in the world.

While the commodity exchanges are now well established in the Chinese agricultural economy, regular policy changes over a 17 year period were made to get to this stage. In 1988, the Chinese government described the set-up of the futures markets in the annual

[4] In comparison, agricultural GDP only accounted for 11% of total GDP in 2007.

government report. This implied that futures markets would become legal again and this after the communist party shut down futures markets completely in 1949 in Shanghai. The first agricultural commodity exchange was established in Zhengzhou (CZCE). However, it took three years for CZCE to effectively run futures markets.

The first agricultural future contracts were traded in CZCE in 1993. The futures markets rapidly expanded since but the exchanges did not perform the basic functions that it was created for, apparently due to imperfect regulations and loose monitoring mechanisms. The number of commodity exchanges increased quickly to more than 50, the number of brokerage firms increased to more than 1,000 in three years, and the number of products traded on these exchanges expanded to 35 products including rice, copper, petroleum, etc. (Yang and Bin, 2004). The perceived chaos in future markets forced the Chinese government to intervene. From 1993 to 2000, most commodity exchanges were closed by the government and only three were allowed to remain open. The number of brokerage firms was reduced to less than 200 and the number of products traded on the futures was cut to 12. In 2000, the total turnover of future markets was only 0.2 trillion US dollar, which accounts for less than 5% of the total turnover today (Qingfei, 2004).

The Chinese government and futures industry learned useful lessons from the turmoil in the futures markets and it began to pay more attention to the monitoring and regulation of the futures markets. In 1999, the national futures market association was established with government support and the first regulations on futures market came in effect as well. However, while the government has been able to control the turmoil and the commodity exchanges have shown high growth rates, it is still the impression that there are different challenges for Chinese agricultural futures markets. We discuss three of them.

First, very few Chinese farmers participate in futures markets directly as farm sizes in China are too small compared to the minimum trading volume requirement in futures market (10 tons). However, the Chinese government and the industry have put in significant efforts to bridge the gap between small farmers and futures markets. For example, the Dalian Commodity Exchange (DCE) helped local governments to train

38,000 soybean farmers in the Chinese soybean production area (in North-East China). It also helped farmers' cooperatives to work with specialized firms to participate in the soybean futures markets in 2006. However, this pattern has not been adopted widely (Xiaoli, 2007).

Second, the commodity exchange is little used for hedging purposes. Even among participants, it is estimated that most players in futures market are speculators (only 5% participants are hedgers), and hedge transactions only account for less than 10% of total turnover in the futures markets.

Third, a sign of a good functioning future market is that future prices can be used as a predictor for spot markets. However, there has been some evidence of pricing ineffectiveness (Williams et al, 1998). The trading in futures contracts was found to be far more active than physical trading in mungbeans futures markets, implying that there was too much speculation. Wholesale price and the nearby futures price in mungbeans often diverged by 15–20%, far beyond the costs involved in any arbitrage operation. Long-run relationships between futures markets and wholesale prices can also not be found to exist in wheat markets, which might imply that too much speculations and government interventions in the wheat markets distort proper price discovery (Yao and Wang, 2005; Wang and Ke, 2003). On the other hand, co-integration was found to exist in other market such as the soybean markets.

For the Chinese commodity exchanges, there are thus a number of questions that need to be tackled and these questions often and interestingly are the same in India. First, small farmers are basically excluded from futures markets now and the question is how ways can be found that would bridge the gap between small farmers and futures markets. Second, empirical evidence indicates that price efficiency exists for some products but not for others. It would be important to understand the key factors that are driving this difference. Third, commodity exchanges only play their hedging role to a limited extent and it would be crucial to understand how this role could be better taken up by the commodity exchanges in these emerging economies.

Chapter II

The futures exchange

1. Introduction

Governments all over the world have now recognized the role the futures markets for commodities can play in a market-oriented economy. In a free market economy, it is understood that properly working futures markets provide efficient mechanisms for price discovery and risk management. However, up until the late 1980s, the governments in many countries played the price stabilization role particularly for agricultural commodities and futures trading were only allowed in a few developed countries. In developing countries where futures markets existed, the government's interventions limited their role to a very few commodities. As countries started liberalizing and opening up their economies and reduced government intervention, the need for futures trading has been recognized to deal with the market determined price volatility. In the last two decades, many countries have experimented with futures trading for various commodities.

India is one of pioneers in the development of the futures markets. Futures trading in cotton started in 1922 by the East India Cotton Association. Many other commodities such as oilseeds and grains were traded on futures exchanges up until the Second World War, when futures trading was prohibited. Independent India encouraged futures trading by passing the Forward Contract (Regulation) Act in 1952. Futures trading was resumed for all the major commodities in various regional exchanges. However, futures trading in most commodities were prohibited in the 1960s as they were considered encouraging speculation during shortage situations. Except for a few commodities such as pepper, castor seed and Hessian, this ban on futures trading continued until the 1990s.

In the 1990s, reforms in the economy led to a revival of the interest in futures trading in commodities. By then, several developments in the agricultural sector had taken place.

First, the agricultural production situation improved considerably and surplus production in several commodities started emerging. India had to increasingly look towards international markets for the sale of its produce. Second, the government intervention measures designed during the shortage situations were becoming unsuitable. Third, due to the increase in income and population, the total demand for agricultural commodities has been increasing and for some commodities such as edible oil, India is a major importer in the world market. Fourth, the government was also unable to intervene on a large scale because of its inefficient operations and budgetary constraints. Fifth, after committing to the agreements on agriculture under the World Trade Organization (WTO), the need for opening up the agricultural market became necessary. In the new globalizing situation, it was increasingly felt that there is a considerable gain to be made in becoming a part of the global economic order. The changing economic environment, increasing commodity uses through value addition at different stages, an increasing number of market participants, the changing demand and supply position of agricultural commodities, and the growing international competition suggested the need for futures trading for agricultural commodities to facilitate price risk management and price discovery.

2. Background

2.1. The Indian commodity sector

India is one of the leading countries in the world in the production of several agricultural commodities like cereals, pulses, oilseeds and castor seeds cotton, jute, sugarcane, spices, tea, fruits and vegetables, and tobacco. However, India's share in the international agricultural commodity trade is very small except for a few commodities such as tea and cashew. Though India is a major player in the international spice market, during the past few years its share has however declined (37% in 2003-04). Presently, it exports only 12 per cent of the total spice production. India is also a major exporter of raw and manufactured tobacco and raw jute and jute products. In spite of being the major producer of pulses, oilseeds, sugar, cotton, fruits and vegetables, India's share in the world export of these commodities is negligible. The production of these commodities in India is often not sufficient to meet the growing domestic demand.

India is also a major importer of pulses and oilseeds. In some years, India also imports sugar and cotton. In the last two decades, due to the increase in the production of castor seeds, soybean, oil cake, coffee, processed fruits and vegetables, the volume of their export has increased substantially. India has become the largest exporter of castor seeds and castor oil in the world. In 2004-05, about 80 per cent of the total coffee production in the country was exported. The import of various agricultural commodities is growing faster than exports. It thus seems that agricultural commodity business and trade will continue to increase in the years to come as production as well as demand increase in the country.

2.2. Trends in agro-processing

Major Indian agro-based industries are cotton textile, sugar, gur and khandsari, edible oils and vanaspati, tea, coffee, tobacco, jute, tyre, rubber, food, and fruits and vegetables processing industries. Cotton, jute and sugar industries are the oldest agro-based industries in the country. The cotton textile industry accounts for about five per cent of the total value of the production in the organised manufacturing sector. Cotton fibre accounts for 66 per cent of the total fibre consumption in the textile industry. The sugar industry consumes about 50 to 70 per cent (69% in 2002-03) of the sugarcane produced in the country. As a result, sugar production and prices are highly influenced by the production and prices of sugarcane and its availability to sugar mills. The gur and khandsari industry meets about a third of the demand for sweetener in the country. Although processing of agricultural commodities is still at a rudimentary stage, there are several processing units for oilseeds, tea, cereals, food, and fruits and vegetables in the country. There are 820 large flourmills that convert about 10.5 million tons of wheat into wheat products and 10,000 mills transform about 75% of the pulse production of 14 million tons. In the organized sector, there are over 820 flourmills.

In the oilseed industry, there is a large number of primary processing units such as decorticating, de-hulling, expellers, etc., and vegetable oil refineries, solvent extraction plants and vanaspati and margarine manufacturing units. The Indian oilseed based sector accounts for a domestic turnover of Rs. 600 billion while export-import trade is worth Rs. 130 billion per annum. The performance of these industries mainly depends on the performance and growth of oilseeds in the country. In this industry, the presence of the organized corporate sector is marginal but it is increasing in the recent years. The organized corporates are major players in the solvent extraction and soya processing industries. After the start of the liberalization process, a number of multinational and domestic corporates have entered this industry. The consumer food industry is also rapidly growing and expanding its coverage. The consumer food industry includes pasta products, cocoa based products, bakery products, biscuits, etc. It seems that the economic liberalization process has encouraged the establishment of consumer food and fruits and vegetables processing industries.

3. The role of futures exchanges

3.1. Need for risk management mechanisms

The government has traditionally played a major role in managing demand, supply, pricing, domestic and international trading, storage, and credit supply of major agricultural commodities. These interventions are being removed as part of the liberalization process. The new economic liberalization policy has also strengthened the process of commercialization of the agricultural sector. As a result, several new agro-based industries are being set up. The performance of these industries depends heavily on the price of raw materials (agricultural commodities), as they constitute a major share in their costs. High volatility in prices makes agro-based industries prone to high price risks and therefore, they need a risk management mechanism to safeguard their business. In addition, in the process of the economic liberalization and signing of the WTO Agreement, the government has given a thrust to enhance international trade in raw agricultural commodities and their value added products. This would expose the domestic market to international price risk. Since exporters of commodities generally operate their business on a thin margin, an efficient price risk management mechanism would be essential in this new environment. The withdrawal of the intervention of the government from the commodity sector ensures that only demand and supply forces will determine the market price in the new economic environment. It is also argued that an efficient price management mechanism for agricultural commodities encourages commercial banks to finance the commodity sector and attract direct foreign investment in the agricultural sector. In the new liberalized economic environment in the agricultural commodity sector, futures markets are therefore expected to play a vital role.

3.2. Functions of the commodity futures markets

The commodity futures market has been developed as a tool for price risk management for traders, stockers, exporters, processors, financiers, farmers, and consumers. It performs two major functions: price discovery and price risk management. The role of the futures market as a facilitator of hedging and speculation by providing liquidity (economy of transactions), efficient inter-temporal allocation of commodities, forward pricing, and providing market information is well recognized. However, its role in stabilizing spot prices is still debated. Several empirical studies have shown contradictory results. Some studies have shown that the futures market stabilizes spot prices (Gray, 1964; Powers, 1970; Taylor and Leuthold, 1977; Pavaskar, 1975) while other studies have shown that it does not have any effect on the spot prices (Working, 1977; Gray, 1977; Johnson, 1977; Tomek 1979-80). Interestingly, theoretical results have reported explanations for both stabilizing (Peck, 1976; Turnovsky, 1979; Turnovsky and Campbell, 1985) and destabilizing (Kawai, 1983; Newbery, 1984, 1987) effects of the futures market on spot prices, depending on the assumptions made.

Some studies (Thompson, 1985; Leuthold, 1994) have examined the role of commodity exchanges in international commodity trade. Commodities that are exported in large quantities are gaining greater attention for futures trading. Exporters can effectively hedge their price risks through the futures market to maintain their profit margins and competitiveness. Moreover, the major functions of the futures market, viz., price discovery and hedging, improve efficiency in production, storage, marketing, processing and financing of agricultural commodity marketing.

4. Futures exchanges in India

4.1. Development of the Indian commodity futures markets

The history of futures trading stretches from the year 1875 when the first organized futures market was established by the Bombay Cotton Trade Association to trade in cotton contracts. Since then, futures trade has witnessed a chequered history. Between the 1920s and the 1940s, India had futures exchanges for a large number of commodities like cotton, groundnut, groundnut oil, raw jute, jute goods, castor seed, wheat, rice, sugar, gold, and silver. In fact, for a long time India, after the USA and UK, was the only country where futures markets for a large number of agricultural commodities and their products were active. In India, futures trade was self-regulated by the members of the commodity exchange and government's intervention in futures markets was completely absent. The first intervention came only in September 1939, after the outbreak of the World War II, to check the soaring prices of agricultural commodities. During the War, futures trading in several commodities were prohibited under the Defense of India Act.

After independence, the Forward Contracts (Regulation) Act, 1952, was enacted to regulate forward trading. [2] The Act defines a forward contract as the contract for delivery of goods that is not a ready delivery contract[5]. It includes two categories of forward contracts, i.e. a specific delivery (customized) contract and a non-specific delivery contract or standardized contract. The standardized contracts are considered as futures contracts.

---

[2] Futures trading is in the Union (Federal) List of Seventh Schedule of the Constitution of India.
[5] Ready delivery contracts are those where delivery of goods and full payment of price therefore is made within a period of eleven days.

The Act provides for regulation of trading by the Exchange on a day-to-day basis according to its rules and byelaws, which are approved by the Forward Market Commission (FMC). Under the Forward Contracts (Regulation) Act, 1952, the Forward Market Commission was set up in September 1953. The Central Government is the ultimate regulatory authority and most of the powers are delegated to the Forward Market Commission.

After the enforcement of this act, the number of recognized associations came down from about 380 to 30. These recognized associations used to operate 50 futures exchanges. In the early 1960s, on the recommendation of the Forward Market Commission, the government recognized trade associations conducting futures trading in 16 commodities, namely cotton lint and raw cotton; raw-jute, hessian and sacking; groundnut, rapeseed/mustard seeds, castor seeds, linseed and cottonseeds, coconut oil, groundnut oil and groundnut expeller cake, turmeric, pepper and gur (jaggery).

In the mid 1960s, the government felt that the futures trading encouraged speculative trading leading to an inflationary tendency in the economy. Therefore, futures trading in most commodities except for pepper, turmeric, castor seed, and linseed were banned in the mid 1960s. In 1977, futures trading in linseed and castor seed were suspended. However, The Dantwala Committee[3] recognized the need for the futures trading even in times of shortages. The Khusro Committee[4] also recommended the revival of futures trading in the major agricultural commodities including raw cotton, raw jute, jute goods, potato and onion. As a result, the futures trading in potato and gur were permitted in the early 1980s and in castor seed in 1985. With the initiation of the liberalization process in 1991, the need for a futures market was once again realized for its price risk management and price discovery roles. However, futures trade in India was yet to establish itself as an integral part of economic activities. It was alleged that the futures market is a business arena for a small community of brokers and the system lacks transparency.

[3] The Forward Markets Review Committee set up under the Chairmanship of Prof. M. L. Dantwala in 1966.
[4] The Committee under the Chairmanship of Prof. A. M. Khusro, submitted the report in 1980.

4.2. Public policies and initiatives

Intervention by the government in the agricultural commodity sector limits the efficiency of the market for price discovery through demand and supply forces. Therefore, the role of the government in price stabilization limits the growth of commodity futures markets. As a result, the commodity futures market could not flourish in the country. After the beginning of the economic liberalization process, the steady and selective withdrawal of the government is encouraging the use of commodity futures markets in India. However, the government still regulates the demand, supply, production, marketing, and domestic and international trading of several agricultural commodities through several policy measures.

After the initiation of economic liberalization process, the government has taken several policy measures to promote and strengthen commodity futures markets in the country. The Kabra Committee[5] was set up to review the operations of forward/futures markets and to assess the role of the Forward Markets Commission in 1993. On the recommendation of the Kabra Committee, the government allowed futures trading in soybean and its oil and meals and to establish international futures exchange for pepper in 1997, for sacking and coffee in 1998, and castor oil in 1999. The government has also permitted futures trading in eight oilseeds, their oil cakes and oils (rapeseed/mustard, groundnut, sunflower, rice bran, cottonseed, coconut, sesame and safflower) in 1999. It further permitted for the first time participation of foreign business houses and traders in Indian commodity futures markets. The government has accepted the recommendations of the Kabra Committee to amend the Forward Contracts (Regulation) Act, 1952, and strengthened the Forward Markets Commission. The amendments include permission for trading in options contracts.

[5] The Kabra Committee was set up on June 15, 1993 by Ministry of Civil Supplies, Government of India under the Chairmanship of Kamal Nayan Kabra. The Committee submitted its report in September 1994 recommending the introduction/resumption of the futures trading in 17 additional commodities (basmati rice, seed cotton, cotton lint, raw jute and jute products, most oilseeds and their oil, major oil cakes, linseed, onions, gold and silver), setting up of the international futures exchange for the trading in pepper and castor oil and strengthening of commodity exchange and the regulatory organizations.

Apart from these measures, the government has taken several policy initiatives to modernize and strengthen commodity exchanges and to facilitate wider use of commodity futures markets. The government has established a separate department under the Secretary to the Government of India in 1995. The Reserve Bank of India (RBI) constituted a nine-member committee under the Chairmanship of Mr. R. V. Gupta to design policies that are pertinent to access the international commodity exchanges. In 1998, on the recommendation of the Gupta Committee, the government permitted Indian companies to use derivatives contracts traded in commodity exchanges abroad. In October 1998, the government permitted the pepper futures trading in dollar denomination at the International Pepper Exchange, Kochi.

4.3. Development of national exchanges

The prohibition and restrictions imposed by the government on the futures trading for over 4 decades stunted the growth of these markets in India while in many developed countries a rapid growth of the derivatives markets took place. This resulted in a significant gap in the infrastructure, systems, and regulations between the futures market in India and in other countries. In the late 90s, the Forward Market Commission and the Government of India started imposing the world's best systems and practices on the commodity exchanges to promote financial integrity, market integrity and transparency. The new regulatory measures were in terms of a daily 'mark-to-market' margin, the design of the contracts, the creation of trade guarantee fund, the back-office computerization for the existing single commodity exchange and online trading for the new exchanges, the demutualization for new exchanges and one-third representation of independent directors on the board of existing exchanges. Traditional players opposed these changes and some exchanges were closed down. The government also initiated the process to start national commodity exchanges and online trading similar to the National Stock Exchange.

The National Agriculture Policy announced in July 2000 indicated the intention of the government to encourage the start-up of futures trading in a number of commodities to help market participants to manage risk. The budget speech of the Finance Minister on February 28, 2002 also indicated that the futures trading were to be expanded to include all agricultural commodities. However it was not until April 1, 2003 when the government issued a notification rescinding all previous notifications that prohibited futures trading in a number of commodities and in May 2003 when prohibition on non-transferable specific deliver forward contract was revoked, the actual interest in establishing modern exchanges received substantial encouragement. The first national exchange, the National Multi-commodity Exchange (NMCE) was established in 2003 and two other national exchanges, i.e. the Multi-commodity Exchange (MCX) and National Commodities and Derivatives Exchange (NCDEX), started in 2004. The National Board of Trade, a regional exchange trading in the soybean complex earlier, was transformed into a national exchange.

The national level multi-commodity exchanges have online trading and set up many terminals all over the country. MCX alone has set up 35,000 trading stations in 680 cities with the help of 1800 members. The growth in the reach of National Exchanges has been phenomenal. As they are for-profit organizations they are interested in building volumes and therefore are making special efforts. The price information is disseminated widely, on the websites as well as TV channels. NCDEX and MCX have arrangements with TV channels to relay spot and futures price tickers. Through subsidiary companies they run training programs for brokers, sub-brokers and others. The remaining 22 exchanges are mainly single commodity exchanges. The futures trade is now available for a large number of commodities.

The number of commodities traded on these commodity exchanges has also registered a significant increase over time, from just 8 in 2000 to 80 in 2004. The value of trading in all the commodity exchanges increased from Rs. 44.95 billion in 2000-01 to Rs. 1,293.64 billion as of 2003-04 (Figure 1) and further to Rs. 5,717 billion in the year 2004-05. In 2007-08, the value of trading was a whopping Rs. 40,660 billion. As many as 12 commodities have been contributing annual trading value of over Rs.10 billion. The number of contracts in each of the commodities has also gone up over time. While 19 regional exchanges were offering generally one contract each per commodity traded at any time in 2000, the national level multi commodity exchanges now are offering about 100 contracts at any time (Nair, 2004). In NCDEX, the number of agricultural commodities has been in the range of 20-40 in the last two years and many commodities were included for trading in the beginning year itself (Annex 1). Lately, some commodities have been dropped from trading due to poor performance.

The value of agriculture commodity trading has increased from Rs 3,900 billion in 2004-05 to Rs 13,170 billion in 2006-07 and declined to Rs. 9,410 billion in 2007-08 (Table 1). The share of agricultural commodities in the total futures trading was 68.2% in 2004-05 and declined to 23.2% in 2007-08. The bullion and other metals accounted for 64.6% in the total futures trade in 2007-08. Energy is another emerging commodity futures. It accounted for 12.3% share in 2007-08. The major agricultural commodities traded are cluster bean, chickpea, soya oil, pepper, cumin seed, soybean, and mustard seed (Table 2).

Figure 1: Turnover of commodity futures markets

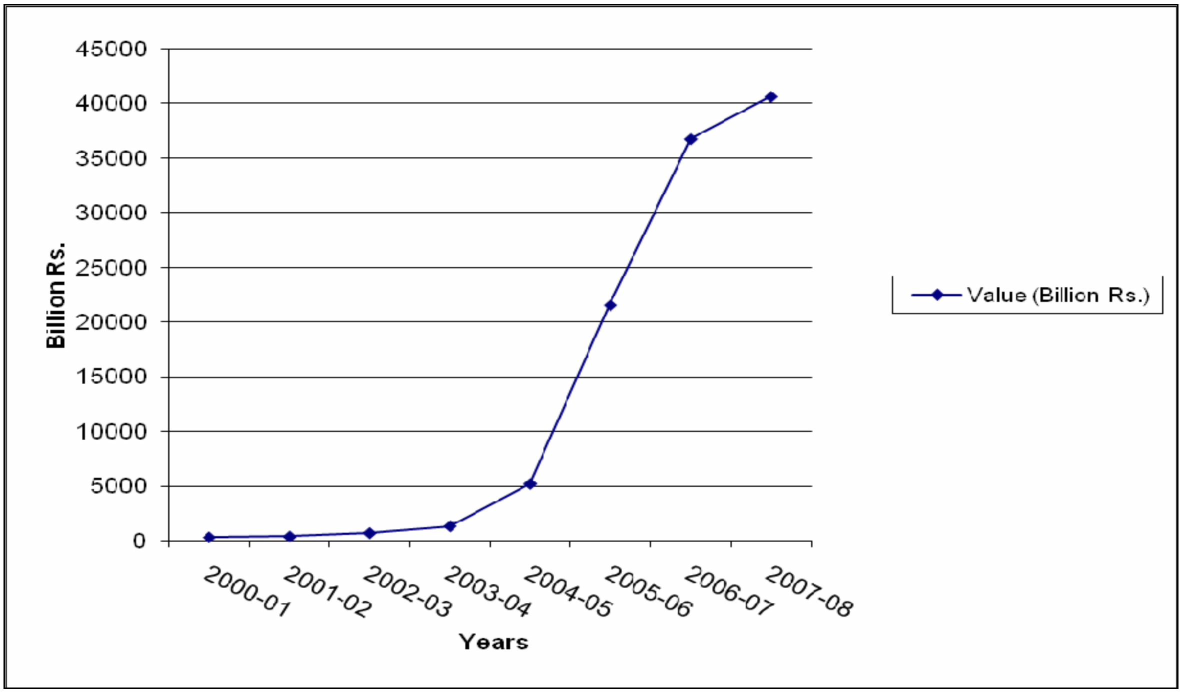


Table 1: Commodity group-wise value of trade (in billion of Rupees)

Commodity Groups	2004-05	2005-06	2006-07	2007-08
Bullion and other metals	1800	7790	21290	26240
	(31.47)	(36.15)	(57.9)	(64.55)
Agriculture	3900	11920	13170	9410
	(68.18)	(55.31)	(35.82)	(23.15)
Energy	20	1820	2310	5000
	(0.35)	(8.45)	(6.28)	(12.3)
Others	0	20	1	0
	(0)	(0.09)	(0)	(0)
Total	5720	21550	36770	40650
	(100)	(100)	(100)	(100)

Note: Figures in parenthesis indicate percentage to total value
Source: Report of the expert committee (2008)

Table 2: Volume & value of trade in major agri-commodities (2004-05 to 2007-08)

(Volume of Trading – in Million Tonnes, Value - in Rs. Billion)

Sl. No	Name of the Commodity	2004-2005 Volume	2004-2005 Value	2005-2006 Volume	2005-2006 Value	2006-2007 Volume	2006-2007 Value	2007-08 Volume	2007-08 Value
I	**Agricultural Commodities**								
	Major Agricultural Commodities								
1	Guar seed	79.91	1295.23	190.20	3304.40	161.00	3248.81	67.05	1237.53
2	Chick pea	10.84	167.55	124.03	2347.74	119.20	3067.94	38.15	935.17
3	Soy Oil	24.96	1015.28	29.77	1102.30	40.15	1766.68	44.83	2415.88
4	Pepper	1.16	83.34	1.16	80.30	7.63	907.28	7.20	1053.24
5	Cumin seed	0.36	29.45	1.78	118.23	6.92	674.77	6.07	729.30
6	Black gram	6.52	102.77	76.98	1969.04	16.47	535.46	--	--
7	Mentha Oil	0.00	0.00	0.67	415.33	0.86	521.04	0.20	100.52
8	Chillis	0.02	0.61	2.43	74.87	7.19	386.51	2.59	124.61
9	Soybean	7.45	97.97	11.15	138.60	18.92	262.39	32.61	607.46
10	Mustard Seed	10.74	194.64	9.49	166.32	11.46	223.32	36.26	882.34
11	Wheat	3.70	28.39	19.43	159.70	23.51	221.80	0.02	0.15
12	Potato	0.00	0.00	0.80	5.79	25.65	150.04	9.06	55.26
13	Turmeric	0.45	11.11	1.60	39.43	6.50	148.18	10.92	281.48
14	Castor seed	8.22	143.27	7.32	117.13	8.08	146.39	8.73	195.73
15	Sugar	4.10	77.37	14.00	267.60	7.53	136.90	17.71	243.65
16	Cluster bean Gum	2.88	134.12	7.97	369.86	2.59	131.32	1.08	49.41
17	Gur	6.81	78.91	10.71	164.41	8.18	110.52	5.07	62.43
18	Red gram	0.04	0.60	23.12	415.48	5.39	106.97	---	---
19	Kapas	19.21	333.17	18.28	308.08	4.23	82.57	4.15	97.89
20	Rubber	0.48	27.45	0.71	48.30	0.85	81.67	0.57	51.20
21	Cardamom	0.01	4.21	0.01	2.93	0.16	74.27	0.07	40.72
22	Maize	0.20	1.10	1.70	9.27	6.52	49.21	2.92	23.01
23	Raw jute	2.87	37.48	3.91	54.72	1.07	14.26	1.64	21.65
24	Rice	0.24	3.97	0.93	14.71	0.24	4.56	--	--
(A)	**Total of Above**	**191.18**	**3867.99**	**558.12**	**11694.55**	**490.26**	**13052.86**	**296.87**	**9208.61**
(B)	**Other Agri-Commodities**	2.76	33.89	23.76	227.72	12.13	118.39	17.65	205.00
(A+B)	**Total Agri-Commodities**	**193.94**	**3901.88**	**581.88**	**11922.27**	**502.39**	**13171.25**	**314.52**	**9413.61**
II	**Bullion & Metals**	0.27	1796.71	5.85	7793.98	19.09	21289.85	45.19	26236.67
III	**Energy**	0.00	19.00	90.90	1818.83	91.43	2307.12	197.62	5009.42
IV	**Plastics**	0.00	0.00	0.25	16.14	0.02	1.04	0.00	0.19
Grant Total (I to IV)		**194.21**	**5717.60**	**678.87**	**21551.22**	**612.93**	**36769.27**	**557.34**	**40659.89**

NB: Shaded Figures indicate highest value during the period of three years 2004 -05 to 2006-07) Source: Report of the Expert Committee (2008)

Among the three National Exchanges, NCDEX and MCX contributed to 94 per cent of the total turnover of agricultural commodity futures trading in the country in 2005-06. The other national exchange, NMCE has only a 1 per cent share in the turnover (Table 3).

Table 3: Turnover of futures trading in Indian commodity markets (in billions of Rupees)

Year	2004-05	2005-06	2006-07	Share in total value of trade in 2005-06
MCX	1650	9620	16220	45
NCDEX	2660	10670	9440	49
NMCE	140	180	1020	1
NBOT	580	540	570	2
Others	680	550	150	3
Total	5720	21550	27390	100

Source: FMC

At NCDEX and NMCE (Table 4), the share of agricultural trade in the total trade is large. However, it has declined over time as non-agricultural commodities are introduced and trading picked up in commodities such as gold, silver, and other metals. At MCX the share of agricultural commodities during the above years varied between 12-14 percent of the total trade in value terms. The major agricultural commodities traded at MCX are soya refined oil, cluster bean, and mentha oil.

Table 4: Share of agricultural commodities (%) in total value of futures trade at NCDEX, MCX and NMCE

Year	NCDEX	NMCE	MCX
2004	83	99	-
2005	87	99	14.62
2006	77	92	15.15

Sources: FMC and NCDEX

Only a few commodities were traded in large volumes at NCDEX (Table 5). They are chickpea, black gram, cluster bean, soya oil, pepper, sugar, chili, wheat, cumin seed, and wheat. The volume of trade in relation to their production is given in Table 5.

Table 5: Production and volume for major commodities traded at NCDEX during 2005 and 2006

Commodity	Production 2005 (Million MT)	Volume/Production 2005	Production 2006 (Million MT)	Volume/production 2006
Urad	1.1	44	1.4	25.4
Chana	5.4	16	4.8	25.4
Soya	1.5	7	1.38	6.5
Guar	.48	393	.55	256.3
Sugar	1.27	9	1.92	5.2
Chilli	.64	Less than 1	1.1	6
Pepper	0.05	14	0.043	105.5
Jeera	1.15	1	.75	5
Wheat	6.86	0.14	6.94	0.44

Sources: FMC

Only a few commodities have relatively high volumes at NCDEX. For pepper, cluster bean, black gram and chickpea, the volume of trade is higher than the domestic production of the commodity. The contribution of the above commodities in the total value of agri-commodities traded on NCDEX has increased from 86% to 92% in the year 2006. Cluster bean and pepper had an extremely high ratio of volume over production.

During 2006, about 76% of the trade in value terms among agricultural commodities took place in 4 commodities: chickpea, cluster bean, black gram, and pepper. These commodities represent a small part of the total commodity sector in India. Wheat and rice (also red gram, black gram, chickpea, soya oil, and rubber), which have been de-listed now, were having a small share in the total volume of trade at the exchanges[6]. Large scale futures trading in major commodities is yet to take place and therefore futures trading currently taking place may affect only a small segment of the farming population.

[6] In 2007, Government of India set up The Expert Committee to study the impact of futures trading on agricultural commodity prices. The committee submitted its report in 2008. The committee found no conclusive evidence of futures trading causing inflation.

Theoretically, the commodity exchanges are supposed to create a platform for various stakeholders in the commodity value chain to de-risk their business. With the growth of commodity exchanges, especially the national level exchanges, it is important to evaluate the effect of the futures trading on the key stakeholders, i.e. the farmers. The first question to be answered is whether the futures trading has made any impact on farmers and if so how? Are they aware of futures market? Are they using futures prices for planting decisions? Are they using it for sales decisions? Are they participating in the future market? There is a need to examine how efficiently the futures market in India is working. This is what we intend to do so in this chapter.

5. Assessing the performance of the futures market: A conceptual framework

5.1. Literature review

The performance of futures market is commonly measured in terms of efficiency and unbiasedness. An efficient futures market is defined broadly as one in which the price fully reflects available information at any point in time (Fama, 1970). Under the assumption that information is costly, Fama (1991) defined an efficient commodity futures market as one, which reflects information up to the point where the marginal benefits from futures trading based on this information do not exceed the marginal costs of collecting the information. The efficiency of the commodity futures market is required from both the public and private perspectives. Only the efficient commodity futures market can be a useful instrument of price discovery, inter-temporal allocation of commodities, and risk management. Therefore, empirical analyses of efficiency and unbiasedness are used for the evaluation of the performance of commodity futures markets.

The efficiency of the futures market is not strictly testable (Fama, 1991). Empirical studies on the efficiency of futures markets typically measure the adjustment of futures prices to a particular information set. Therefore, any test for market efficiency is necessarily a joint test of efficiency and a model of asset pricing. Several empirical studies have been conducted using different methods to measure the efficiency of commodity futures market abroad. Basic theories used for testing efficiency of futures markets are based on weak, semi-strong and strong form hypotheses, which depend on the type of information used in the analysis. The information used for the tests for weak-form hypothesis of efficiency is historical market prices. For the test of semi-strong form hypothesis, all publicly available information - both prices and other relevant market information - are used. The test for strong-form hypothesis of efficiency uses, apart from all public information, insider information that is not available to the public.

Kofi (1973) was the first to test the forecasting ability of the futures market in the context of market efficiency by regressing the spot price on the futures price. He argued that inventories of storable commodities provide a link between the spring time prices of the post-harvest futures and the subsequent harvest-time prices. The study also revealed that the forward pricing function of futures markets was more reliable for continuous than discontinuous inventory markets. Some studies concluded that an efficient futures market is a predictor of spot prices only near maturity dates (Kofi 1973; Leuthold 1972; Stein 1961). Maberly (1985), and Elam and Dixon (1988) argued that regressing the spot price on the futures price could give misleading results with regard to pricing efficiency as inefficiency may be due to biased OLS estimates resulting from ex-post 'censored' data. Elam and Dixon argued that the best regressor in the regression model is the lagged value of the dependent variable.

Elam (1978) developed a semi-strong test of efficiency and he considered the question of whether or not profits can be earned by trading in the hog futures market. Leuthold and Hartmann (1979) have tested the efficiency of the US hog market by estimating a simple two-equation, demand-supply model to forecast hog prices. Rausser and Carter (1983) used a semi-strong form test to examine the efficiency of the soybean complex. The relative accuracy of soybean, soybean oils, and soybean meal futures markets was examined via a structurally based ARIMA model. Fama and French (1987) tested whether commodity futures prices could provide forecast information superior to the information contained in spot prices or not. They found that futures markets for seasonal commodities contained superior forecasting power relative to spot prices. However, this is not true in case of non-seasonal commodities. Mean reverting behavior in commodity prices is inconsistent with a random walk model and it has been used to test for the efficiency. Several earlier studies investigated the price leadership of commodity futures price and the unbiasedness of futures price as a predictor of spot price at maturity to examine the efficiency of commodity futures markets (Kolb and Gay, 1983; Rajaraman, 1986).

Owing to the complexities involved in the test of the semi-strong and strong-form hypothesis of the efficiency of futures market, the weak-form test is most widely used. In recent years, several studies have used the co-integration test for the testing of the weak-form hypothesis of the futures market (Chowdhury, 1991; Fortenbery and Zapata, 1993; Fraser and MacDonald, 1992; Lai and Lai, 1991; Aulton, Ennew and Rayner, 1997). They have argued that the co-integration test is superior to simple regression method for the evaluation of the efficiency of futures market. The co-integration test, particularly Johansen's co-integration procedure, is used for testing the long-run market efficiency and unbiasedness of futures prices. Unbaisedness indicates no risk premium or risk neutrality. The short-run market efficiency is tested through an error correction model (ECM). Variations of the ECM, such as ARCH and GARCH models, are also used to take care of time-varying risk premium and potential asymmetries and nonlinearities in the conditional second moments (McKenzie and Holt, 2002). A co-integration test has been used by Naik and Jain (2002) to test the efficiency of Indian commodity futures market organized by the regional exchanges. They found that, except for castor, all other markets were inefficient.

The ECM model computes the influence of yesterday's change in futures on today's change in spot over and above what is captured by an equilibrium co-integrating equation. This information can be used to compute the optimal hedging ratio and the maximum hedging cover that can be obtained by any farmer by transacting in futures markets.

Working (1949) formulated a generalized model of cash-futures price relationships where inter-temporal price relationships or spot-future price differences are viewed as prices of storage. These prices provide incentives for storing and hedging commodities. The futures price for any delivery month is equal to the current spot price plus the cost of storage, which includes physical handling costs, interest charges, and possibly a risk premium. The term 'basis' is defined as the price difference between the spot and the futures market. The 'basis' represents the difference between a local cash (or spot) price at a specific location and a relevant futures price. Factors that affect the basis include: supply and demand for the commodity; supply and demand for products competing for storage; freight, storage and interest rates; method of delivery (i.e. delivery procedures and costs and storage cost); and market risk.

This relationship between the basis and cost of carrying charges may not hold very well a few months before harvest season. During this period cash and futures prices relationship could include a convenience yield that is the benefit from the storage of the physical commodity, but not from holding the forward contract on the physical commodity. When stock levels are low, storage may benefit from profit opportunities that are available and the return to storage is negative. The shortage arises mainly due to the convenience arising from owning the asset spot for the production process. When shortages occur, the spot price for the commodity is high, generating a convenience yield. When the convenience is high, the spot-forward curve goes into "backwardation", i.e. the term structure of current forward prices is lower than the spot price. Spot prices are above the futures price in this case and an inverse (negative) carrying cost is said to exist. A negative cost, the convenience yield, dominates physical costs. Convenience yield decreases as the aggregate inventory increases, and becomes zero with buffer stock inventory levels that can satisfy the short sales in futures.

Hedging in the futures market, on the contrary, provides farmers and other players in the market with a tool to lock in the price. By hedging in the futures market, holders of stocks or processors swap spot price risk for basis risk. *Spot price risk* is the risk faced due to variability in the spot price of the commodity. *Basis risk* is the risk in the actual and expected basis at the time of offsetting the contract. If the expected basis is a close forecast to the actual basis, hedgers get the price that they expect. If hedgers can predict the basis change, they can take advantage of this information to decide when to lift their hedge. Therefore, a more accurate basis forecast could help farmers or processors to make a better decision. Tomek (1997) has emphasized the potential value of basis forecasts to hedging decisions.

Basis changes are more predicable than cash price changes based on two fundamental reasons. One is that cash price and futures price converge as the futures contract nears maturity. The second reason is that the theory of storage predicts that the basis for storable goods is lower bounded by the negative sum of the marginal storage cost and time value. Hedging transforms cash price risk (spot risk) into smaller basis risk. Basis variability determines the usefulness of futures markets in hedging and the smaller the proportion of basis variability to spot price variability, the greater the usefulness of the futures market. The basis for commodities is expected to converge to zero at maturity, and the difference between spot price and future price should reflect only the delivery charges.

A number of statistical tools and techniques are used for the analysis of futures and spot price data. Below, we have given a description of some of the techniques applied for this research. The first part deals with the interrelationship between futures and spot markets, the second part with the relationship between wholesale and retail prices during the Pre- and Post-Exchange introduction periods.

5.2. Relationships between the futures and the spot market

The interrelationship between futures and spot market is measured by assessing the following: 1. Convergence, i.e. to what extent the futures and spot prices converge at the time of maturity of the contract; 2. Basis and price risk, i.e. how large is basis risk in relation to spot price risk; 3. Market efficiency, i.e. whether the futures and spot prices are co-integrated both in the long-run as well as in the short-run; 4. Hedging returns, i.e. to what extent hedgers can hedge their produce to reduce price risk; 5. Causality, i.e. to what extent the price in one market causes the price in the other market.

(a) Convergence

Convergence refers to the tendency of the difference between spot and futures contract to decline continuously, so as to become zero on the date on maturity. In contrast to convergence, a percentage divergence of basis from spot prices was also calculated to evaluate the efficient and extent of binding between futures and spot markets.

In this analysis, a contract wise basis (Spot price – Futures price) was calculated for the last ten days and the average of the percentage divergence from spot markets was calculated for these ten days. The formula used for calculating the percentage divergence of basis from spot is: (Basis) /spot price X 100

(b) Basis risk and price risk

Commodities usually experience wide, continuous and unpredictable price volatility. Sellers and buyers of commodities are exposed to the price risk that this volatility creates. Price risk can occur for a number of reasons in the case of agricultural commodities such as supply shocks (drought, floods, etc.), changes in demand and government policy. The sellers and buyers often want to find ways to insulate themselves from such price risk. A traditional solution to this problem has been "forward" contracts as well as hedging through futures contract.

A commodity basis provides a significant amount of information to producers and agribusinesses for making production, forward pricing, hedging, and storage decisions.

Basis is therefore a crucial factor in hedging using the futures. The commodity basis is the difference between the prevailing spot price of an asset and the future prices. The basis tends to follow historical seasonal patterns and by understanding these patterns a producer or agribusiness person can make better management decisions and reduce the risks involved in those decisions. Basis in absolute terms is the cost of carrying (the cost of storage plus working capital cost and other expenses as well as convenience yield), i.e. the cost of holding a commodity from the time it is purchased until its disposal and the premium associated with holding a commodity over a derivative.

However, there exists risk of fluctuations of the spot and the futures price between the moment a position is opened and the moment at which it is closed and this is referred as basis risk. That is when the basis becomes more or less than the cost of carry. In an efficient market, the basis risk should ideally remain much lower than the price risk to make hedging feasible. The smaller the basis risk, the more attractive it is for hedgers to use the futures market.

An attempt was made to understand whether futures could provide a means to transfer price risk between persons holding the physical commodity (hedgers) and other hedgers or persons speculating in the market.

In this paper, the basis was calculated for all the contracts that existed between January 2005 and available contract data in 2008. The most fundamental way to understand if futures have been instrumental in minimizing price risk is to compare the variance of the basis and the variance of spot prices. If the basis risk is lower than price risk, then only it makes a case for hedging.

(c) Market efficiency

The long-run market efficiency and unbiasedness of futures prices is tested through a Johansen co-integration procedure (Johansen, 1988). This procedure tests existence of a co-integrating vector that makes the linear combination of price series stationary. Short term price dynamics are analysed through an error correction model (ECM). When the spot and future prices are co-integrated, then the change in prices can be represented by the following error correction model

$$\Delta C_t = \alpha \cdot z_{t-1} + \beta_1 \cdot \Delta F_{t-1} + \beta_2 \cdot \Delta F_{t-2} + \gamma_1 \cdot \Delta C_{t-1} + \gamma_2 \cdot \Delta C_{t-2} + \varepsilon_t$$

and

$$\Delta F_t = \alpha' \cdot z_{t-1} + \beta_1^{'} \cdot \Delta F_{t-1} + \beta_2^{'} \cdot \Delta F_{t-2} + \gamma_1^{'} \cdot \Delta C_{t-1} + \gamma_2^{'} \cdot \Delta C_{t-2} + \varepsilon'_t$$

Where, ΔF_t and ΔC_t are first differences of the futures and spot prices and z_{t-1} represents the lagged deviation from equilibrium obtained from a co-integrating vector. Co-integration implies $\alpha>0$ in the first equation which provides us a test for market efficiency. The short run efficiency implies that $\alpha = 1$, $\beta_1 \neq 0$; $\beta_2 = \gamma i= 0$, which assess the role of changes in futures prices in price discovery of spot prices, which is independent of the equilibrium forces captured in the co-integrating vector.

(d) Hedging returns

Once we have the VEC model, we can compute the hypothetical hedging returns from the futures market. This is done by estimating the following equation

$$\Delta C_t = \alpha' \cdot z_{t-1} + \Phi \Delta F_t + \beta' \cdot \Delta F_{t-1} + \gamma' \cdot \Delta C_{t-1} + \varepsilon'_t$$

where Φ is the optimal hedge ratio. The effectiveness of this hedging can be computed by comparing the risk of unhedged position to that of hedged position:

$$E_t = 1 - \frac{Var(\Delta C_t^h)}{Var(\Delta C_t^u)} = 1 - \frac{MSE^h}{MSE^h}$$

(e) Causality tests

Granger causality tests are conducted to examine whether the influence of price is unidirectional. If the futures prices cause spot prices all the time and if hedging is negligible, speculation can have an unnecessary influence on spot prices. In the second part of the analysis, we analyze the relationship between the wholesale and retail prices before and after futures trading.

5.3. The relationship of the wholesale and the retail market

The introduction of futures trading would normally improve the availability of information as the exchanges take special care to disseminate the information in the hope of attracting large trade volume. Since futures price and also spot prices are announced for a specific quality of the commodity by the futures exchange, it helps to relate price and quality better for the market participants. In the existing spot markets, formal quality assessment is not done and though market prices are available, it is difficult to associate the prices with any particular quality. Therefore, dissemination of exchange-based futures and spot prices helps market participants in different parts of the country to use it as a reference price. We thus expect that the integration between different spot markets will improve with an effective futures trading in the commodity. We tested this hypothesis by computing the correlation coefficient between wholesale and retail prices before and after the introduction of the commodity exchange.

If the futures markets are efficient we would expect that the wholesale-retail mark up will decline due to informational efficiency. We computed the markup between wholesale and retail prices before and after the futures trading to test this hypothesis. By the same argument, we would expect that the mark up between primary and secondary wholesale market would reduce in the presence of an efficient futures market. For some markets we also compared the price difference between primary and secondary wholesale markets before and after futures trading to test this hypothesis.

5.4. The impact on small farmers

Farmers, in general, gain from an efficient futures market in several ways. Efficient price discovery and dissemination of price information helps farmers to get better prices for their produce. If information is not easily available, small farmers suffer more compared to large farmers as they have to spend a relatively higher amount per unit of goods they sell in acquiring information. It is also difficult for them to predict futures prices, again due to higher cost of acquiring relevant information. In the presence of futures trading, futures exchanges make special effort to disseminate both spot and futures price information as widely as possible on a real time basis so as to attract more players to trade in their exchanges. This indirectly helps small farmers as information about spot as well as futures price becomes easily available. This helps them in taking decision regarding planting crops or selling them. While planting decisions are also influenced by many other factors, availability of more information on prices is likely to be very useful to small farmers. With easy availability of information in the market place, small farmers gain more as their bargaining power improves. Additionally, there is also likely to be more competition among the buyers in the market place. Small farmers may also be in a position to time their sales better. In order to test this hypothesis we compared the price realized by small and large farmers before and after futures trading. This was done for crops that have high volume of futures trading. If $P_{s,t-1}$ and $P_{s,t}$ are prices received by the small farmers in t-1 and t periods and $P_{l,t-1}$ and $P_{l,t}$ are the price received by large farmers during the same period, the above hypothesis indicates that

1. $D_{t-1} > D_t$, where $D_{t-1} = P_{l,t-1} - P_{s,t-1}$ and $D_t = P_{l,t} - P_{s,t}$
2. $\Delta P_{s,t} > \Delta P_{l,t}$ where $\Delta P_{s,t} = P_{s,t} - P_{s,t-1}$ and $\Delta P_{l,t} = P_{l,t} - P_{l,t-1}$.

We used survey data for testing this hypothesis.

6. Data description

6.1. Price data

Daily prices of NCDEX futures and NCDEX spot for each contract from the year 2004 to most recent available contract data in 2008 was used for analysis. In the case of co-integration and ECM the time range of data used is given in the Table 6.

Table 6: Contract data for co-integration and ECM

Commodity	From	To
Chickpeas	June 2004	December 2007
Cluster Beans	June 2004	December 2007
Mentha	October 2005	December 2007
Potato	August 2006	November 2006
	March 2007	September 2007
Soyabean	January 2005	December 2007
Sugar	October 2004	December 2007
Wheat	October 2005	May 2007

In order to perform long run time series tests like Johansen's co-integration and for building the Error Correction Model (ECM) the data was combined across contracts. As the futures contracts nearest to maturity had the highest volumes, they are the best representative futures prices. Therefore, we constructed a time series of futures prices of the nearest contract over the entire period of analysis by incorporating rollover. An open position typically is rolled over by hedgers to the next available contract in the last few days before expiry. Therefore, the open interest for a contract declines sharply in the last trading week. The last week data is not included in the data series. The cost of carrying charges is not substantial within a month and therefore can be combined across contracts. Hence, last one month data prior to the last week of maturity have been used in the analysis.

For analyzing the wholesale-retail market price relationships, weekly prices changes of wholesale markets and retail markets from 2002 to 2006 were collected. The Pre-Exchange period is considered as 2002 to mid-2004 and the post introduction period as mid-2004 to 2006. A correlation matrix was computed between different wholesale and retail prices during the Pre- and Post-Exchange period. The markets and data period used for wholesale and retail mark up is given in Table 7.

Table 7: Wholesale and retail data used for analysis

Commodity	Pre exchange introduction	Post exchange introduction	Markets
Sugar	1/4/2002 to 26/07/2004	1/08/2004 to31/12/2006	Delhi, Mumbai, Hyderabad, Kolkatta, Bangalore wholesale and retail prices
Chickpea	1/7/2001 to 31/3/2004	1/4/2004 to 31/12/2006	Delhi, Mumbai, Hyderabad, Ahmadabad, Kolkatta, Bangalore wholesale and retail prices
Wheat	1/1/2002 to 30/06/2004	1/7/2004 to 31/12/2006	Delhi, Mumbai, Chennai and Bangalore wholesale and retail prices
Red gram	1/7/2003 to 31/03/2004	1/04/2005 to 31/12/2006	Delhi, Mumbai, Kolkatta, Chennai wholesale and retail prices

6.2. Primary survey data

The other approach followed in the study is to survey the market participants, specifically farmers, to understand awareness, usage, and perception of futures market. The survey was also done for other market participants such as traders and processors. A multistage random sampling method was followed to select farmers for the survey. In the first stage those areas (states, districts and talukas) that are prominent with regard to the production of the respective crops were selected. Table 8 indicates the major producing states selected for surveying farmers for each crop.

Table 8: States selected for primary survey for each selected crop

State	Crops				
UP	Sugarcane	Black gram	Gram	Red gram	Wheat
TN	Sugarcane				
Maharashtra	Sugarcane	Black gram	Gram	Red gram	
AP	Sugarcane	Black gram	Red gram		
MP	Black gram	Gram	Red gram		
Rajasthan	Black gram	Gram			
Punjab	Wheat				
Haryana	Wheat				
Gujarat	Guar-seed				

Within each state, two districts were chosen which represented the prominent growing areas of the respective crops and within each district, two prominent talukas representing important growing areas of the respective crops were selected. Steps were taken to ensure that the two talukas are not geographically contiguous and are spread apart to assure enough variability in the sample.

Within the talukas, a sample of farmers was drawn randomly from the available population of the farmers growing the selected crop in the village. The number of farmers drawn from this population is in proportion to the sample size allotted for the particular taluka, which in turn is derived from the sample size allotted to the district. Table 9 presents the sampling plan for each state and each selected crop. While conducting the survey, data about crops other than the main target crop were also collected. This has helped to increase the data points beyond the targeted number of samples for each crop.

Table 9: Number of farmers selected from each state for each selected commodity

State	Sugarcane	Cluster Bean	Black Gram	Chickpea	Red Gram	Wheat	Total
UP	100		60	75	75	100	410
TN	50						50
Maharashtra	100		60	75	75		310
AP	50		60				110
MP			60	75	75		210
Rajasthan		100	60	75	75		310
Punjab						100	100
Haryana						100	100
Gujarat		50					50
Total	300	150	300	300	300	300	1650

An important objective of the study is to test whether small farmers benefited from the futures trading. While there could be direct impact of futures trading on small farmers through use of futures prices for planting decision, hedging in the futures, etc., there may also be indirect benefits such as improvement in availability of price information which increases competition in the market and which allows for better sales decisions. In the survey questionnaire, information was sought on prices realized in the last three years (2004, 2005 and 2006) for major crops grown by the farmer. In the year 2004, futures trade was at a very nascent stage at the national exchanges and only a few commodities were traded. As volumes picked up in the subsequent years, the impact is likely to have taken place and hence the difference in the price received by small and large farmers would reduce. The data on land holding was also collected. Using this information, analysis was done for four crops: wheat, chickpea, red gram and cluster bean. While these crops are traded in high volumes, their performances vary with respect to price discovery and risk management functions.

Small samples of the traders and processors of each selected commodity were interviewed to assess their awareness and perception of futures market as well as the impact of futures on them. Table 10 presents the trading centers from where traders were selected for each of the commodities. From each of these markets, a sample of about 15 traders was selected from 2-3 trading centers of each commodity.

Table 10: Trading centers selected for each commodity

Commodity	Trading Centers
Wheat	Karnal, Kota
Chana	Indore, Akola
Tur	Latur, Jalgaon, Gulbarga
Urad	Latur, Jalgaon, Tenali
Sugar	Hapur, Kolhapur
Guar seed	Bikaner, Jodhpur

A sample of 10-12 processors of each commodity was also selected except in the case of wheat, as wheat milling is largely fragmented and distributed throughout the country and there are only a few large processors. The information collected is mostly qualitative in nature. While surveying it was found that a clear understanding of the hedging process is lacking among the traders and the small processors.

7. Findings of the study

7.1. Convergence in Indian commodity futures market

Proper convergence in the spot and futures prices is lacking in most of the commodities and there is lack of any predictable pattern in the basis indicating possibilities of absence of effective arbitrage between the cash and futures market (Annex 2). The possible imperfections in the spot market may have a bearing on the futures market, which at times could lead to non-convergence of the contracts as it approaches maturity. The commodity exchanges have put in place a mechanism wherein all the outstanding open positions on the maturity of the contract have to be settled / delivered on the spot price of the settlement day of the contract which ensures that the futures markets are in sync with the prevailing spot markets. Convergence problem is greater in the case of wheat, sugar, potato, mentha and to some extent in the case of cluster bean. This indicates there are significant risks in hedging these commodities.

Table 11 indicates that the basis risk is lower than price risk for most of the contracts in the case of red gram, soybean and cluster bean. In case of wheat, sugar and mentha oil, however, a number of contracts had higher basis risk than spot price risk. For the futures trading to be an effective risk management tool, it is necessary that the basis risk is lower than the spot price risk.

Table 11: Extent of Basis Risk in relation to Spot price risk

Commodity	Basis risk > Price risk (No. of Contracts)
Wheat	14 out of 26
Chickpea	14 out of 44
Red Gram	0 out of 12
Red Gram Desi	0 out of 4
Black Gram	4 out of 17
Black Gram Desi	4 out of 4
Sugar	18 out of 40
Cluster Bean	6 out of 44
Mentha	11 out of 32
Potato	1 out of 15
Soybean	3 out of 44

7.2. Efficiency of the futures markets

Market co-integration analysis showed that long run equilibrium between spot and futures exists in all the commodities (Table 12). The value of β is equal to 1 and α is greater than zero. However, the short run market efficiency is lacking. The α is less than one for all the commodities and the spot prices are influenced by lagged spot prices apart from lagged futures prices. While the immediate lag of futures price changes influence spot price changes, which we would expect, the other lags of future price changes and spot price changes also influence current spot price changes, indicating inefficiency in the market. Inefficiency is high in the case of chickpea, soybean, sugar and wheat. The mentha oil market is better compared to other commodities in terms of short run efficiency.

Hedge ratios calculated for the period that data are available also shows that the extent to which the hedgers can effectively hedge their stock is in the range of 20 per cent in the case of sugar to 55 per cent in the case of soybean (Table 13). Hedge ratios calculated for each contract also showed similar result and no significant increase in the hedge ratio over time is found. While the price risk reduction is there, it is not sufficient to enable hedger to full hedge their stock.

Strong linkage between futures and spot, required for the efficient market functioning is yet to develop. This is likely due to the lack of hedging, which may be the result of high basis risk and non-convergence of prices.

7.3. Causality

Granger causality tests are further conducted to test the influence of lagged spot and futures prices on the current spot and futures prices. The results are presented in Annex 3. We find that the futures price changes cause spot price changes. We do not see a strong information flow from the spot price to the futures price. If there is lack of hedging, unidirectional causality from futures to spot could have an adverse effect on spot prices.

7.4. The wholesale-retail price relationship

In the case of chickpea and wheat, the difference between prices in primary wholesale market and retail market has not declined during arrival season after the introduction of futures market (Figure 2 & 3). While we observe a decline the price difference in wheat market during the off-season, it has increased after the introduction of futures market in the chickpea market.

Table 12: Estimated coefficients for co-integration and ECM (figures in brackets are p-values)

Commodity	Long-Run Cointegration Parameter β	Coefficient estimates for ΔC_t					Coefficient estimates for ΔF_t				
		Z	ΔC_{t-1}	ΔC_{t-2}	ΔF_{t-1}	ΔF_{t-2}	Z	ΔC_{t-1}	ΔC_{t-2}	ΔF_{t-1}	ΔF_{t-2}
Chickpeas	-1.0017	-0.0466	-0.0913	0.0834	0.4209	-0.0926	0.0064	0.0234	0.0430	0.0278	-0.0033
		[0.0001]	[0.0090]	[0.0048]	[0.0000]	[0.0023]	[0.6427]	[0.6136]	[0.2734]	[0.4472]	[0.9347]
Cluster Bean	-0.9676	-0.0421	-0.3723	-0.0688	0.5381	0.0474	0.0711	-0.0209	0.0033	0.1273	-0.0643
		[0.0534]	[0.0000]	[0.0819]	[0.0000]	[0.2140]	[0.0169]	[0.7430]	[0.9506]	[0.0094]	[0.2165]
Mentha	-1.0495	-0.0270	-0.0567	-0.0731	0.2369	0.0670	0.0064	0.2695	0.1338	-0.0483	-0.1007
		[0.0088]	[0.2204]	[0.1026]	[0.0000]	[0.0699]	[0.6311]	[0.0001]	[0.0208]	[0.3056]	[0.0350]
Soya Bean	-1.0030	-0.0560	0.2094	0.0477	0.0952	-0.0466	0.0076	0.1702	0.0475	-0.1137	-0.0237
		[0.0000]	[0.0000]	[0.0982]	[0.0001]	[0.0468]	[0.5111]	[0.0001]	[0.2184]	[0.0004]	[0.4500]
Sugar	-1.0248	-0.0104	0.1062	0.0414	0.2117	0.0443	0.0064	0.0265	-0.0350	0.0881	-0.0022
		[0.0103]	[0.0019]	[0.1887]	[0.0000]	[0.0344]	[0.3655]	[0.6572]	[0.5250]	[0.0114]	[0.9514]
Wheat	-1.0367	-0.0295	0.1498	-0.0629	0.1094	0.1070	0.0037	0.1043	-0.0780	0.0334	-0.0364
		[0.0053]	[0.0013]	[0.1711]	[0.0101]	[0.0122]	[0.7568]	[0.0473]	[0.1324]	[0.4857]	[0.4505]

Table 13: Hedge ratios for various commodities

Commodity	From	To	Hedge Ratio
Chickpea	JUN2004	JAN2008	0.38989
Cluster bean	JUN2004	JAN2008	0.54463
Mentha oil	OCT2005	MAY2008	0.49527
Soybean	JAN2005	MAY2008	0.55791
Sugar	OCT2004	JAN2008	0.20610
Wheat	OCT2005	MAY2007	0.28892

Figure 2: Difference between prices of retail and primary wholesale markets for chickpea.

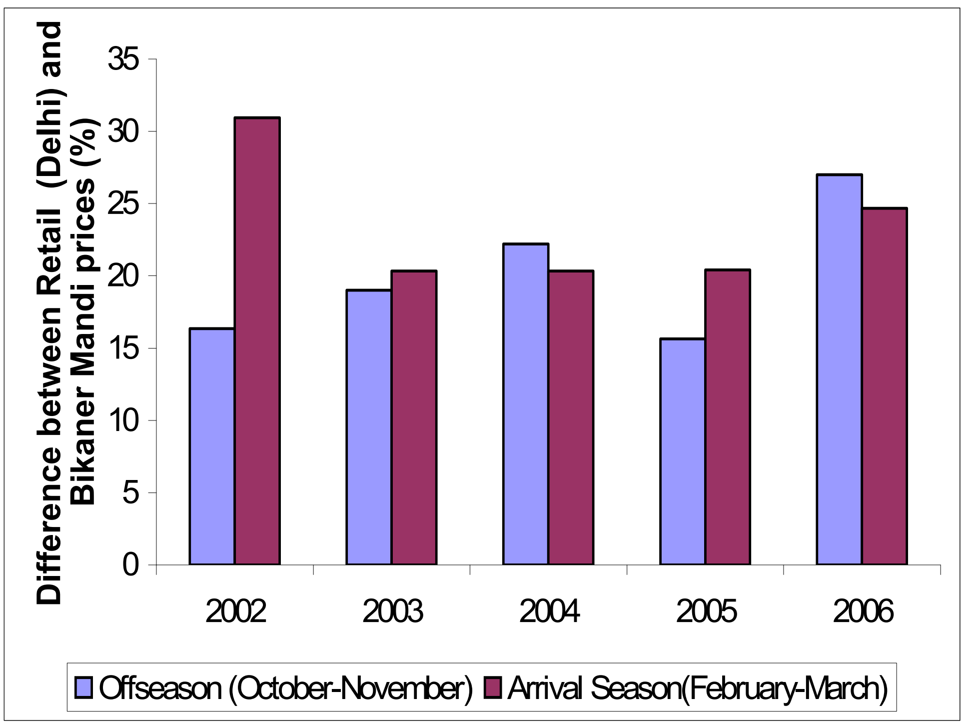
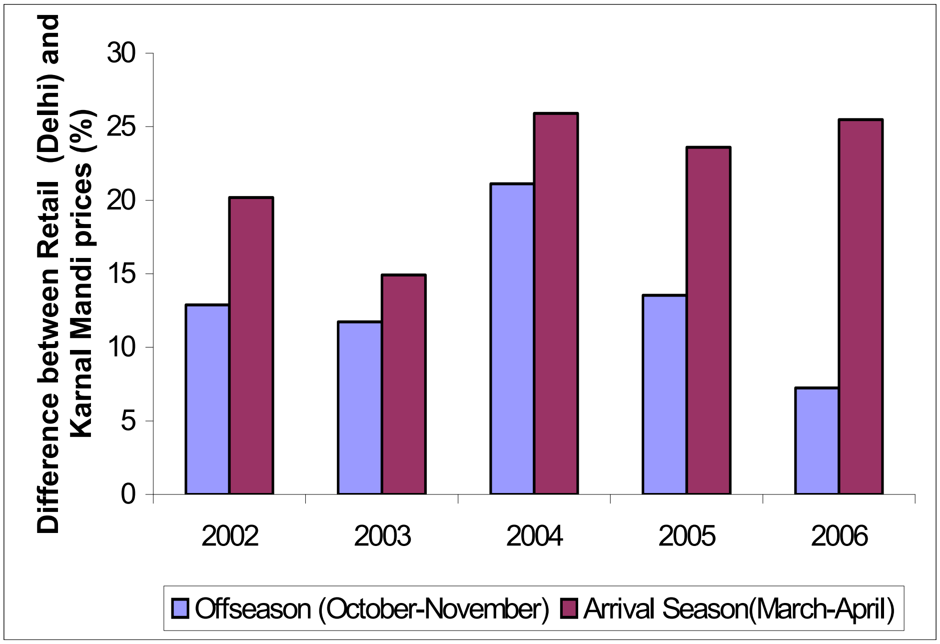


Figure 3: Difference between prices of retail and primary wholesale markets for wheat.



Except for the case of wheat and sugar, in all other commodities studied there is no substantial change in the difference between primary wholesale and retail prices. The difference between the lean and peak season prices also has not changed. In the case of wheat, the difference between the primary wholesale market prices and the retail prices have increased during the post-exchange era, seemingly indicating that the effect of price increase was en-cashed mostly by the intermediaries and not the farmers. In the case of sugar, the wholesale retail price spread has come down during the post-exchange period. There is not clear trend on the impact of futures trading on the retail mark-up (Tables 14a, 14b & 14c). In commodities like wheat and red gram, while in some markets the mark-up has increased, in other market the mark-up has declined. In the case of chickpea we observe that the mark-up has mostly increased.

Table 14a: Wholesale and retail mark-up (%) for wheat

Aspects	Markets	From January 2002 till June 2004	Between July 2004 till December 2006	Percent change
Average retail mark-up as a percent of wholesale prices	Delhi	12.83	13.69	6.70
	Mumbai	13.31	10.77	-19.03
	Bangalore	10.12	12.22	20.74
	Chennai	13.31	12.24	-8.07
	Average	12.39	14.02	13.11

Table 14b: Wholesale and retail mark-up (%) for chickpea

Aspects	Markets	From July 2001 till March 2004	Between April 2004 till December 2006	Percent Change
Average retail mark-up as a percent of Wholesale prices	Delhi	20	22	10
	Mumbai	11	12	9
	Kolkata	16	16	0
	Chennai	12	14	17
	Average	15	16	8

Table 14c: Wholesale and retail mark-up (%) for red gram

Aspects	Markets	From July 2003 till March 2005	Between April 2005 till December 2006	Percent Change
Average retail mark-up as a percent of wholesale prices	Delhi	17.74	13.02	-26.61
	Mumbai	9.42	9.52	1.02
	Kolkatta	10.87	14.73	35.54
	Chennai	9.92	9.20	-7.22
	Average	11.99	11.62	-3.08

The retail-primary wholesale market price difference had not declined after introduction of futures market for wheat, chickpea and red gram (Tables15a, 15b and 15c). In fact in the case of wheat and red gram, we see an increase in the mark-up after futures was introduced.

Table 15a: Difference between retail and primary wholesale market prices of wheat pre and post introduction of futures trading

	Pre-Exchange	Post-Exchange	Percent difference
Average Delhi retail prices (Rs/Qtl)	774	955	23
Average Karnal market prices (Rs/Qtl)	670	812	21
Average difference as % of Karnal market price	15	19	27

Table 15b: Difference between retail and primary wholesale market prices of chickpea pre and post introduction of futures trading

	Pre-Exchange	Post-Exchange	Percent difference
Average Delhi retail prices (Rs/Qtl)	2027	2251	11
Average Bikaner market prices (Rs/Qtl)	1675	1873	12
Average difference as % of the Bikaner market prices	21.6	20.5	-5

Table 15c: Difference between retail and primary wholesale market prices of red gram during pre and post introduction of futures trading

	Pre-Exchange	Post-Exchange	Percent difference
Average Mumbai Retail prices (Rs/Qtl)	2927	3038	3.8
Average Latur market prices (Rs/Qtl)	1839	1821	-1.0
Average difference as a percent of Latur Market prices	59	67	

An important outcome of futures trading seems to be that, in all cases after introduction of futures trading, there is stronger spatial integration between physical markets. This can be observed from an increased number of significant correlation coefficients after the introduction of futures trading (Tables 16a, 16b, 16c). The futures prices seem to have served as a reference market for physical markets.

Table 16a: Correlation between wholesale and retail prices of wheat in important markets

	Pre-Exchange	Post-Exchange
No of cases tested	66	66
No of cases significant	5	13
> 0.7	2	9
0.5 to 0.7	2	3

Table 16b: Correlation between wholesale and retail prices of chickpea in important markets

	Pre-Exchange	Post-Exchange
No of cases tested	66	66
No of cases significant	12	24
> 0.7	1	3
0.5 to 0.7	1	3

Table 16c: Correlation between wholesale and retail prices of red gram in important markets

	Pre-Exchange	Post-Exchange
No of cases tested	28	28
No of cases significant	28	28
> 0.7	14	28
0.5 to 0.7	12	0

The relationship between wholesale and retail prices also improved in most of the cities (Table 17a, 17b and 17c).

Table 17a: Correlation coefficient between weekly price changes in wholesale and retail markets of different regions for wheat

Correlation between Wholesale and Retail Markets	Pre-Exchange	Post-Exchange	Differences
Delhi	Ns	Ns	
Indore	0.66	0.95	0.29
Mumbai	Ns	Ns	
Bangalore	0.71	0.78	0.07
Chennai	0.59	0.56	-0.03
Hyderabad	0.88	0.44	-0.44

Table 17b: Correlation coefficient between weekly price changes in wholesale and retail markets of different regions and their differences

Correlation between Wholesale and Retail Markets	Pre-Exchange	Post-Exchange	Differences
Delhi	0.22	NS	NS
Mumbai	0.39	0.68	0.29
Ahemdabad	0.44	0.94	0.5
Kolkatta	NS	NS	NS
Bangalore	0.54	0.96	0.42
Hyderabad	0.79	0.87	0.08

Table 17c: Correlation coefficient between weekly price changes of red gram in wholesale and retail markets of different regions and their differences

Correlation between Wholesale and Retail Markets	Pre-Exchange	Post-Exchange	Differences
Delhi	0.9	0.92	0.02
Mumbai	0.88	0.99	0.11
Kolkatta	0.51	0.89	0.38
Chennai	0.85	0.95	0.1

The futures market is rather a new concept in the Indian scenario. The year 2006-07 being the second year of active futures market in identified commodities, these markets had not yet fully served the purpose of risk management. While there is long-run equilibrium between the prices of physical and futures market, the short run cash-futures linkage was not strong. However, the futures markets have a significant achievement by way of integrating geographically separated physical markets, likely due to the fact that they serve as reference markets. In the case of chickpea, sugar, wheat and red gram, there is improvement in correlation between weekly price changes in wholesale and retail markets in the Post-Exchange period. In the absence of an efficient spot market, the futures market so far may have helped in integrating spot markets, while their use in the risk management functions is yet to develop in a significant way. In some commodities such as cluster bean and pulses, the extent of price risk reduction has been encouraging. As futures trading concepts are internalized in the decision making process by various players in the value chain and as they start using the exchange for risk management purpose, the extent of spot and futures market integration is likely be strengthened and that will in turn encourage further use of futures market.

7.5. Participation and knowledge

At the time of the survey, only a handful of farmers were aware of the term futures and had very preliminary understanding of the concept (Annex 4). More than half of the farmers do not even consider that knowledge of prevailing prices of the crops they grow is important when they are selling the crops as they have to sell the produce at whatever price is offered (Annex 4). Less than half of the farmers are able to defer sales by a maximum of 20-30 days of harvesting in expectation of a better price. Most of the sampled farmers said that there is an increase in prices received by them for all the target commodities during 2006 compared to 2005 season. The increase is as high as 23% in case of black gram. Due to the increased prices, the area under the crop has been retained and in some cases area under the crop increased. The survey also shows that fellow farmers and traders are popular sources of price information.

There is a fair amount of knowledge about futures trading and national level exchanges among traders and processors (Annexes 5 & 6). However, their participation level is low and also the confidence level on the exchanges. There is hardly any hedge participation by the processors or traders. The participation is mainly for speculative purposes. Moreover, the basis of taking position is purely gut feel or technical advice given by brokers. Traders' do not have a clear idea about how futures prices are formed. Traders and processors feel that their knowledge of the commodity might be helpful in taking positions in the futures market. They indicated both fundamental reasons (imbalances in demand and supply) as well as speculation through futures trading for the increase in volatility in the spot markets during the post-exchange period. Very few traders take important decisions regarding their product portfolio and timing of buy and sell based on futures prices.

The survey revealed that awareness about the future trading among the farmers is negligible. With the existing marketing infrastructure and the farmers merely accepting the offered price, information on futures prices could become a potent tool for bargaining. However, for this to happen, the farmers have to be made aware of and organized, and most importantly, warehousing and financing arrangements need to be created to meet his immediate needs. The quality specifications, delivery norms, margin, and lot sizes of most of the commodities traded at the bourses, make it difficult for the average farmers (and even traders and processors) to directly participate in exchange to trade as hedgers. So, there is a need to introduce an agent who can un-bundle the contract to farmers. NCDEX is trying to reach out to farmers through cooperatives, banks and NGOs who could act as aggregators. The Government could think of enabling cooperatives to bridge this important link.

The futures markets so far have had positive impact on price discovery. The integration between various spatially separated markets have improved as the futures market and associated spot price dissemination are likely playing the role of reference market. The long-run relationship between spot and futures prices is also strong. However, in the short run there are aberrations particularly in commodities like wheat where the physical and futures market relationship needs strengthening.

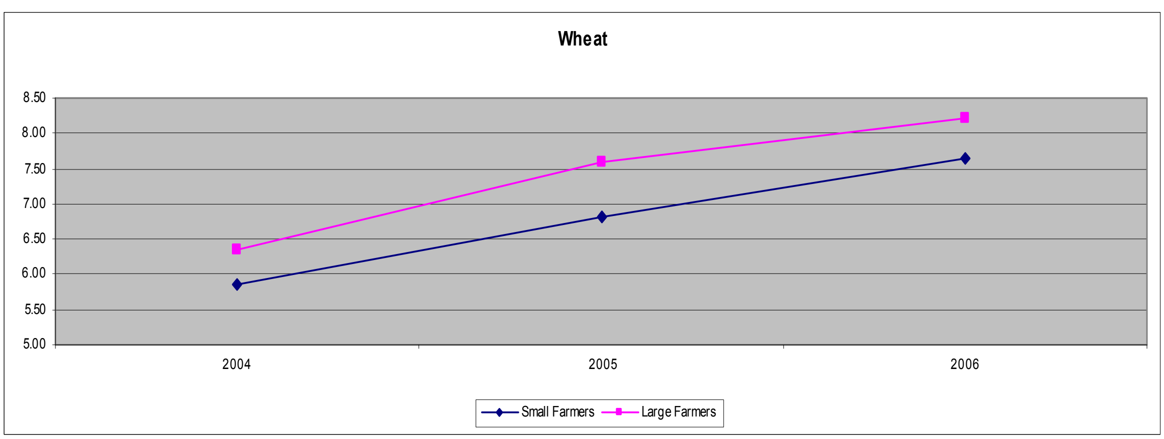
7.6. Impact on small farmers

In the case of wheat, we do not observe substantial difference in the price realized by small and large farmers during 2004 to 2006 (Table 18) though the increase in price is marginally higher (30.5%) in the case of small farmers compared to large farmers (29.5%). The Table indicates that the difference in the price realized by large and small farmers reduced by about 10% during the year 2004 through 2006. While there seems to be some improvement in the prices received by small farmers compared to large farmers, it is not very evident on Figure 4.

Table 18: Prices received by small and large wheat farmers during the period 2004-06.

Year	Small farmers		Large farmers		Difference in price received between small and large farmers	
	Num-ber	Price received (Rs/Kg)	Number	Price received (Rs/Kg)	p-value for significant difference	Percentage
2004	193	5.86	116	6.34	0.00	7.54
2005	305	6.82	360	7.58	0.00	10.07
2006	312	7.65	362	8.21	0.00	6.79
Change in prices during 2004-06 (%)		30.55		29.50		-9.98

Figure 4: Prices received by small and large wheat farmers

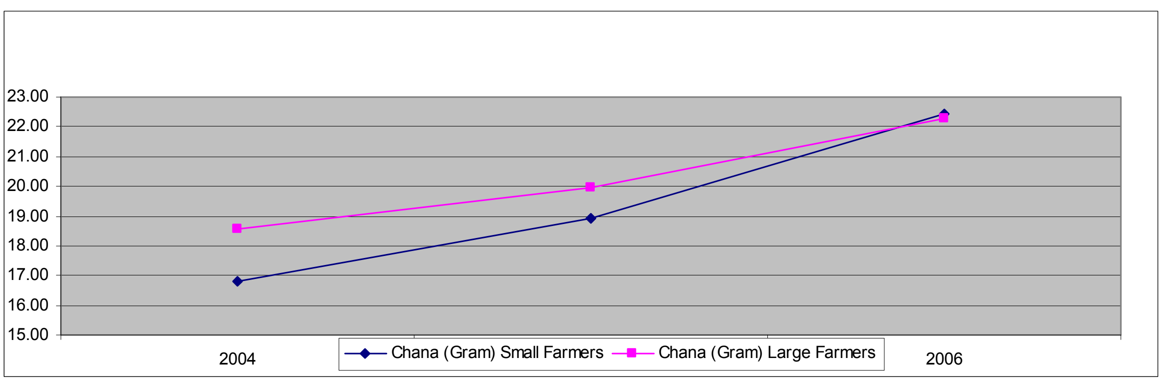


Data on prices received by chick pea farmers is very revealing. The small farmers gained 33.6% higher prices during 2004 through 2006 compared to only 20.2% by the large farmers (Table 19). The small farmers received about 9 % less price than the large farmers in 2004. This difference was reduced in 2005 and ultimately vanished in 2006. The presence of futures trading could be a major reason for this trend. The reduction in the differences in the price realization is clearly evident in Figure 5.

Table 19: Difference in prices received by small and large chickpea farmers

Year	Small farmers		Large farmers		Difference in price received between small and large farmers	
	Number	Price received (Rs/Kg)	Number	Price received (Rs/Kg)	p-value for significant difference	Percentage
2004	143	16.79	44	18.54	0.00	9.41
2005	219	18.92	185	19.96	0.00	5.19
2006	217	22.43	186	22.29	0.89	-0.63
Change in prices during 2004-06 (%)		33.56		20.23		-106.72

Figure 5: Prices received by small and large chick pea farmers

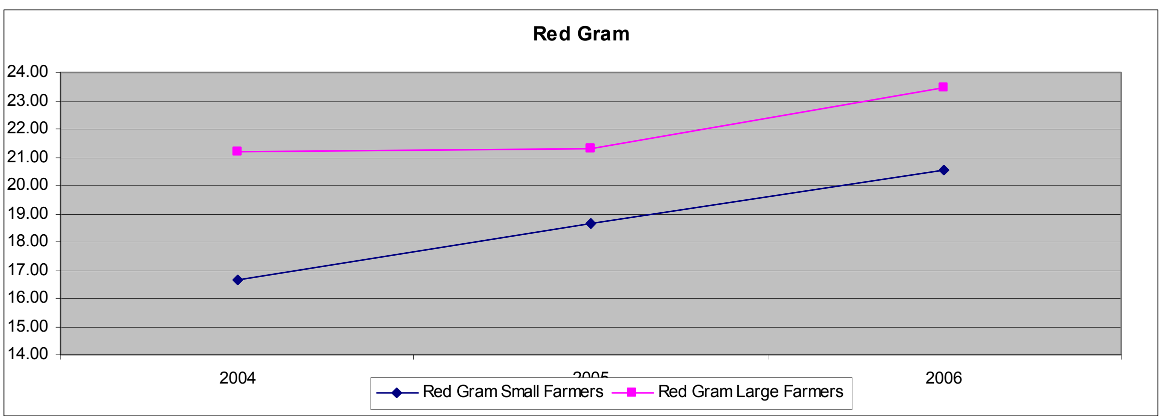


In the case of red gram the result is similar to that observed in the case of chickpea. The price received by small farmers increased by 23.2% during 2004-06 whereas for large farmers in increase is 10.9% (Table 20). The difference in prices received by small and large farmers is reduced by 41.1%, from 21.3 per cent in 2004 to 12.5 % in 2006. This narrowing difference is evident from Figure 6.

Table 20: Difference in prices received by small and large red gram farmers

Year	Small farmers		Large farmers		Difference in price received between small and large farmers	
	Num-ber	Price received (Rs/Kg)	Number	Price received (Rs/Kg)	p-value for significant difference	Percentage
2004	110	16.65	118	21.17	0.00	21.33
2005	156	18.66	199	21.29	0.00	12.36
2006	155	20.52	206	23.47	0.00	12.56
Change in prices during 2004-06 (%)		23.21		10.86		-41.11

Figure 6: Prices received by small and large red gram farmers

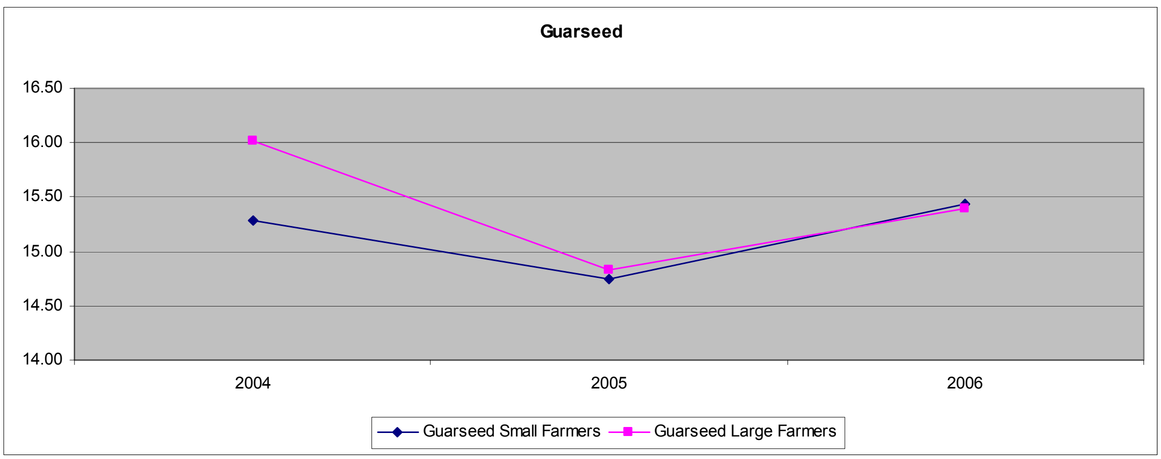


The results for cluster beans are also consistent with the result obtained earlier. While the prices received by large farmers decreased from 2004 to 2006 by about 4%, the prices received by small farmers increased by about one per cent during the same period (Table 21). The difference in the prices received by small farmers and large farmers was 4.6% during 2004 and the prices converged completely during 2006 as we observed in the case of chick pea. The convergence can be observed from Figure 7.

Table 21: Difference in prices received by small and large cluster bean farmers

Year	Small farmers: Number	Small farmers: Price received (Rs/Kg)	Large farmers: Number	Large farmers: Price received (Rs/Kg)	Difference in price received between small and large farmers: p-value for significant difference	Difference in price received between small and large farmers: Percentage
2004	14	15.29	22	16.02	0.00	4.60
2005	100	14.75	139	14.83	0.40	0.55
2006	80	15.44	99	15.39	0.96	-0.33
Change in prices during 2004-06 (%)		1.01		-3.96		-107.28

Figure 7: Prices received by small and large cluster bean farmers



Consistent results from the above analysis support the hypothesis that a well-functioning futures market can help small farmers in realizing better prices due to availability of more information on the current prices as well as futures prices. This is consistently evident from the analysis on chick pea, red gram and cluster bean prices. Not surprisingly then, better performing futures trading in the case of chick pea and cluster bean ensured that the difference in price realization between small and large farmers is negligible. Therefore, we conclude that small farmers may be able to get about 10 per cent higher prices in the presence of a reasonably well-functioning futures trading.

8. Conclusions

The use of the futures market for risk management purpose so far has been very limited except in the case of cluster bean where there is a reasonable amount of hedging taking place. Strengthening short-run cash futures price relationship by encouraging hedgers to use futures market for hedging purpose, needs immediate attention.

Commodity futures trading, being a reasonably complex process, requires time to fine-tune it to the individual commodity situation. As the exchanges are at the beginning of the learning curve, there is need for a large-scale campaign to build awareness among various actors in the value chain. Infrastructure facilities such as storages have to be adequately provided. Institutional arrangements such as aggregators have to be brought in. Exchanges have to take up confidence building measures (through strict measures to control excessive volatility are required).

The exchanges should play a greater role in awareness and confidence-building programs and demonstrate the use of futures market to various potential hedgers in the value chain. Each exchange should focus on a limited number of commodities at a time to involve potential hedgers in the value chain by creating awareness, building confidence to hedge in the futures, and fine-tune their systems and processes to facilitate user requirements. There is a strong perception in the minds of potential hedgers that large players could be manipulating markets. It is important for the exchanges to allay these fears by reducing daily price limits, reducing the role of market makers and strengthening self-regulation.

The government could facilitate infrastructure such as warehousing, grade standards and credit facilities through involvements of institutions such as banks, etc. Use of futures trading by various government agencies dealing with buying and or selling of commodities could be encouraged to hedge their risk in the commodity futures. As these agencies generally deal in large volumes, their participation will increase hedging substantially, which in turn will help in strengthening physical and futures markets and build confidence among the other players in the market to use the futures market. Additionally, as many government agencies will look for physical delivery, it would help to streamline the delivery mechanism in terms of processes and grade and standards. This will help other players to understand the futures mechanism well and also help in strengthening physical and futures market integration.

The futures markets in a short span of time have not only registered phenomenal growth in terms of volume of trade but also showed positive trends in terms of various qualitative factors as indicated above. The futures markets, like any other market, need time to mature and serve its intended purpose. The various regulatory interventions (increase in margins, reduction in price bands, limits on open position, suspension of contracts) by the Forward Markets Commission have been made to steer them towards achieving their intended purposes. The regulator of the commodity market is also perceived to be grossly under equipped in terms of regulatory capabilities and authority when compared to other regulators, like RBI, SEBI, etc. The fact that futures market in commodities are being regulated through an archaic Act, enacted in 1952, which does not address various challenges being faced by modern regulator and markets, does not help in inspiring confidence. There is an urgent need to upgrade the regulatory capabilities of the Forward Markets Commission by amending the Forward Contracts (Regulation) Act, 1952. To make the markets work efficiently, an optional product mix is needed. However, the present regulatory provisions prohibit the launch of options, index futures and various cash settled derivatives. Introduction of these products would not only provide alternate risk mitigation tools, but would also add to the liquidity and depth of the markets.

Another major challenge faced by the futures market is the imperfections in the spot markets. The success of a futures market depends on an underlying organized and efficient spot market and various enabling environment and logistical supports like warehouses, assaying and grading facilities, harmonization of various regulations and statutes governing the movement of goods across the states, etc. The proposed Act relating to Warehousing Development and Regulation would go a long way in bridging some of the gaps, which has been adversely impacting the price discovery and risk management functions of the futures market.

The results also clearly support the hypothesis that a well-functioning futures market can help small farmers in the realization of better prices through the availability of more information about the current as well as futures prices. This is consistently evident from the analysis on chick pea, red gram and cluster bean prices. Futures trading in the case of chick pea and cluster bean ensured that the difference in price realization between small and large farmers is negligible. Therefore small farmers may be able to get about 10 per cent higher prices in the presence of a reasonably well-functioning futures trading. Facilitating the functioning of futures is therefore likely to benefit small farmers substantially.

Annexes

Annex 1: Number agricultural commodities traded, added and discontinued in NCDEX

Month/ Year	# of Agricultural Commodities traded	No of Commodities added	# of Agri-Commodities Discontinued
Dec-03	7	7	0
Jan-04	7	0	0
Feb-04	7	0	0
Mar-04	7	0	0
Apr-04	10	3	0
May-04	10	0	0
Jun-04	10	0	0
Jul-04	19	9	0
Aug-04	20	1	0
Sep-04	20	0	0
Oct-04	22	2	0
Nov-04	21	0	1
Dec-04	21	0	0
Jan-05	24	3	0
Feb-05	25	1	0
Mar-05	27	2	0
Apr-05	32	5	0
May-05	33	1	0
Jun-05	33	0	0
Jul-05	33	0	0
Aug-05	34	1	0
Sep-05	33	1	2
Oct-05	36	3	0
Nov-05	37	1	0
Dec-05	37	0	0
Jan-06	38	3	2
Feb-06	38	0	0
Mar-06	38	0	0
Apr-06	38	0	0
May-06	38	0	0
Jun-06	38	0	0
Jul-06	40	2	0
Aug-06	41	3	2
Sep-06	42	1	0
Oct-06	41	1	0
Nov-06	41	0	0
Dec-06	41	1	1
Jan-07	39	0	2
Feb-07	32	0	7
Mar-07	31	0	1
Apr-07	30	0	1

May-07	29	0	1
Jun-07	28	0	1
Jul-07	28	0	0
Aug-07	28	0	0
Sep-07	28	1	1
Oct-07	28	0	0
Nov-07	29	1	0
Dec-07	28	0	1
Jan-08	26	0	2
Feb-08	26	0	0
Mar-08	26	0	0
Apr-08	26	0	0
May-08	23	0	3
Jun-08	21	0	2

Annex 2: Divergence observed in the last 10 days of trading

Contract	Chickpeas	Cluster Beans	Mentha	Potato	Soyabean	Sugar	Wheat
Jun-04	-0.69	-0.97			-9.06		
Jul-04	-1.67	-3.87			-1.96		
Aug-04	-1.69	-2.69			4.05		
Sep-04	-1.36	-5.09			4.93		
Oct-04	-0.39	-0.91			0.70	-1.00	
Nov-04	-0.08	-1.21			0.04	1.03	
Dec-04	-0.72	0.22			-0.73	-0.71	
Jan-05	-1.21	-0.05			-0.48	1.15	
Feb-05	-1.20	0.05			-1.51	-1.24	
Mar-05	-1.24	-2.71			-0.70	-0.64	
Apr-05	-2.63	-2.44			-0.85	-0.09	
May-05	-2.51	-0.82			0.04	2.76	
Jun-05	-1.39	-3.54			-0.19	2.97	
Jul-05	-2.08	-2.61			-0.55	-0.18	
Aug-05	-0.59	-2.19			-0.95	0.86	
Sep-05	-0.30	-2.06			-0.94	0.78	
Oct-05	0.15	-2.08	-0.39		-1.30	1.79	0.56
Nov-05	-0.39	-2.30	-1.70		-1.24	2.05	1.29
Dec-05	0.96	-0.98	-3.79		-1.56	0.10	9.07
Jan-06	1.28	-0.99	-2.65		0.66	1.35	13.06
Feb-06	4.49	-1.11	3.67		1.59	2.47	9.89
Mar-06	2.69	-0.45	11.80		1.61	3.02	7.05
Apr-06	-2.33	-0.83	11.18		2.21	3.91	-2.73
May-06	-1.79	-1.39	6.90		2.48	3.97	-2.82
Jun-06	-2.20	-0.92	6.12		4.29	3.80	0.86
Jul-06	-0.38	-2.00	0.19		5.66	2.07	4.35
Aug-06	-3.94	-3.05	-0.77	-1.59	6.60	2.07	2.47
Sep-06	-0.53	-2.39	0.25	-6.38	7.24	3.18	4.29
Oct-06	-0.06	-3.05	2.00	-3.38	2.51	1.37	0.64
Nov-06	4.55	-5.07	4.26	-3.00	-0.09	0.54	2.74
Dec-06	-1.64	-4.39	6.75		0.22	0.97	9.39
Jan-07	1.35	-4.22	9.88		0.70	1.08	1.78
Feb-07	1.15	-2.93	4.57		0.26	-0.03	3.40
Mar-07	1.97	-3.57	4.21	-5.11	-0.25	1.34	-0.12
Apr-07	-4.68	-5.12	-1.28	-1.89	2.37	9.60	-5.23
May-07	-1.74	0.93	-3.10		0.84	13.14	-3.99
Jun-07	-0.87	0.97	3.40	-5.28	1.37	12.65	
Jul-07	2.42	-0.54	3.21	-4.72	-0.02	9.30	
Aug-07	3.11	-3.60	4.02	-4.01	-0.45	9.35	
Sep-07	1.80	-1.95	4.62	-2.32	0.51	7.25	
Oct-07	2.39	-1.34	6.58		-1.82	9.53	
Nov-07	0.31	-3.03	11.39		-0.40	9.47	
Dec-07	1.12	-1.43	13.67		-0.11	11.34	

Annex 3: Granger Causality Test (p-values)

Contract	Chickpeas: Futures Does Not Granger Cause Spot	Chickpeas: Spot Does Not Granger Cause Futures	Cluster Beans: Futures Does Not Granger Cause Spot	Cluster Beans: Spot Does Not Granger Cause Futures	Mentha: Futures Does Not Granger Cause Spot	Mentha: Spot Does Not Granger Cause Futures
Jun-04	0.00	0.10	0.22	0.00		
Jul-04	0.00	0.45	0.00	0.28		
Aug-04	0.00	0.64	0.00	0.68		
Sep-04	0.00	0.04	0.00	0.12		
Oct-04	0.00	0.02	0.00	0.62		
Nov-04	0.00	0.19	0.00	0.07		
Dec-04	0.00	0.11	0.00	0.11		
Jan-05	0.00	0.97	0.00	0.09		
Feb-05	0.00	0.29	0.00	0.38		
Mar-05	0.00	0.02	0.00	0.03		
Apr-05	0.02	0.26	0.00	0.16		
May-05	0.00	0.83	0.00	0.45		
Jun-05	0.00	0.03	0.00	0.02		
Jul-05	0.00	0.00	0.11	0.15		
Aug-05	0.00	0.53	0.03	0.47		
Sep-05	0.00	0.18	0.00	0.76		
Oct-05	0.00	0.50	0.00	0.80	0.72	0.96
Nov-05	0.00	0.38	0.00	0.23	0.62	0.15
Dec-05	0.00	0.08	0.00	0.21	0.09	0.00
Jan-06	0.00	0.01	0.00	0.66	0.20	0.00
Feb-06	0.00	0.51	0.00	0.75	0.00	0.00
Mar-06	0.00	0.05	0.00	0.07	0.00	0.00
Apr-06	0.00	0.06	0.00	0.31	0.00	0.39
May-06	0.00	0.12	0.00	0.02	0.00	0.00
Jun-06	0.00	0.03	0.00	0.50	0.00	0.39
Jul-06	0.00	0.16	0.00	0.03	0.00	0.79
Aug-06	0.00	0.50	0.00	0.02	0.08	0.61
Sep-06	0.00	0.74	0.15	0.09	0.00	0.03
Oct-06	0.00	0.05	0.10	0.10	0.00	0.76
Nov-06	0.00	0.38	0.01	0.02	0.00	0.48
Dec-06	0.00	0.69	0.00	0.75	0.00	0.10
Jan-07	0.00	0.70	0.00	0.62	0.00	0.00
Feb-07	0.00	0.80	0.00	0.05	0.00	0.02
Mar-07	0.00	0.24	0.00	0.90	0.00	0.00
Apr-07	0.00	0.21	0.00	0.17	0.00	0.59
May-07	0.00	0.33	0.00	0.22	0.00	0.05
Jun-07	0.00	0.57	0.00	0.03	0.02	0.39
Jul-07	0.00	0.84	0.00	0.28	0.19	0.79
Aug-07	0.00	0.37	0.00	0.35	0.40	0.21
Sep-07	0.00	0.12	0.02	0.33	0.16	0.00
Oct-07	0.00	0.26	0.00	0.00	0.20	0.03
Nov-07	0.00	0.20	0.00	0.67	0.07	0.11
Dec-07	0.00	0.39	0.00	0.89	0.01	0.36

Annex 3. Granger Causality Test (p-values) (cont'd)

Contract	SoyaBean Futures Does Not Granger Cause Spot	SoyaBean Spot Does Not Granger Cause Futures	Sugar Futures Does Not Granger Cause Spot	Sugar Spot Does Not Granger Cause Futures	Wheat Futures Does Not Granger Cause Spot	Wheat Spot Does Not Granger Cause Futures
Jun-04	0.95	0.00				
Jul-04	0.97	0.06				
Aug-04	0.97	0.06				
Sep-04	0.31	0.39				
Oct-04	0.12	0.02	0.48	0.03		
Nov-04	0.12	0.22	0.04	0.15		
Dec-04	0.63	0.92	0.11	0.90		
Jan-05	0.00	0.83	0.00	0.34		
Feb-05	0.00	0.91	0.00	0.44		
Mar-05	0.00	0.85	0.00	0.01		
Apr-05	0.00	0.26	0.00	0.15		
May-05	0.00	0.00	0.00	0.03		
Jun-05	0.03	0.37	0.00	0.07		
Jul-05	0.02	0.49	0.00	0.02		
Aug-05	0.00	0.00	0.00	0.05		
Sep-05	0.00	0.24	0.00	0.04		
Oct-05	0.01	0.96	0.00	0.13	0.00	0.56
Nov-05	0.00	0.35	0.01	0.55	0.01	0.15
Dec-05	0.00	0.14	0.00	0.16	0.00	0.05
Jan-06	0.00	0.11	0.00	0.11	0.00	0.79
Feb-06	0.00	0.01	0.00	0.12	0.00	0.41
Mar-06	0.00	0.26	0.00	0.05	0.01	0.13
Apr-06	0.00	0.41	0.00	0.45	0.00	0.59
May-06	0.00	0.55	0.00	0.01	0.63	0.02
Jun-06	0.00	0.52	0.00	0.06	0.59	0.02
Jul-06	0.00	0.24	0.00	0.17	0.62	0.06
Aug-06	0.00	0.42	0.00	0.17	0.00	0.42
Sep-06	0.03	0.00	0.01	0.20	0.00	0.66
Oct-06	0.06	0.43	0.01	0.24	0.00	0.36
Nov-06	0.00	0.06	0.01	0.03	0.00	0.62
Dec-06	0.01	0.05	0.32	0.09	0.00	0.54
Jan-07	0.00	0.26	0.00	0.02	0.00	0.80
Feb-07	0.00	0.51	0.01	0.40	0.00	0.40
Mar-07	0.00	0.55	0.00	0.23	0.02	0.02
Apr-07	0.00	0.10	0.00	0.10	0.14	0.03
May-07	0.00	0.29	0.00	0.54	0.17	0.08
Jun-07	0.00	0.90	0.00	0.50		
Jul-07	0.00	0.60	0.00	0.31		
Aug-07	0.00	0.01	0.00	0.36		
Sep-07	0.00	0.08	0.00	0.22		
Oct-07	0.00	0.03	0.00	0.66		
Nov-07	0.00	0.03	0.03	0.04		
Dec-07	0.00	0.06	0.09	0.12		

Annex 4: Summary findings of survey: Farmers

Crop	Total farmer sample	Average land holding in acres (percent irrigated)	Percent illiterate and modal education level	Number of farmers aware of futures trading	Percent of farmers seek spot price information	Percent farmers able to defer sales among those obtaining information (Mean no. of days deferred)	Average change in price obtained from 2005 to 2006	Percent of sample who retained and increased area under the crop
Wheat	781	7.34 (86%)	14, Class 1-6	11	48	40, (20)	+15%	72, 12
Chickpea	424	8.31 (47%)	7, Class 1-6	5	68	48, (25)	+15%	76, 17
Red gram	384	17.31 (35%)	12, Class 1-6	6	62	51, (32)	+20%	72, 14
Black gram	384	6.3 (47%)	18, Class 6-10	5	60	52, (32)	+23%	75, 21
Sugarcane	466	13.08 (88%)	15, Class 6-10	10	NA	NA	+10%	75, 19
Cluster bean	275	7.71 (0%)	19, Class 6-10	0	25	45, (20)	+11%	79, 15

Source: Naik (2008)

Annex 4: Summary Findings of the Survey: Farmers (cont'd)

Crop	States	Popular information sources on prices	Popular information sources on farming techniques	Popular Marketing channels
Wheat	UP	Market and fellow farmers	Input Dealers and AEO*	Village traders and APMC
	Gujarat	Fellow farmers	AEO	Pvt traders and APMC
	Haryana	Radio and market	Input Dealers and AEO	Village traders and company
	MP	Market and fellow farmers	Input Dealers and AAO	APMC and Village traders
	Maharashtra	Market and fellow farmers	AEO and Progressive farmers	APMC and Village traders
	Punjab	Newspaper (MSP)	Input Dealers and Progressive farmers	APMC and Village traders
	Rajasthan	Fellow farmers	Input Dealers and AEO	Village traders and Traders
Chickpea	UP	Fellow farmers and market	Radio and AAO	Village broker and APMC
	Maharashtra	Fellow farmers and market	Progressive farmers and AEO	APMC
	MP	Fellow farmers and market	Input Dealers and AAO	Traders
	Rajasthan	Fellow farmers and market	Input Dealers and Progressive farmers	APMC and Village broker
Red gram	Madhya Pradesh	Market and Newspapers	Input Dealers and Progressive farmers	APMC and Village broker
	Maharastra	Newspapers and Radio	Progressive farmers and AAO	APMC and directly to company
	Rajasthan	Market and fellow farmers	AEO and KVK	APMC and Village broker
	Uttar Pradesh	Market and fellow farmers	Input Dealers and Progressive farmers	APMC and Village broker
Black gram	Andhra Pradesh	Market and fellow farmers	Progressive farmers and AEO	Village broker
	Madhya Pradesh	Fellow farmers and Market	Input Dealers and AAO	Village broker and APMC
	Maharashtra	Market and fellow farmers	Progressive farmers and AAO	APMC and Village broker
	Rajasthan	Market	AEO and Input Dealers	Traders and village brokers
	Uttar Pradesh	Fellow farmers and Market r	Input Dealers and Progressive farmers	APMC and Village broker
Sugar	UP	Sugar factory	AEO and Input Dealers	Sugar factory
	Maharashtra	Sugar factory	AEO and AAO	Sugar factory
	AP	Sugar factory	Input Dealers and progressive farmers	Sugar factory
	Punjab	Sugar factory	Input Dealers and AEO	Sugar factory
	Haryana		Input Dealers and progressive farmers	
	Tamil Nadu		Radio and Input Dealers	
Cluster Bean	Gujarat	-	AEO	Private traders
	Haryana	Newspaper and market	Input Dealers and AEO	APMC and Village broker
	Punjab	-	Input Dealers and Progressive farmers	APMC and Village broker
	Rajasthan	Newspaper and market	AEO and Input Dealers	APMC and Village broker

Source: Naik (2008); *: AEO: Agricultural Extension Officers

Annex 5: Summary Findings of the Survey: Traders

Crop	Total trader sam-ple	Average storage in months	Change in turnover in 2006 compared to 2005	% awareness: on-online trading (national exchanges)	Most popular means of awareness	Percent of aware sample participating and type of majority participation	Exchange preferred for partici-pation	Major commodities traded	Basis for positions taken	Percent of participants in online trading who say that they benefited
Wheat	30	2	30% increase	100 (100)	Internet, News paper	57, Speculator	NCDEX	Cereals	Broker advice, Gut feel	0
Chickpea	57	2	11% increase	100 (87)	Newspaper	23, Speculator	NCDEX	Pulses	Broker advice, Gut feel	22
Red gram	47	2	54% increase	57 (34)	Newspaper	9, Speculator	NCDEX	Pulses	Broker advice, Gut feel	50
Black gram	45	1	40% increase	80 (100)	Fellow trader and Newspaper	33, Speculator	NCDEX	Pulses	Broker advice, Gut feel	22
Sugar	30	3	9% increase	100(100)	Newspaper and fellow trader	27, speculator and hedger	NCDEX, Regional exchange, Hapur	Sugar and cereals	Broker advice, Gut feel	17
Cluster bean	30	2	14% increase	100(100)	Internet	100, speculator	NCDEX,	All agri products	Broker advice, Gut feel	97

Source: Naik (2008)

Annex 5: Summary Findings of the Survey: Traders (cont'd)

Crop	Main merit of futures trading	Main de-merit of futures trading	Percent reported increased spot volatility post exchanges	Reasons for increased volatility (if any)	Farmers taking decisions based on futures prices (%)	Types of decision taken
Wheat	Maintain stability in market	Increased Speculation	61	Futures trading and illegal hoarding	47	Product portfolio, stocking and sales
Chickpea	Efficient Price discovery	Distortion by large players	88	Increased imbalances in D&S, Futures trade	9	Stocking and sales
Red gram	Support trade by giving direction	Increased price fluctuation	75	Corporates and illegal hoarding	11	Product portfolio, stocking
Black gram	Support trade by giving direction	Wrong signals to market	71	Futures trading and illegal hoarding	11	Product portfolio, stocking
Sugar		Increased price fluctuation	100	Futures trading and illegal hoarding	7	Stocking and sales
Cluster bean	Maintain stability in market	Increased price speculation	10		87	Product portfolio and selling

Source: Naik (2008)

Annex 6: Summary Findings of the Survey: Processors

Crop	Total processors	Popular channel of procurement of raw material	Price forecasting tools	Change in turnover in 2006 compared to 2005	% awareness on online trading (% awareness on national exchanges)	Most popular source of awareness	Percent of aware sample participating and type of majority participation	Ex-change preferred for partici-pation	Major commo-dities traded
Chickpea	14	Brokers and Mandi traders	Futures and spot price	87% increase	77 (100)	Fellow processors	22, speculation	NCDEX	Pulses
Red gram	14	Brokers and Mandi traders	Spot price and news	37% increase	46 (14)	Newspaper and Radio	0	NA	NA
Black gram	12	Brokers	Spot price and news	14 % increase	42 (100)	Newspaper	40, speculation and hedging	NCDEX	Pulses
Sugar	13	Farmers	Spot price and sugarcane area	43 % decrease	70 (100)	Newspaper	-	-	-
Cluster bean	10	Brokers	-	12 % increase	100(100)	Exchange representative	100, speculation and hedging	NCDEX	Cluster bean gum

Source: Naik (2008)

Annex 6: Summary Findings of the Survey: Processors (cont'd)

Crop	Percent of participants in online trading who say that they benefited	Main merit of futures trading	Main de-merit of futures trading	Percent reported increased spot volatility post exchanges	Reasons for increased volatility if any
Chickpea	50	Source of price forecast	Distortion by large players	100	Increased imbalances in D&S, Futures trade
Red gram	NA	Support procurement by giving price direction	Distortion by large players	46	Increased imbalances in D&S
Black gram	20	Platform for hedging	Increased speculation	80	Increased imbalances in D&S and monopoly of traders
Sugar	-	-	-	38	Increased imbalances in D&S
Cluster bean	33	Platform for hedging	Distortion by large players	100	Increased imbalances in D&S

Source: Naik (2008)

Chapter III

The modern spot exchange

1. Introduction

Recent research on the traditional agricultural marketing system in India indicates that agricultural spot markets are not efficient (Matoo et al., 2007; Ramaswami and Balakrishnan, 2002; Umali-Deininger and Deininger, 2001), lack integration (Palaskas and Harriss-White, 1996), are pested by trader collusion (Banerji, and Meenaski, 2004) and are characterized by a high level of wastage (Matoo et al., 2007). Given the likely pay-off and welfare effects of interventions, there is an increasing interest to improve these markets by the policy makers as well as the private sector.

Different major changes are occurring in agricultural markets, including the growing demand for high-value and processed products linked to increasing incomes and urbanization, the requirements of modern retail, and the insistence on food safety, especially so in export markets. First, for more than two decades, India has registered a growth rate of at least 5 to 6 percent a year. This growth has accelerated even further in the last years. Through its effect on incomes, the high growth rate is a strong driver for changing food consumption patterns, away from staples and towards high-value products such as fruits and vegetables, dairy, poultry and fishery products.[7] Second, a retail revolution is sweeping trough India - as well as the rest of Asia - with enormous consequences on food systems and agricultural production. Annual growth rates of sales by modern retail are currently around 75% and they are expected to stay that high or even to increase (Reardon et al., forthcoming). Third, food safety and agricultural health standards are increasingly important in international trade. These are established to reduce the risks of the spread of plant and animal pests and diseases and the incidence of microbial pathogens or contaminants in food. These standards are there to stay and

[7] For example, it is projected that the demand for fruits and vegetables in India will increase from 77 million tons in 2000 to 183 million tons in 2020 assuming an annual GDP growth of 7% over that same period (Mittal, 2006).

meeting increasingly high standards will be a critical challenge for India in expanding exports to industrial countries. It is also expected that meeting these standards will become increasingly important for tapping into lucrative local markets.

In this chapter we look at some innovative spot exchange models that are currently emerging as an alternative to these seemingly malfunctioning traditional agricultural markets and that might address the changes in agricultural markets and food demand. One of the unique characteristics of the modern spot markets is that they aim to separate out the different processes of physical handling, quality and quantity assessments, and financial settlements while these are all combined in a single spot transaction in traditional markets. We use case studies from the Bangalore area in the state of Karnataka as some of these modern models are currently being tried out there. This is not by accident as the state of Karnataka has the most progressive marketing legislation where regulators allow, among others, for the set-up of private wholesale markets as well as electronic auctions.[8]

More in particular, we compare in this chapter two models of emerging modern spot exchanges with the traditional system. Both of these models are characterized by allowing a large number of buyers and sellers to participate in modern transparent auctions. The first modern open-source exchange is an on-line virtual wholesale market (without any wholesale facilities), where after the on-line transaction has taken place, produce is shipped directly from the house of the seller to the place of the buyer. The second modern open-source exchange is an electronic auction system, which is linked to a physical wholesale market and modern wholesale facilities, where the produce is centralized for the transaction.[9]

The structure of the chapter is as follows. First, we look at the traditional spot exchange and discuss regulatory issues and the normal way of trading in these markets. Second, the

[8] In contrast with the majority of developing countries, India's agricultural markets in the majority of its states are still heavily regulated through an APMC Act, but it is not well understood what the impact of this regulation is on the functioning of the current system and to what extent this regulation inhibits market innovation as well as reduces efficiency.
[9] Sometimes referred to as a 'Terminal Market'.

on-line decentralized wholesale market that was recently started up is described and its functioning is evaluated. Third, we present the experience of the centralized electronic auction system. Fourth, we elaborate on the potential benefits of these modern spot exchanges for the smallholder.

2. The traditional spot exchange

2.1. Regulatory issues

Agricultural marketing in India is strongly regulated. Regulation has been deemed important by successive governments as to allow farmers to get the best prices and to avoid exploitation by unscrupulous traders (Shiva, 2007; Acharya, 2004). Agricultural marketing is regulated by the Agricultural Produce Marketing (APM) Act. For each market area, a Committee (APMC) is responsible for enforcing the Act and it is empowered to establish markets, control and regulate admissions to the market; charge fees (market, license and rental fees); issue and renew licenses, and suspend or cancel them. While the APMC collects significant revenues from market fees, the infrastructure on most markets is largely deficient with lack of water provision, covered areas, drainage and appropriate waste disposal (Umali-Deininger and Sur, 2007; Fafchamps et al., 2007).

The existing marketing structure inhibits the development of an integrated national market because of cumbersome licensing procedures and because of a cascading and complex tax structure. While the nominal costs of obtaining licenses are small, there are usually large opportunity costs in obtaining these licenses and often space limitations of wholesale markets in congested cities make it impossible for new entrants to come in, even if a license could be obtained. Taxes also have to paid in most of the states on transactions. In some states, a market fee has to be paid each time a transaction takes place while in other states, this tax only has to be paid once for the traded produce. This limits the movement of agricultural goods between different wholesale markets within a state and across state borders.

The existing Act prevents greater private sector involvement in the construction and operation of wholesale markets. The Amended Act proposes to remove the restriction of direct marketing by the farmer, opens market infrastructure development to other agencies, and establishes a framework for contract farming. However, this Act has not been amended by a large number of states, i.e. as of the beginning of 2007, of the 28 states in India, 11 states had amended the Act, 14 had not while 2 had never an Act in place, and one repelled it (Bihar).

The state of Karnataka - where these more modern marketing models are emerging - has been the most progressive in reforming the APMC Act. It was a pioneer in amending the Act to allow the National Dairy Development Board (NDDB) to set up terminal wholesale fruits and vegetable markets in Bangalore. By Karnataka Act No. 23/2007, amendments that are recommended in the Model Act, have all been put in practice. The explicit provision for the establishment of 'electronic spot exchange' has also been incorporated in this new Act. The new rules have officially been published on 19/03/2008, freeing the legal road for a change in agricultural marketing. New initiatives and investments are thus quickly emerging.[10]

2.2. Traditional spot markets in practice

The majority of traded agricultural products in India passes through the wholesale market (mandi). In a typical transaction, farmers or consolidators take produce to the mandi. Once they arrive at the wholesale market, they hand the produce over to a commission agent who will conduct an auction as to get the best prices for the farmer. Different buyers (retailers) can bid for the produce. The highest bidder wins the auction and obtains the produce. Depending on the setting of the wholesale market and the type of product, commission rates charged by the commission agent range between 6% and 14% in the case of fruits and vegetables and much lower (2-4%) in the case of grains and other large-

[10] For example, a license has been demanded at the APMC to set up 4 private mandis for a total value of 125 million $ (one fifth of the capital costs would be borne by the state government).

volume crops such as potato and onions. These rates are usually charged to the farmer. In some states, commission rates are also charged to the retailer (see Minten et al., 2008).

The current system suffers from a number of problems which might differ across locations in the country. First, agricultural produce is characterized by significant variation in quantity and quality, observable and non-observable. To allow buyers to make right valuation decisions, they need to obtain adequate information on the lot and mechanisms are thus ideally in place to address the asymmetric information problem. Given that often no personal relationships exist between farmers and final retailers and given that there are no repeated transactions between them, which might be an effective way of dealing with information asymmetries, information transmission is even more important. However, there is no objective system of quality verification in place. To assess the quality, traders rely exclusively on personal inspection themselves (Fafchamps et al., 2007; Minten et al., 2008). Quality is checked mostly by looking and touching the produce. To correctly assess quantities, lots should be weighted. However, weighting methods are still old-fashioned or, even more often, weighting does not take place at all. Even when produce is weighted, farmers and traders complain about 'rounding off effects', i.e. where only whole amounts of kgs are paid for. In most cases is the advantage of the rounding off towards the broker or the buyer. When no weighting takes place, farmers and retailers might still feel at ease with traditional units that are in vogue. However, a significant number of farmers seemingly feel uncomfortable with quality and quantity assessments on traditional markets (Minten et al., 2008).

Second, while modern markets, and especially international markets, put a high premium on food safety, this is seemingly less the case in these traditional markets. The use of modern inputs is relatively high in India, but there is currently little or no transmission in the marketing system for information on the use of inputs (Fafchamps et al., 2007). However, there might be important public health issues related to the lack of proper attention and control of these (Umali-Deininger and Sur, 2007; Athukorala and

Jayasuriya, 2003).[11] Only a small number of retailers are aware of the production activities on pesticide, fertilizer and irrigation water use by the farmers. Even if they are aware, this does not imply that they do sell safe food as recent research in India shows that there is no premium in traditional retail markets for these un-observable quality characteristics.

Third, the traditional system seemingly suffers from a lack of competition. A recent survey from wholesale markets in Uttarakhand (Minten et al., 2008) shows that there is little choice for farmers and retailers outside the broker system (however, there is a lot of choice within). Brokers as a group might thus have an incentive to keep the system as such and try as much as possible to protect their interests from outside competition. They seem to effectively do this through the organization of broker unions that use their powers - and money - to lobby politicians as well as market authorities. This is obvious through the non-respect of the APMC rules. It also shows up in the opposition that traders and brokers are able to successfully organize towards organizations that want to bypass them. For example, traders in the states of Uttarakhand and Uttar Pradesh succeeded in delaying the investments by modern retail in food markets by calling for large strikes. It is especially interesting that the modern retailer Reliance, that had a clear strategy of wanting to bypass brokers and to buy directly from farmers, got most of the heat of these protesters.[12,13]

Fourth, transaction costs are high on traditional markets. Two types of transaction costs for retailers as well as farmers can be distinguished, i.e. the monetary costs incurred and the opportunity costs of time to travel to the market as to assist in the auction. Depending on the distance to the market, farmers might have to spend long times traveling to the market and farmers have to rely on own transport means to get to the market. A recently

[11] For example, Marshall et al. (2003) tested fresh vegetables in different production sites and in the main wholesale market in Delhi. They found that 72% of the spinach samples exceeded the Indian Maximum Residue Levels (MRL) and 100% exceeded the Codex MRL level. Kumari et al. (2004) found that 26% of their samples of seasonal vegetables contained residues above the MRL levels.

[12] Interestingly, farmers staged also protests as to keep modern retail procurement there. They however lost.

[13] On the other hand, large schemes such as the e-choupal model, that used brokers while bypassing the regular wholesale markets, were easily accepted (Goyal, 2008).

conducted survey in Uttarakhand shows that farmers would spend on average 3.5 hours on the wholesale market on top of the often long travel to and from the mandi.

Fifth, brokers are often providers of input advances and insurance services to farmers. However, results from the Uttarakhand study suggest that the major role of the brokers would not be to pay for these interlinked markets. It is likely that part of the broker rates might be rent rewards due to licenses and space limitations in the wholesale markets. It thus seems that the efficiency of the whole marketing system might then be improved by encouraging extra competition with the broker system and/or a more efficient set-up of these auctions potentially not run by brokers but, for example, by appointed auctioneers as is done in some grain markets in India (Banerji and Meenakski, 2004), or by relying on modernizing spot markets.[14]

There are thus a number of problems with the existing market system that could seemingly be improved upon, to the welfare of the farmer and consumer. We discuss in the next two chapters two recent experiences that try to put in place a more efficient and modern system.

3. The decentralized on-line wholesale market (e-auction): The SNX experience

3.1. Set-up

In a unique initiative, the Safal National Exchange of India Ltd (SNX) was recently created as a commodity exchange platform to start trading horticultural crops. The Exchange is a joint venture of renowned players in this area, the National Dairy Development Board (NDDB), the Multi-commodity Exchange of India Limited (MCX) and the Financial Technologies India Limited (FTIL). This project started at the end of 2007 (December 14th). SNX currently employs 110 persons of which 70 are employed in

[14] Other authors have come to similar conclusions recently. For example, Goyal (2007) found that producer prices of soybeans in Central India increased by 1% to 5% on regular wholesale markets after the introduction of alternative marketing channels where soybeans could be procured directly from farmers. She explains this upward pressure by access to increased information by farmers and the pressure that this put on traditional traders.

the field and 40 in the headquarters in Bangalore.[15] Its initial membership is estimated at around 250 and the members include growers of horticultural crops, traders, self-help groups, growers' cooperatives, input distributors, etc.

The basic features of the model are the following. It is a self-regulated organization where members are connected to a central computer system and orders are matched based on the priority of highest prices and timing. Deliveries are mandatory and only well-defined qualities are accepted in the system. The organization is characterized by impartial management. Buyers as well as sellers are required to deposit "margin money" as to allow for trading. Trading takes place from Monday to Saturday between 10 am and 4 pm. The financial services for the exchange are provided by 5 clearing banks.[16]

The working model that SNX adheres to is the following: Farmers would deliver the product to members of the SNX, be it farmer associations, traders, broker firms, NGOs or self-help groups. Sellers give to the lot a unique contract id which reflects its specifics. They then quote a price for this lot on the platform that they would be willing to accept. Members that buy on the platform (wholesalers, traders, retail chains, processors and exporters) can take the offer or bid at a lower price. Members can then continue bargaining on-line until they agree or not agree. If there is an agreement, a trade margin, i.e. 10% of the traded value, is immediately deducted from the account of the seller and the buyer.[17] The full electronic payment by the seller is automatically settled on the next day through the clearing banks that work with SNX. These banks have direct access to the trading accounts of the members. The delivery then occurs on the day stated in the commodity specification when it was put up for sale. In the most commonly used contract, delivery is 3 days after the trade match occurred (referred to as T+3). The buyer is responsible for transport and for the payment of potential APMC taxes that would have

[15] More particularly in the fields of Supply Chain and Farmer Linkages (assisting the sellers) and in Business Development (assisting the buyers).
[16] Axis Bank, Union Bank of India, HDFC Bank, ICICI Bank, and State Bank of India.
[17] In the case the buyer does not pay, a 10% penalty will be levied on him. The same holds for the seller. When prices would increase dramatically in one day, the seller might have an incentive to pay the penalty and to not go trough SNX. This has occurred already a couple of times in the case of onions.

to be incurred. The buyer is responsible for the transport[18] and for the payment of potential APMC taxes that would have to be incurred.

SNX is currently offering 64 contracts for 7 commodities. The commodity characteristics are defined in strict ways for buyers and sellers with respect to quality, quantity, timing of delivery, and location. Each of these factors are important determinants for the price setting of a product and are thus important characteristics that the buyers have to be clearly informed about before the transaction: First, the commodities that are currently traded are limited. They include for fruits: apples, banana, mango, and grapes and for vegetables: potato, onion, and tomato; Second, each commodity that is traded has a location attached to it that is mentioned on the trading platform. It is then the responsibility of the buyer to arrange transport; Third, different types of delivery schedules are part of the commodity offering. Commodities can be delivered up to seven days after the transaction deal was done on the platform. The most common is three days after the transaction took place. The delivery time is explicitly stated to be part of the commodity that is traded; Fourth, the quantities that are traded are multiples of 1 tons in the case of most products, except for apples (expressed in multiples of 10 cartons) and potato (multiples of 16 MT).

While the other characteristics of the commodity for sale are easy to verify and will give probably the least problems between buyers and sellers, this is not the case for quality requirements for which stringent objective standards are needed as to avoid disputes. SNX has thus defined quality and grade standards for these selected horticulture commodities. These grades have been tested at the Fruit and Vegetable Unit of Safal over the last 15 years and are close to the grades being transacted in the traditional markets. It seems that they are thus easily understood by buyers and sellers. A detailed quality assurance protocol has been developed for each item to be traded at SNX including a list of characteristics, limits for each of the characteristics in measurable terms, maximum tolerance permissible, sampling and inspection procedures, provisions for re-sampling

[18] The buyer is free to take delivery and arrange transport, but he has the option to ask the seller to arrange to transport, as the convenience of buying can be achieved only if delivery happens without the buyer having to go to the production area.

and recording, and reporting of the results. An example of requirements in the case of mango is attached in annex 1. If the quality requirements are not met, the contract documents provide several guidelines and rules on what the deduction should be from the agreed upon price on the platform. This objective quality description is a major difference compared with traditional trade where quality assessments are subjective and is done personally by each buyer in every transaction (Fafchamps et al., 2008). The anonymity in the transaction should allow for more efficient transactions as well as facilitate the achievement of economies of scale in the system.

During the start-up of the platform, the SNX team implemented the protocol in the field to ensure quality. After the initial start-up, actual inspection is jointly done at the point of dispatch by a representative of the buyer and of the seller as to make sure that contract specifications are met. Owing to the perishable nature and differences in perception, quality related disputes are not uncommon in fresh fruits and vegetables trade. Any such disputes are resolved on a case by case basis through a mutual conciliation process between buying and selling members. The unresolved disputes are referred to and decided by an arbitration panel, as provided in the bye-laws and rules and regulations of SNX. The decision of the arbitration panel is final and binding on all the parties that are involved in the dispute.

On top of these services, SNX, through its division "Supply Chain and Farmer Linkages", provides several services to the farmer in the field and acts as a link across the country to facilitate: 1/ the development of trading linkages between growing associations, self-help groups, cooperatives, and trading members; 2/ the link between existing trading communities to the members; 3/ quality inspections on dispatch; 4/ logistics support related to freight decisions, timely deliveries, and corrective actions on buyer's feedback.

Two types of memberships currently exist.[19] The A-members are the sellers. They pay a 27,000 Rs fee to be able to participate in the exchange. Of this amount, 25,000 Rs. is used

[19] A "B" category membership is also offered. This category would include State level apex cooperative societies, marketing federations marketing boards, or similar bodies set up by the state governments. Currently, this category has no members yet.

towards a refundable security deposit and 2,000 Rs. is used for a one-time application fees. A-memberships are annually renewable after approval by SNX. There are restrictions on usage as sellers have only access to two or three viewer id's. The C-members are the buyers. They pay a much higher fee than the sellers as to be able to participate, i.e. 460,000 Rs. Of this amount, 10,000 Rs is used towards a processing fee, 250,000 Rs towards an admission fee and 200,000 Rs towards a refundable security deposit. C-memberships are transferable and there is an unlimited number of viewer id's for these members. Currently, SNX has about 104 C-members and 166 A-members. Among their C-members there are large cooperates such as the processors Pepsico, Coke, Premium Farms, Heritage Foods, Appolo Sindhuri, Kuvarji Comm and the modern retailer Reliance, a potential indication for the demand for this service by the formal sector.

Buyers and sellers are each charged 1.5% of the auction price. It is suggested by SNX that members can charge farmers and retailers each 2%. This implies that the transaction costs, excluding marketing costs such as transport as well as APMC taxes, would be 7% in total. However, it seems hard to ensure that only 2% is actually charged to farmers as well as retailers. SNX authorities stated that service charges could probably go down when higher volumes could be attracted over time (this is not unlikely as is the case in most future exchanges where broker costs also decrease over time).

3.2. Initial experiences

Table 1 shows how trade has evolved since the start of SNX in December 2007 until the end of March 2008. In total almost 6,000 tons of produce has been traded for a total value of 35.34 million Rs. (880.000 $). The Table shows how trade is gaining momentum over time and how trade in March doubled compared to the month of February. The most important crop that was traded on the platform has been onions which accounted for more than half of the quantities transacted. It seems that the most perishable crops that were initially offered (such as tomatoes and grapes) were the least successful to take off. The slow take-off for some products is also explained by the timing of the harvest season. For example, it is expected that mango for which production is starting in the month of April might be an important crop traded on the SNX in the months to come.

Table 1: Quantities traded on SNX platform 12/2007-03/2008

	Quantities (Tons)
By month	
December	217
January	1086
February	1681
March	3010
Total	*5994*
By crop	
Onion	3272
Banana	1050
Potato	1020
Kinnow	337
Grapes	299
Other	16
Total	*5994*

Source: SNX

Table 2 shows the initial spatial spread of memberships. Tamil Nadu and Karnataka are the states where initial memberships are best represented. Both states combined count for almost two thirds of all the potential sellers to the SNX. The East and the North are the least represented. The biggest success for the membership drive has been in those states where SNX has been allowed to work outside the APMC, i.e. Tamil Nadu, Karnataka, Andra Pradesh, and Maharasthra. The crucial linkage as to be allowed to do so has been the partnership with the National Dairy Development Board (NDDB).

While 166 A-members are currently members of the SNX exchange, a significantly smaller number has however actively traded on the exchange. It has been estimated by SNX staff that only 30 members actively participate in the trade. The current challenge of SNX is thus not to attract more members but to attract more trade from its existing membership base. They also face the challenge of further attracting sellers that are currently less well presented than the buyers. Some produce that was thus put up for sale did not get sold in this start-up phase. Some quality disputes have occurred in the initial phase and it was estimated that price changes were needed for 2.5% of the traded volume.

Table 2: SHGs/Farmer Associations Membership on SNX

	Category "A" Membership		
States	SNX/Safal Ass.	PCS	Total
Andhra Pradesh	5	2	7
Karnataka	36	6	42
Kerala	0	0	0
Tamil Nadu	11	51	62
South	**52**	**59**	**111**
Maharastra	31	9	40
Gujarat	0	0	0
Mady Pradesh	0	0	0
West	**31**	**0**	**40**
Orissa	0	0	0
West Bengal	0	0	0
East	**0**	**0**	**0**
Delhi	0	0	0
Rajasthan	0	1	1
Uttar Pradesh	4	0	4
Haryana	0	0	0
Punjab	4	1	5
J&K	0	0	0
North	**8**	**2**	**10**
All India	**91**	**70**	**161**

Source: SNX

3.3. Other experiences with on-line auctions

Different experiences are currently under-way with e-auctions in agricultural markets. However, despite the hype in the beginning of the 2000s, e-acutions have been slow in taking off in international markets (Akridge, 2001; Barton, 2003; Beurskens, 2003). Williams (2001) argues that e-auctions in agriculture are not able to overcome the most important drawback, i.e. what to do if one of the parties defaults and one is faced by large lawyer costs, implying that informal arrangements to assure on-time and quality delivery will be a preferred way of supplying products in US markets.

Some e-auction models are however emerging, especially so in the coffee market. Donnet et al. (2007) find that that these e-auctions in Central and South America are especially beneficial for small roasters in more uncertain environments. Recently, an e-auction has been started in coffee in Bangalore (Banker and Mitra, 2005, 2007). This e-auction was initiated by ITC Ltd. In the traditional system, a coffee auction is held every Thursday in Bangalore. It is the major weekly coffee auction held in India but other auctions are also held in various coffee growing regions of the country. The e-auction on the other hand is open for 5 days a week. Between 9 am and 11 am every day, sellers submit information about the lots for sale on that day such as coffee type and grade, lot size, reservation price, and details of the seller.

Banker and Mitra (2007) find that the coffee e-auction is identical to the physical auction, except for four dimensions: 1/ lower transaction costs: for commodities that are traded less frequently (i.e. thin markets), the search costs of finding a buyer might be significantly higher than for normal commodities and the transactions costs would thus be significantly reduced in this case; 2/ commodities that have higher price volatility are more likely to be traded on an e-auction; 3/ sellers that participate in e-auctions tend to be more sophisticated. The e-auction also seems to create a role for intermediaries who buy from the planters or from the physical auction in small lots and aggregate the lots and find buyers through the e-auction; 4/ trusted intermediaries and more established planners have an advantage as buyers view them as trusted partners.

The two major commodity exchanges (MCX and NCDEX) have both plans to expand their activities in this area and both are actively planning to trade staple products (as well as inputs) on such a platform. Following the example of SNX, MCX is scheduling to set up together with FTIL and with Nafed (the National Agricultural Cooperative Marketing Federation of India Ltd) the National Spot Exchange (NSEL). This is scheduled to start in the next months and it is expected to provide access to the farmers and the traders in all the blocks of the country. The platform would trade standardized contracts with clear quality indications for a range of commodities for immediate delivery at specific delivery centers (Unctad, 2007). After a long delay, the NSEL is planning to start trial operations in August 2008 (Economic Times, June 2, 2008). It would offer agricultural produce to competitive bidders from all over India and sell farm inputs as well. It is planned that the

National Spot Exchange (NSEL) will be accessible through 100,000 common service centers (CSC) in rural areas within a year and that it will reach out to more than 500,000 villages through the network of these centers. NCDEX is also scheduling to start online spot markets but their plans are seemingly less concrete than the ones of its competitor. It would invest in this area once the APMC Acts would allow them to do so. It would thus be interesting to carefully watch how these initiatives unfold and evaluate how they will help in making the marketing system more efficient and how policy and investments might help in up-scaling.

4. The centralized electronic auction wholesale markets: The Safal Market experience

4.1. Set-up

The National Dairy Development Board, that had been very successful with the implementation of dairy cooperatives all over India, started a similar model for fruit and vegetables in New Delhi at the end of the 1980s, called SAFAL. It was one of the first fruit and vegetable retail chains set up in Delhi (as a unit of Mother Dairy Foods Processing Ltd). At the demand of the government, Safal started a modern terminal wholesale market in Bangalore as a pilot project. It is the first of its kind in India. The Safal Fruit and Vegetable Auction Market, further called 'Safal Market', was started in 2001 and finished in 2003. The market is spread across an area of over 60 acres with facilities such as two electronic auction halls, climate controlled interim storage facilities, fruit ripening chambers, and commercial cold storage. It is a state-of-the-art market with ample parking space, a clean and hygienic business environment, hi-tech food handling equipment, and a one-stop shop where graded and sorted produce are all under one roof. It is claimed that a "modern, professionally managed structure shortens the intermediary chain, reduces losses and margins between the producer and consumer prices and implements quality standards" (Safal market brochure, p. 4).

Following the model of NDDB, Safal has set up more than 114 Safal Growing Associations, of which 75 are located in Karnataka and the rest out of state, that supply daily fruits and vegetables. Suppliers are given approximate weekly requirements by the Safal Market which they then try to fulfill during the week. The Safal Market is set up as a hub-and-spoke model where the Safal Market acts at the hub and the different collection centers run by the associations are the spokes. Associations are given advice and training on grading and sorting by a representative of the Safal Market. However, Safal gives no financial inputs to the Associations.

All produce is gathered in crates for which Safal charges a rental rate. Crates are filled during the day and trucks leave in the late afternoon to arrive at the Safal Market in the evening between 6 pm – 9 pm.[20] Most of the grading is done at the farm level but the quality of the produce is checked at the Safal Market by a quality department. To be able to participate in the electronic auction, one has to first become a member. However, the entry costs are extremely low. Registered members pay 500 Rs for a lifetime card. There is also a possibility to buy a card valid for one day for 20 Rs. On top of these flat rates, auction buyers are asked to pay for a 1.25% service charge on the total value of their purchases.

4.2. Initial experiences

While the facilities are designed for the handling of 1,600 tons per day (which could potentially fulfill 30% of all the demand of fruits and vegetables for the city of Bangalore), it is currently much below that level. On the day of our survey, it was estimated that 200 tons of fruits and vegetables were traded (12.5% of its total capacity). While Safal has been very successful in building producer organizations, it has however been less successful in attracting buyers to their platform. It has thus started to improve upon their front-end business with better linkages with modern retail and with more

[20] Given perishability, operations have to be well timed: 1/ Retail operations: At 2am, produce is dispatched to the different outlets. It should reach the outlets by 4am. Sales to retailers happen between 4 am and 7 am. The retail operations are from 7 am to 9 pm; 2/ Auctions start at 6 am and are over by 9 am; 3/ Surplus produce are dispatched by 10 to 11 am to local mandi. These are usually mandi in Tamil Nadu and Kerala.

vertical integration. It is planning to expand its own retail operations in Bangalore. While it has currently 8 retail outlets, it plans to increase those with 25 extra in the next year. Safal Market is not only planning to open these in Bangalore but will also do this in other cities, and it thus plans to make their retail activities a pan-Indian exercise.

Table 3 gives an overview of the current turnover in tons at the Safal Market as well as some tentative projections for the year 2010. From these numbers it is clear that the focus of the Safal Market will be less on the electronic auctions but more on the vertical integration of their activities. In 2008, less than one third of the turnover of the Safal market was towards its own retail operations. In 2010, this is expected to increase to about 50% of their operations. Safal is also expecting a large growth in demand from modern retail. Currently, some modern retailers in Bangalore (such as Big Bazaar) already completely depend on the Safal Market for their back-end operations. Given the boom in modern retail in Bangalore and beyond[21], these operations are expected to increase dramatically in the next years.

The other most important buyers on the auction are the local retailers. Around 50 retailers buy daily 25 tons of produce. These retailers usually are from the areas around the Safal Market[22] while retailers that are from the city of Bangalore itself will usually not come here (seemingly partly because of the high transport costs to the Safal Market). Another sure outlet on the auction, but smaller in importance, are the caterers. On the other hand, the number of forwarders that buy is very variable. Finally, there are the occasional customers (for example, for use towards marriages).

[21] It is estimated that there are by now 1000 modern retail outlets in Bangalore alone (out of 10,000, mostly kirani, stores in general).
[22] The Safal Market is located on the Whitefield Hoskote Highway. It takes about one hour from the city to reach this location.

Table 3: Turnover Safal Market (in tons)

	Year	
		Projections
	2008	2010
Direct retailing	60	200
Auction		
for modern retail	25	75
others	75	80
Surplus	30	35
Total	190	390

Source: Discussions Safal Market management

The Safal market has been successful with the cold storage and fruit ripening facilities that they installed. The cold storage as well as the fruit ripening facilities are all fully used and given the large demand, Safal is currently building extra facilities for fruit ripening. While Safal Market was a pioneer in this area, there are clearly spillovers of this and other private players are currently copying this model and start to offer these facilities.

In contrast with traditional markets, Safal adheres to a strict quality grading system. Three grades are distinguished: A is the best grade, B is a medium grade, and the commercial grade is the worst quality.[23] The pricing mechanism that Safal has put in place is as follows. The Safal market tries to be on par with traditional markets. To know prices on the traditional wholesale markets, the Safal Market sends out a team of enumerators that collects systematically prices on the four large wholesale markets in Bangalore for the fruits and vegetables that Safal procures and sells. The prices that are collected in these markets are called the base prices. Base prices are then used in the auction to set floor prices: the floor price for the A grade is 10% above the base price, for the B grade is 30% below the base price and for the commercial variety it is 50% below the base price. Safal will not let the price drop below this price at the auction. At this floor price, Safal will procure the product itself and will use it towards their own sales or towards surplus sales in other markets.

[23] All grades are indicated by the farmer through adding colored papers to the crate: blue for A, yellow for B and pink for commercial.

The price that is used in the own retail outlets is 30% higher than the base price. Prices charged to the retailers (that buy in the early morning at the retail shops are between 10% and 15% higher). At the back-end, prices paid to the farmers are based on a weighted average of the auction price and the base prices. Different charges have then to be paid by the farmers (these are subtracted from the wholesale price and clearly printed on a receipt given to the farmers): 1/ Transport costs between the village and the Safal wholesale market. Transport can be organized by the Safal Market or by the farmers themselves. When the transport is organized by Safal, this is subtracted from the payment to the association; 2/ A service charge of 3.5%. This money is used towards the functioning of the Safal Market; 3/ An association charge of 1.5%. The money is used towards the organization of the association including the salary of employees; 4/ A crate rental fee. Crates are rented out at 1 Rs per crate per trip; and 5/ Bank charges.

5. Benefits for the smallholder of modern spot exchanges

5.1. Stated benefits by the farmer

Given that the online market had at the time of the research had little trading and most of the members had only conducted few transactions, it was too early to do an assessment with the members that SNX dealt with. As to better understand the benefits of access to the electronic auction of Safal Market, focus groups interviews were held with different farmer groups around the city of Banagalore that trade on the Safal Market. Below, we document the stated advantages and disadvantages of farmers selling to the Safal wholesale market.

First, farmers stated various benefits from selling to Safal:
1/ *The pricing mechanism is transparent.* Safal uses the wholesale prices and auction prices on the day of delivery at the wholesale market as the reference price and it subtracts the transport costs and service charges from this (3.5% service charge by the wholesale market and 1.5% service charge paid to the association).

2/ Safal wholesale prices are higher. Members of the federations state that the gross wholesale prices that Safal pays are, on average, 0.5Rs/Kg higher than those offered by private traders in traditional wholesale markets.

3/ *Prices are the same for everybody.* Safal gives the same price for everybody no matter if the produce is delivered in large or small lots and regardless of the background of the producer. Producers feel that private traders would offer lower prices to poorer and less-informed farmers and to farmers who sell smaller lots.

4/ *There is no cheating with weights.* Crates are distributed and standardized by Safal and there is little discussion on the weights of a crate. Farmers who sell through the traditional channel complain regularly about being cheated in weights as scales are sometimes not present in the wholesale markets.

5/ *Packing costs are less.* Safal distributes crates as to transport their produce and for every transaction, they charge 1 Rs rental charges to the federations. In traditional marketing systems, gunny bags are used which cost about 10-12 Rs and are not reused by the supplying farmer. The content in one gunny-bag equals the weight of two crates, implying important packing costs savings for the farmer that is connected to the Safal Market.

6/ *Wastage levels are lower.* Due to the use of plastic crates for the transport of vegetables, transport losses due to damaged produce are often significantly lower. Farmer groups estimate that they could lose up to 10% of their produce due to bad packing practices.

7/ *Payments are regular.* Safal pays by cheque through the federation and farmers receive their payment in less than a week after the delivery has been done (federations deposit cheques in bank accounts of the members). While farmers would be able to collect the money from the market after the transaction, this is not always the case and sometimes they only receive part of the payment immediately.

8/ *Bank payments avoid intra-household allocation problems.* An additional advantage, voiced by women in particular, is that payments made into bank accounts give men less opportunity to spend the money in town (women rarely go the market as this is the responsibility of the men) on goods and services that are of little use to the household. Some women estimated that less than 50% of the earning of produce sales would actually make it for household necessities if farmers are paid at the market.

9/ No time lost for transportation to the market. Safal Market organizes the pickup of the produce immediately from the collection centers in the villages. When farmers have to travel to the wholesale market, they usually leave in the evening the day before and come back mid-day the day of the transaction. They thus face significant opportunities costs in marketing the produce themselves.

10/ Transport costs might be lower. Transport is often organized by by Safal itself which is usually lower than transport costs charged by private transporters. Safal can offer more competitive rates as they are able to negotiate lower cost contracts with transporters as they offer them contracts for a whole year (as they procure in other periods from other areas).

However, farmers also stated there are several disadvantages of selling to the Safal Market. They include:

1/ *There is only a limited quantity that can be sold to Safal*. Safal fixes a weekly target of produce that it wants to procure. While it may slightly exceed supply for particular days, regular communications with the Safal Market will ensure that procurements are in line with the demand for produce from the Safal Market. Excess production would therefore not be purchased.[24]

---

[24] Focus groups that we talked to indicated that about 20% to 25% of the supply of the fruits and vegetables by the members of the association would be sold to Safal.

2/ *Safal does not provide input advances*. Commission Agents (CA) are willing to provide input advances as to potentially lock them into contracts with them. Focus groups indicated that about 20% of the farmers would use input advances from the CAs. Almost all of them could obtain these input advances in case of urgency. However, while there are usually no interest charges applied to input advances, there are complaints about the prices that are being charged to inputs. The CAs usually charge the unsubsidized rates (the Maximum Retail Price, MRP) for inputs while most of these products can in reality be obtained with a 50% subsidy. Safal on the other hand does not give input advances. The federations where Safal procures from might however facilitate access to credit for their farmers.

3/ *While regular, payments might take time.* While Safal Market pays regularly, the whole process of payment to the federations from Safal Market (usually between 3 to 5 days) and then the payments from the federations to the individual farmers (usually also between 3 and 5 days) might take time. Some farmers indicated that the time between delivery and payment could take up to 10 days in some cases.

5.2. Overview of the value chains for the different channels

As to better quantify the different costs faced by the farmers in the different channels, detailed interviews were conducted with farmers, retailers and wholesalers and prices were collected from the Safal Market, the SNX market, the traditional wholesale market as well as traditional and modern retail outlets in the city of Bangalore. This information allows us to make a distinction in the structure and the costs of the different value chains.

We start with an analysis at the retail level. The Figure below illustrates the price differences of fruits and vegetables between the different retail outlets and wholesale markets based on a small survey conducted in the beginning of April 2008 in the city of Bangalore.[25] All prices are compared to the traditional wholesale market. Prices were collected in three modern retailers (Nilgiris, Spencers, Reliance), two cooperatives

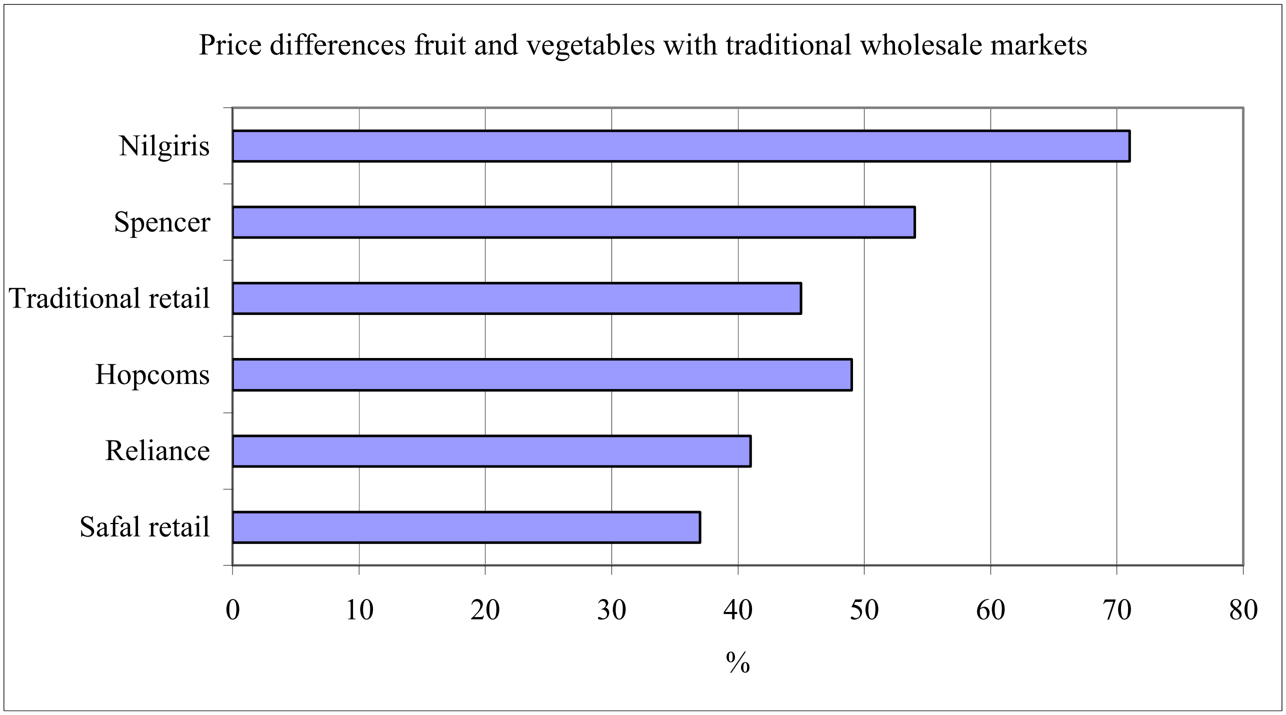
[25] 148 prices of fresh frits and vegetables were collected in total.

involved in retail (Hopcoms, Safal), traditional retail as well as four wholesale markets[26]. While only one outlet was visited for each branch and the survey is not representative for the whole of the city, it is however indicative of the real situation. Prices could not be collected for all products in all outlets.[27]

The results illustrate the margins between wholesale and retail markets in Bangalore as well as the differences between different types of retail outlets.[28] Different important results come out of this analysis: 1/ Retail margins (between retailers and wholesalers) of fruits and vegetables in the city of Bangalore vary between 71% and 34%; 2/ Overall, modern retailers offer the most expensive fruits and vegetables; traditional retail comes second and cheapest are the retail stores of the cooperatives; 3/ Reliance is the exception to this rule as its prices are at the same level as the cooperative (and less expensive than traditional retail). Interestingly, it is also the only modern retailer that has a large network of own collection centers in the rural areas and it thus mostly bypasses the traditional wholesale markets (as does Hopcoms and Safal). The other modern retailers rely mostly on procurement from the traditional wholesale market. Please note that these results are different than the results coming out of a survey in Delhi where modern retail was shown to be less expensive overall than traditional retail.

---

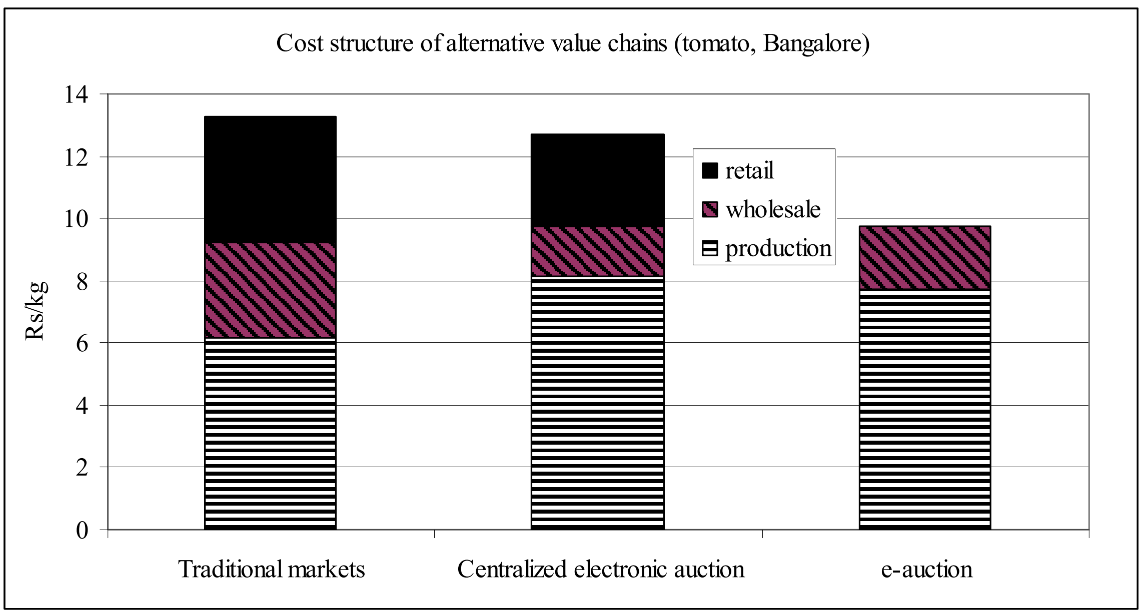
[26] To allow for comparisons with the Bangalore market, only these products could be used that were traded in Bangalore. This limits the number of observations to two.
[27] To make comparisons between outlets, we resorted to a regression analysis where the log of the price was regressed on dummies for the retail and wholesale outlets as well as product dummies. The coefficients obtained on the outlets reflect the percentage price difference with the traditional wholesale market that was set as the default.
[28] Note that we are not controlling for quality in this analysis. Produce in the Nilgiris supermarkets were mostly packed in plastic bags.



We compare the cost structure of the different value chains of representative products of the fruit and vegetables value chains in the Figure below. The numbers in the Figure were obtained through detailed interviews with farmers, wholesalers, and retailers during our stay in the city. While the results of these surveys are not based upon a representative scientific survey, we believe that they are however largely indicative of the situation on the ground.[29] While we assume that the wholesale prices are similar for the e-auction and for the centralized electronic auction, this is not based on any statistical analysis.[30] The results show how the prices that are offered to the farmer in the Safal model are significantly higher than in the traditional marketing system. The prices are evaluated to be almost one-third higher in this model. Simulations on the benefits of the e-auctions also indicate that benefits to the farmer would be in the same range as for the Safal model. It is estimated that the marketing costs between producers and the wholesale market in the case of tomato would be reduced from 3 Rs/kg to 2 Rs/kg in the case of the on-line auction and to 1.2 Rs/kg in the case of the electronic auction.

[29] To come to these numbers, we had to make several assumptions. For example, we assumed a commercial load of 750 kgs, i.e. 20 bags of 15 kgs each, to arrive at the costs per unit.
[30] Diekman et al. (2008) did recently an analysis of differences of prices (of tractors) on eBay and in-person auctions. They could not detect any differences between the two for the most traded product.

It is important to note that the retail margins - the difference between the retail price and the wholesale price - in both cases are higher than the wholesale margins – the difference between the wholesale price and the farm-gate price - , i.e. in the case of the traditional markets about 30% higher and in the case of Safal about 82% higher. The retail prices that are offered are also lower in the Safal model as, under this system, it seems that economies of scale allow for savings on retailing costs (Safal charges a mark-up of 30% on wholesale prices in their system).[31] An important cost at the retail level for fruits and vegetables is "dump" or the fruit and vegetables that can not be sold at a profitable price. Informed stakeholders estimated that a level of less than 12% should be achieved to make a modern retailer viable.



To illustrate how the savings in the wholesale margin would work, we further distinguish within the marketing costs the share of packaging costs, transportation costs, wastage at producers' level, commission rates charged by the commission agents to the farmers or the association charges by Safal to the farmers, and the retail margin (Table 4 below). In

[31] The high retail margin is explained by the low turnover by small vendors who do not make a large profit through this activity. For example, a retailer that sells and purchases 5 bags of tomatoes a day reported to make an average profit of 200Rs (5dollars) if one accounts for wastage at time of purchase and at the end of the day.

the traditional market set-up, we look at the cost structure of a simple commodity chain of tomato[32] in which farmers deliver their produce to the wholesale markets, commission agents then conduct an auction at the wholesale markets, and retailers purchase the produce there at that auction. Obviously, other longer value chains exist where consolidators sell to commission agents; where commission agents sell to commission agents or wholesale traders in other states; or where wholesalers buy at the auction, grade the produce, and sell locally to retailers. However, the chosen structure represents the most common marketing chain. In the case of longer chains, savings of the modern systems could even be higher.

The costs that are represented here are the costs reported by farmer groups in areas close to Bangalore (50 kms from the main city). To bring produce to the wholesale market, farmers there face several costs, amounting to one-third of the wholesale price. This compares to only 13% in the case of Safal and 21% in the case of e-auctions. First, transportation costs can be divided in three parts: 1/ the actual transportation costs of bringing produce to the city (through bus); 2/ the transport costs within the city; and 3/ the opportunity costs of time to bring produce to the city, transact on the market, and then to travel back. Transportation costs organized by Safal might be cheaper as they are able to negotiate better deals through the permanent use of transporters and as transport within the city has not extra to be paid for. Farmers also do not have to travel to the market as their produce is being picked up at the collection center. To bring produce to the market, farmers usually leave at 6 pm in the afternoon to come back the next day at 11 am. Given the fatigue of the trip and the bad sleeping conditions in the city, farmers reported to usually lose a working day due to such a trip.

---

[32] Tomato is a major vegetable in India. Similar numbers could be applied to other fruits and vegetables with similar perishability characteristics.

Table 4: Value chain costs in the case of tomato

	Traditional* markets	Centralized electronic auction SAFAL	e-auction SNX
Producer prices	**6.16**	**8.58**	**8.21**
Bank charges	0.00	0.14	0.00
Gunnybag	0.67	0.00	0.67
Crate rental	0.00	0.05	0.00
Wastage costs	0.46	0.00	0.00
Opportunity costs	0.13	0.00	0.00
Personal transport	0.05	0.00	0.00
Transport village - city	0.53	0.50	0.53
Transport intracity	0.33	0.00	0.00
Commission rate (10%)	0.93	0.00	0.00
Association charge**	0.00	0.15	0.15
Service charge**	0.00	0.34	0.20
Wholesale price	**9.25**	**9.75**	**9.75**
Retail margin (30%)	0.00	2.93	
Retail margin	4.00	0.00	
Retail price	**13.25**	**12.68**	
Producer/retail price ratio	46.46	67.66	
Producer/wholesale price ratio	66.55	87.96	84.19
Marketing cost producer-wholesale (Rs/kg)	3.09	1.17	1.54

Source: Own calculations based on interviews with stakeholders
* calculations were done based on a load of 50 bags of tomato of 15 kgs each
** In the case of Safal, the association charge is 1,5% and the service charge is 3,5%
In the case of the e-auction, association charges refer to commissions paid by farmers to members; SNX recommends 2% for this; Service rates are 1.5%

Second, packing costs and the related damages are significantly higher in the traditional value chain. Traditionally, gunny bags are used to transport vegetables and fruits. The costs of gunny bags are about 10 Rs. These bags stay usually with the wholesaler and go with the produce to the buyer. For the farmers, it is thus a cost that he has to incur in every transaction. Gunny bags are further not the appropriate material to well protect the produce during transport. Farmers estimated that they would lose on average 5% of their produce (and even up to 10%) due to damages during transport and in our simulations, we thus assume a cost of 5% in the traditional chain.[33] Safal has introduced a system of crates that are rented at 1Rs per crate per transaction. This is a significantly cheaper way

[33] We assume a loss of 2.5% in the case of e-auctions as it still relies on traditional packing material but produce might have to travel less far.

of transporting produce. However, this can only be done because the crates are being re-used over and over again in the vertically integrated Safal supply chain. The packing is cheaper and losses with this packing system are also small as vegetables are better protected.

Third, commission rates charged by commission agents amount to 10% of the value of the produce. In the case of the Safal, there are two types of charges. Safal itself uses 3.5% of the value of the produce in the auction towards their own functioning. A 1.5% association charge is further levied on produce towards the expenses of the local association.[34] Each association has a small collection center and it also employs 2 people permanently.[35] These people assure the good functioning of the organization, and correct loading and grading practices. The functioning costs for the association are covered by the proceeds of this 1.5% charge. The service charge for the e-auction would be 1.5% for the members that sell on the wholesale market. SNX recommends that members would charge 2% commission to buyers but it has however no legal way to impose these charges.

These simulations thus show that there might be significant benefits of these modern open-source beneficiaries. We estimate in the case of the on-line exchanges that the prices that are offered are about one-third higher than compared to traditional channels. We also find that similar high prices are offered in the case of modernized wholesale markets. In this case, it is estimated that producer prices are increased by 39%.

[34] Farmers also pay a 100 Rs lifetime membership fee.
[35] They are visited every day by an extension agent of Safal. This person is responsible for the supervision of five associations.

Annex 1: Contract specification for mango in the SNX system

Contract Specification
Mango Kesar Table Quality Unripe Packed FOR Destination Markets

Symbol	MKTQGJFOR4
Description	Daily Mango Kesar Unripe Table Quality Gujarat FOR T+4
Trading related aspects	
Trading Period	✓ One day ✓ Available for trading - • from Monday to Saturday • During May 22nd 2008 to until further notice
Trade Timings	Monday to Saturday – 10.00 am to 4.00 pm
Trading Unit	100 cartons and in multiples of 100 cartons
Price Quotation / Base value	Rs. per carton. for Mango Kesar Medium size approx.10kg packed in Corrugated carton Ex-Gujarat (excluding Transport cost, Transaction fee, all taxes and cess as may be applicable)
Tick Size (minimum price movement)	5 Rupees
Maximum order size	1.5 times of security deposit
Daily Price limits	5% over previous day's closing price
Initial margin	10% of Traded Value
Special margin	In case of additional volatility, a special margin of such percentage as deemed fit by Exchange will be imposed immediately on both buy and sell side in respect of all outstanding positions and fresh deals thereafter.
Delivery related aspects	
Delivery Logic	Compulsory Delivery
Place of Delivery	To be delivered to buyer's destination as informed by the exchange
Basis Variety	**Kesar**
Basis Territory	Gujarat
Delivery Margin	10% on traded value
Release of Delivery Margin	• Delivery Margin of buyer is released upon pay in of funds • Delivery Margin of Seller is released upon delivery of commodity
Quality Specifications :	
Size (by weight) Individual Weight of fruit Under/Over size(+/-50 gm)	Large: More than 250 gms Medium:200-250 gms Small:150-200 gms Maximum 5% more than 5% with 1: 0.5 rebate in quantity
Percentages of above size in the lot offered for sale	Large: Minimum 30% Medium: Maximum 50% Small: Maximum 20%
Premium/Discount based on dozen dispatched	Rate shall be quoted for medium size. For small size discount of 20% will be given by seller. For large size premium of 20% will be charged by seller. amount of premium or discount will be worked out by exchange after dispatch and will be credited / debited to the

	seller and buyer accordingly
Colour	Greenish
General Characteristics	Fully Matured, Hard, unripe, clean and sound fruits reasonably free from defects and latex marks.
Ripe / Semi ripe fruits	Zero on dispatch. Not to be treated as a defect at the time of arrival at destination market if sound and free from any damage as some fruits may turn semi ripe in transit.
Hand feel	Firm
Internal Maturity	Stone should be well formed
Defects in fruit (By weight)	
Minor defects	5% (Maximum) on arrival at destination More than 5 % with 1:0.5 rebate in quantity
Major defects	Max.4% on arrival at destination More than 4% with 1:1 rebate in quantity
Serious defects	Max. 2% on arrival at destination More than 2% with 1:1 rebate in quantity
Delivery and Settlement Procedure	
Settlement period	
Commodity to be dispatched /delivered to buyer	On or before T+1 day
Pay-in of funds	On T+1 day before 12 noon or on T+4 day before 12 noon against Bank Guarantee
Pay-out of funds	On T+4 day before 2 pm
Information related to Delivery	
Rebate for moisture Loss	As may be notified by the exchange from time to time
Delivery Unit	Same as trading Unit
Tolerance Limit	Plus/minus 10% of the delivery volume Delivery obligation by a seller member shall be deemed to be met if the quantity delivered is within the tolerance limit, as per the contract specifications and within the pay-in duration, as specified by the Exchange.
Delivery and logistics coordination	**Mr.Atul Thakre :09325683103** **Mr.Dhanjay Lodam:09325683116** **Mr.Vijay Sulakhe :09325683114** **Email: members.support@snxindia.com** **SNX Helpline: 1800-425-5551**
Deliverable grade of commodity	As per Contract Specifications
Packing Material	To be packed in 5 ply corrugated carton each having approx. 10kg of fruits. Cartons to be arranged by the selling member at his own cost.
Delivery Marking	At closing price
Transportation	Transport is to be arranged by the selling member on freight to pay basis in consultation with SNX Officials provided buyer has purchased full truck load (5/10 Mt for short distances and 10/15 Mt for long distances) . Any advance paid should

	be mentioned on dispatch documents (LR/Bilty) accompanying the vehicle and on the copy sent to the exchange officials. Exchange shall recover the freight advance from buying member and pay to the selling member, the buying member shall pay the balance freight to the transporter. However if buyer intends to take delivery from delivery location he can arrange his own transport subject to written information to SNX before 6 pm on the trading day. If the volume purchased is not full truck load the buyer shall make his own arrangement to take delivery from delivery location
Insurance	Consignment for which seller / SNX has arranged transport; cargo shall be compulsorily insured by SNX. Actual cost of such insurance cover shall be debited to buyers. Details shall be communicated to members through circulars from time to time
Taxes, duties, cess and levies	Government levies, if any, will be borne by seller / buyer, as applicable.
Unloading/Loading Charges at delivery location	To be paid and borne by selling member.
Unloading Charges at buyer's place	Unloading to be arranged by the buyer at his own cost
Lorry waiting time for unloading	It will be sole responsibility of the buyer to ensure unloading of vehicle within normally acceptable limits of waiting time. If detained abnormally buyer shall be liable to bear any detention charges claimed by the transporter and any losses in quality.
Quality assessment charges	As may be notified by the exchange from time to time
Penal Provision/closeout procedure	Failure to meet delivery obligation in part or full by seller will attract a penalty of 10% of the contract value or value at closing price of T + 1 day, whichever is higher. In case of part delivery the undelivered portion of the contract will only attract penalty. Out of the penalty so recovered, 90% of the penalty amount shall be credited to the buying member and 10% shall be retained by the Exchange for meeting administrative expenses.
Funds pay in default penalty	If the buying member fails to make the payment, penalty of 10% of the contract value or value at closing price whichever is higher will be charged from buyer. Out of the penalty so recovered, 90% of the penalty amount shall be credited to the selling member and 10% shall be retained by the Exchange for meeting administrative expenses. In such cases

	seller will be free to realize the proceeds by selling the commodity in open market.
Extension of delivery period	As per Exchange decision due to a force majeure or otherwise.
Applicability of Bye-laws, Rules and Regulations of the Exchange	The general provisions of Bye-laws, Rules and Regulations of the Exchange and decisions taken by the Chief Executive Officer in respect of matters specified above will apply mutatis mutandis. The Exchange may further prescribe additional measures relating to delivery procedures, warehousing, Quality Certification, Margining, risk management from time to time. In case of any interpretational dispute or clarifications the decision of the Exchange shall be final and binding on the members and others.
Legal Obligation, road permit, way bill etc.	The members will provide appropriate tax forms wherever required as per law and as customary. Neither of the parties will unreasonably refuse to do so.
Steps to be taken for delivery	
Delivery Details	SNX will intimate every buyer and seller for the quantity, delivery location as per allocation made by the Exchange, by end of the day for deliveries through Extranet (FTP)
Documents for delivery pay out	Delivery challan, Bilty/LR, Road weigh bridge slip, copy of open insurance policy.
Quality Assessment	It is the sole responsibility of selling member to ensure that quality is as per contract specifications. In case of any complaint by buying member about quality same will be inspected by SNX at buyer's place and quality rebate if any will be provided by the selling member as may be recommended by the exchange. Decision of the exchange about the quality of the commodity will be binding on both the buying and selling members. If the seller/buyer is not in agreement with the quality test results of the exchange and decides not to tender / accept delivery, such case shall be treated as default and shall attract penal provisions
Transfer of Ownership of Goods	• If Transport organized by seller ○ Ownership is deemed to be transferred to the buying member upon handing over the commodity to the transporter against a copy of LR / bilty • If Transport Organized by Buyer ○ Ownership is deemed transferred upon signing of delivery challan by buyer or his representative

Annexure – 1

Quality verification Procedure for Mango Kesar packed

Lot:

All the boxes in a single consignment of the Mango pertaining to the same grade shall constitute a lot. Sample shall be tested from each lot for ascertaining conformation of the material to the requirements of contract specifications.

Sample Size:

The number of boxes to be selected from a lot as sample shall depend on the size of the lot. Number of sample boxes shall be decided in accordance with the table given below

Lot size No. of boxes in the lot (N)	No of boxes to be drawn as sample (n)
Up to 40	**3**
41 – 65	**4**
66 – 110	**5**
111 – 180	**6**
181 – 300	**7**
301 – 450	**8**
Above 450	**13**

The boxes to be selected for sampling shall be chosen from the lot randomly, starting from any box, count them as 1, 2, 3 ………up to r and so on. Every r^{th} box shall be withdrawn from the lot to give a sample test.

Where $r = N/n$

N being the total no. of boxes in the lot and **n** the number of box to be chosen according to above table.

Analysis of the test sample:

All the boxes selected as sample shall be opened and sorted graded as per contract specifications. Defective fruits shall be segregated in to minor, major and serious defects. Mango with Minor, Major and Serious defects shall be weighed and percentage of each shall be recorded in the analysis format. Inspection results shall be declared based on the findings as under

Declaration of the inspection results

- Lot shall be declared as conforming to the **'Contract Specifications without any rebate'** when each of the test result of the final sample conforms to the contract specifications.

- Lot shall be declared as conforming to the **'Contract Specifications with rebate'** if any of the test result of the final sample exceeds the tolerance limits and is to be accepted with quality rebate.

Re Sampling:

In case of any requirement of re-sampling raised by the seller or buyer due to valid reasons, a second sample shall be drawn and analyzed as that of first sample and final test result shall be declared as under

- In case re-sample result conforms to the first sample result; the result declared after first sample will hold good for the entire lot.

- In case result of second sample does not conform to the first sample, average of both samples will be considered for declaration of results.

Preservation of the sample:
No samples shall be preserved for further references

Annexure: 2

Matrix of Defects
Mango Kesar packed

Sl. No.	Defects	Measurement	Minor	Major	Serious
1	Bruise marks	Surface area	Up to 5 % SA	On >5 % SA	---
2	Immature fruits	Flat sides and under grown shoulder blades	Any immature fruit	---	---
3	Gross Mis-shape	Visual	Slightly mis-shape	Gross mis-shape	---
4	Hail Damage	Severity	Minor healed hail spot max 1 in no.	>1 minor or major hail spot	---
5	Latex marks	Surface area	upto 5% SA	---	---
6	Black spots	Surface area	Upto 3% surface area	3-5% surface area	-
7	Deep cut	Length	----	----	Any such Fruit
8	Healed black brown marks	Surface area	---	Upto 1 rupee coin size	---
9	Stem end rot	Stem end area	---	---	Any such Fruit
10	Insect damage	Visibility	---	---	Any such Fruit
11	Diseased	Visibility	---	---	Diseased fruit
12	Rotten / fungal infected	Visibility	---	---	Any rotten fruit

Method of observation: Visual Inspection for defects, visible by naked eye.
Size: To be measured with the help of a weighing scale.
Note: Extent of defects not covered in the aforesaid Matrix are permitted

Chapter IV

The rural business hubs

1. Introduction

Mosher's (1966) memorable words of encouragement for "getting agriculture moving" via the Green Revolution and via an understanding of and reliance on farmer and private sector entrepreneurship need to be applied today to "getting rural services moving" in India. There is a considerable "rural services vacuum" facing the small farmer in India. This is a major problem constraining agricultural and market development. The lack of these services is determinant of the inability of rural households, including women, to achieve agricultural productivity and market access for inputs and outputs. This undermines competitiveness of farmers and inclusiveness of the poor, women, and states.

The missing or inadequate services are: (a) agricultural-marketing services (procurement by buyer, market information, risk-reduction via contracts, physical warehousing); (b) agricultural-input services (technical assistance including retailer-driven farm extension services, marketing of correct-quality inputs, training, financial services, and risk management/insurance); (c) agricultural-household-consumer services (health and child nutrition, affordable consumables).

These services appear to be inadequate because: (a) government services exist but are inadequate or not delivered; (b) traditional actor services are available (such as commission agent at wholesale markets providing credit to some farmers, and marketing output), but are inadequate and inefficient or appear to be over-priced compared to real value-added.

The Indian private sector has proved itself dynamic and innovative, since economic liberalization in the 1990s, in transforming the agrifood sector – first with modern processing and recently with modern food retail. A surprising, and internationally unique, phenomenon has recently been added to that stream of innovation, and that is the emergence of rural modern retail and wholesale in the form of private sector "rural service hubs" for which we use the acronym RBH.

The RBHs are in general terms platforms all under "one roof" managed by a private company, with various services and products retailed or wholesaled to farm and rural households (output procurement, input wholesale, provision of extension and finance, and retail of consumables, as well as sometimes farmer and rural youth training, insurance, and health services). The RBHs address the services dearth in such a way that a rural hub or cluster of services are created that facilitate linkages over the supply chain, from farmer to wholesaler and processor, and on to processor, retailer, or exporter.

The RBH companies are undertaking these activities because, in the now-popular phrase, there is "profit at the bottom of the pyramid" – with many millions of rural households with unmet services but with farm products to sell – and with many millions of urban households able and wanting to buy increasing amounts of staple and non-staple foods. There are several categories of these private-sector approaches being rolled out by very large Indian companies, most of which are conglomerates engaged in a wide variety of activities, including DSCL, ITC, Future Ventures India and Godrej Agrovet in joint venture, Tata, Mahindra, Reliance, Triveni, and others.

The RBH concept appears to be an appealing and feasible way to facilitate these linkages and address the services vacuum. They have the potential to increase access that small farmers, including women, and rural laborers, have to more and better products and services than they can access in the traditional sector, and with lower transaction costs given the "one-stop shop" and the hub-and-spoke rural dispersal of the RHBs. They also have the potential to bring modern-sector expertise and competition into the local areas, helping to stir up innovation and upgrading in the traditional sector.

However, to date, there has been no systematic study of the RBHs that have been started or planned in India very recently – at most in the past 3-4 years. This chapter is designed to begin to fill that gap by describing and classifying the activities of RBHs, within the context of a classification of problems in rural services and emergence of a broader set of types of rural hubs of which RBH is one type.

The objectives and structure of the chapter are fivefold.

First, in section 2, we briefly discuss the considerable dearth of rural services in India, as the context or grid into which the RHBs are being introduced.

Second, in section 3, we analyze the "family" composed of several species of what we broadly term "rural services platforms", in which RBH figures as one "species" in India. That family includes a variety of approaches, from private sector initiatives such RBHs to public sector initiatives that amount to public-private partnerships; the latter include one "species" which is termed by its implementers as "rural business hubs," (the recent initiative by the Ministry of Panchayati Raj in partnership with the Confederation of Indian Industry), but we do not use that term for that initiative here so as to avoid confusion with the private sector variety on which we focus. There are several other "species" in the family that are other public sector initiatives leading to public-private partnerships, which all aim essentially at the same objectives and functions (though use different methods and approaches) as the RBHs, and those are the Mega-Food Parks planned by the Ministry of Food Processing, and the Agribusiness Terminals planned or being initiated by the Ministry of Agriculture. We review these briefly in one section mainly to show that there is a family of initiatives, public and private, all recent or planned, all aiming at creating rural service platforms using a wide variety of specific approaches.

Third, in section 4, after the above context, we focus in on one species in the new family, the "private-sector RBHs" platforms being established by single companies. The justification for this focus is twofold: (1) there is in fact an internationally-unique and innovative experiment in private sector RBHs emerging today in India; (2) while the public sector initiatives are highly attractive and appear to be promising, we will show that they are not unique to India and in general are not innovations. That of course does not mean that they are not useful; careful empirical research could reveal whether they are in fact useful, and empirically test their claims, and that research has not been done.

Fourth, in section 5, we (very preliminarily, as the knowledge gaps are important and this paper is just a preliminary examination of this new phenomenon) assess potential impacts of the RBHs and evaluate whether and how RBHs may, or might be designed to, solve the "Rubik Cube", where simultaneously one needs to find solutions to "Competitiveness, Inclusiveness, Scalability, and Sustainability" (CISS) (Gulati and Reardon, 2007) to achieve inclusive rural development.

Fifth, in sections 6 and 7, we conclude with an agenda for future research and suggestions for Bill and Melinda Gates Foundation actions in this emerging area.

The chapter is built on interviews with key informants in government, business, and several farmers (but see the caveat below), on a review of news stories and press releases (given the lack of academic research on this), and on interviews with three companies and first-hand observation of private-sector single-company RBHs of two companies in two states. The budget and time did not allow a systematic and representative field study of the RBHs across the states and companies, nor a comparison over various types of RBHs public and private, or any survey of farmers to determine the impacts of RBHs on them or on the markets around them. All those are important gaps that we hope to address in future research.

It is important for the reader to note that we emphasize above the words "appear", "hypothesis," and "potential", hence the descriptive and hypothesis-presenting nature of this present work. This is due to the limited scope and budget of our research – rapid reconnaissance with interviews of four companies, of a ministry and an industry association, and brief field visits to RBHs in Haryana, Uttar Pradesh, and Madhya

Pradesh. There were, in particular, no surveys to test any hypotheses or empirically prove or disprove any assertions. This limitation allowed us only to classify and describe the phenomena, and listen to statements and claims made by companies and other key informants, and interview a few farmers mainly at the RBHs in each location. .

2. The Problem addressed by RBHs: Brief review on the rural services vacuum in India

In this section we review problems that the RBHs address and the constraints under which all work: lagging rural growth, lagging inclusion of rural poor in the rural growth that exists, and as a working hypothesis, dearth of rural services, and (b) the opportunities and challenges that are developing, including the transformation of the Indian agri-food economy since liberalization.

2.1. Problems and constraints: lagging rural growth, fragmented and unequal farm base, and lagging inclusion of the poor

Agricultural growth lags overall growth. India witnessed 8.7% growth on an average in the past four years - but agriculture grew only at an average of 3.3% (2004-05 to 2007-08).

The farm land base is fragmented and fragmenting. The average size of farm in India is 1.37 ha in 2000-01, down from 1.82 hectares in 1980-81. The share in farmer population of farmers with less than 2 hectares has gone from around 75% in 1980-81 to 81% in 2000-01. The area operated by these smallest farmers has also risen from 26.3% in 1980-81 to 37.5% in 2000-01. This shows fragmentation.

This is a significant point in our chapter's context because it shows that RBHs that mean to service the rural population face the fact that four-fifths of all potential clients are tiny farmers, which potentially means high transaction costs, need for affordable small units, provision of credit, and also facing a substantial number of farmers who are only in the subsistence sector, and have not even moved into the stage of agricultural commercialization.

Yet on the other hand, while the facts that transaction costs are high and clientele are fragmented into many poor and small farms - rural areas are dominated in numbers of farmers by very small farmers, and India's rural population of 700 million is dispersed over 600 thousand villages – nevertheless, these are problems facing public services and are a reason for their inadequacy, and so represent an opportunity for solution that will broaden rural development – while broadening rural markets and thus growth opportunities for Indian companies.

This latter is especially important because smaller farmers use labor more intensively and thus tend to have higher land productivity, and thus are using India's scarce land relatively effectively; their labor resources also have induced small farmers to enter and dominate the high-value products (fruit, vegetables, dairy, poultry). This means that if small farmers could further unlock that productivity potential by having adequate rural services, a substantial increase in growth with equity could be expected.

However, while the smallest farmers dominate numbers, larger-small farmers and medium farmers have an important share of land and output. Note above that the smallest farmers (less than 2 ha), highly correlated with the group of the rural poor (which also includes the poor landless), only have about a third of the land, and because they have the lower productivity (than larger small farmers), they have around a third of the output. Farmers classified as small-medium (2-5 ha) are still merely as well off in real terms as the urban poor, and have another 20% or so of the land, so we can say (a very rough approximation as the detail is not crucial for this argument) that roughly half the land and perhaps 60% of the output (depending on the crop) is due to farmers with less than 5 ha and either poor or barely non-poor. That means that nearly half of the output and land is associated with medium and larger farmers with more than 5 ha.

This latter point is a significant point in our chapter's context because it shows that RBHs the service rural areas have potentially a significant client base (20% of the rural population) which produces nearly half of the farm output depending on the crop – and are producing it on farms that are commercialized and have a surplus.

That is important for two reasons. First, as many RBHs are engaged in procurement of output (not just provision of inputs, consumables, and other services), they will need to source from these medium/large farmers, and possible go first to them as presumably transaction costs are in the short term less to source from larger farms. That would be the natural action for a business that needed to establish profitability in order to survive. Second, this inequality of farmers in output terms means that there may be an attraction for RBHs to "deepen" the market among this upper 20% of the farmers, rather than move into the more difficult territory of extending beyond this group into the smallest farms majority. Note that there are absolutely no data available on the size distribution of farms in the clientele bases of the RBHs, whether public or private, and so we cannot empirically test the hypothesis that the RBHs dwell on the "larger" (although still nearly all only larger-small or medium farmers) clientele base, at least in the early stages of RBH development (that of establishment, teething, attainment of break-even profitability, and initial deepening of market before broadening of market). In fact, RBHs we interviewed claimed to have a mixed clientele base (although none had data bases with farm areas), and we observed small and large farmers in their shops.

The main point of the latter, however, is to emphasize that there may be a challenge for RBHs to serve the rural poor, and that may require special efforts with respect to design and delivery of services in order to make sure to reach the majority of farmers who are small and poor. We take this point up again below in the section about CISS.

2.2. Problem addressed by RBHs transacting with farmers: Dearth of rural services

A key premise as background is that the private "Rural Business Hubs" (RBHs) address a severe dearth, in terms of amount and/or quality, of key rural services that farm households need to attain the above objectives. We discuss this in several points.

First, we use a working hypothesis (based on a corpus of literature in India on rural services, which we do not review here) that there is a considerable "rural services vacuum" in rural India – with missing or inadequate rural services, the categories of which we discussed in the introduction.

Second, at first glance the above characterization of rural services in India – a "rural services vacuum" – might be puzzling to the observer of India rural areas. The latter might say that instead of a dearth, there is an embarrassment of riches. (1) In output procurement/wholesale, there are some 7100 regulated public wholesale markets (mandis), both primary (in cities and towns) and secondary (in rural areas), and many thousands of permanent and temporary unregulated feeder markets, "haats," below the mandis. There are also already scores of large and medium private companies with procurement and contract schemes, such as the DSCL sugar mills. (2) In input markets, there are thousands of small "informal" input traders and input shops, as well as private companies like Bayer, Mahindra, and John Deere who have networks of distributors in rural areas. For extension, there is the KVK from the central government level. (3) In financial markets, there are a number of banks with rural branches, such as ICICI, SBI, NABARD; there are many NGOs providing micro credit; there are thousands of small-scale village money lenders as well as mandi commission agents who also provide credit (tied to output marketing arrangements) to farmers. (4) Finally, for the retail of consumables, there are of course millions of small kirana stores in rural areas, and for health, village health posts.

To this impressive inventory of service providers in rural areas that are already there, the government is rolling out or planning a series of new initiatives (discussed more in the next section) that provide public sector platforms for more clusters of services – such as the Mega Food Parks planned by the Ministry of Food Processing, the Agribusiness Terminals planned by the Ministry of Agriculture, and the PPPP Rural Hubs planned by the Ministry of Panchayati Raj (with CII as partner). These public sector projects are in the same family tree as the "Integrated Rural Development Projects" (IRDPs) started in the 1970s. IRDPs had one element necessary – but not sufficient – to solve the missing services problem – and that was that IRDPs provided a full cluster of services, all of which are needed and inter-dependent. But the IRDPs mostly ended in failure and were not sustainable - mainly because they missed the key elements "competitiveness" and "sustainability". These elements are even more important now in the "new economy" of the urban areas where food markets are becoming more competitive and it is becoming more important that farmers be able to meet requirements of cost, volumes, consistency, and standards to access dynamic markets.

Third, while there are new and planned public sector service initiatives (discussed in the next section) that have not yet been empirically evaluated, we believe it is already possible to proffer some broad assessments of the extant rural services noted above, and discuss why it is reasonable to qualify the body of them as still inadequate – even to the point of characterization as a kind of vacuum.

A number of studies of specific services show that while there is no denying that the number of service providers is high in rural India, the actual delivery of rural services is inadequate relative to the needs of farmers.

That inadequacy is sometimes from the supply side: effective costs of informal sector credit are high, the true full commissions and fees charged by the commission agents in mandis are high and the payment uncertain or lagged, the quality of farm inputs sold by informal traders is low due to adulterations of various kinds, services such as mandis and input dealers are scattered or far from farmers and thus with high transaction costs. An even more stark point is that it appears that many services are more than anything simply "on paper" but not a reality: this appears to be the case most often for extension services and health care.

Or sometimes the inadequacy is from the demand side: small poor farmers do not have the transport and time (due to intensive agricultural work, but also due to home chores and childcare, as well as off-farm labor) to bargain and search and jump over many intermediaries to sell to modern sector companies.

Fourth, these problems for small farmers accessing services are hypothesized to undermine the competitiveness of small farmers in rural India – and with it their incomes and futures. Beside the equity problem this poses, it poses two other problems. The first is that it means that the vast majority of farmers are excluded from services needed to raise productivity and incomes, because most Indian farms are tiny or small. The second is that it means that India thus foregoes a major motor of growth and diversification into high-value agricultural products – because small farmers are known to have higher land productivity due to the intense labor they apply to their tiny plots, and are known to grow most of the high-value products like dairy and vegetables because these are labor intensive.

This dearth is hypothesized to be especially problematic for small farmers because: (1) small farmers sell small volumes and have little land thus collateral and are thus at present are hypothesized to be (although there is no extant empirical study testing this hypothesis) disfavored regarding direct access to services such as the wholesale markets and credit and so suffer higher transaction costs and product costs; (2) small farmers buy and sell small volumes and thus transaction costs to travel to a number of dispersed sales points to buy inputs, sell output, get loans, get medical care, and so on, are particularly burdensome; this is hypothesized to be especially hard on women who shoulder the burden of home and child care; (3) small farmers have very little possibility of finding and paying for private extension as a larger farmer might do, yet public extension services are severely inadequate for small farmers.

2.3. The opportunity and challenge addressed by RBHs supplying retailers and processors: Transformation of the Indian agri-food economy

In a traditional food economy and market, where most farmers are subsistence or semi-subsistence, where the market is only the local village haat, where there is little or no reward for quality differentiation, where subsistence grains dominate except for the seasonal flurry of village sales or home consumption of local fruits and vegetables and dairy, the dearth of rural services is a "tax" on the system, but is not critical, because the market itself is of minor importance, and the market is easily accessed because local, and there are few if any market requirements in the way of quality, volumes, or consistency, and so there are very few services needed to meet requirements.

It takes the growth and transformation of the urban market, the commercialization of agriculture and thus shift away from subsistence, for the market to at the same time become an opportunity for large volumes from many farmers and quality differentiation, and become a challenge, as a growing and transforming food market will require of farmers increased volumes and thus increased productivity and quality and consistency of the product, non-traditional post-harvest practices, and monetization, and thus the need for credit. All these then imply a sudden "tug" on the rope of the barge of rural services and the need to "get rural services moving."

There is ample evidence that such growth and transformation is taking place in Indian food markets:

(1) The sheer size of total consumption has grown quickly: per capita food consumption has risen over 1983-2000. While total cereals declined from 147 to 132 kg/person/year for the bottom income group and from 194 to 155 for the upper income group, and pulses consumption stagnated, edible oils doubled for both groups, vegetable consumption increased 50% for the lowest income and 39% for the highest income; fruit consumption rose 169% for the poorest and

184% for the richest, milk equivalent rose 31% for poorest and for richest, and meat, fish, and eggs rose 100% for poorest and 123% for richest. Hence, the diet has diversified into, and thus the market has grown in, non-staples, as predicted by Bennett's Law, with the per capita consumption of high-value agricultural products - processed grain products and processed and fresh non-staple products (eggs, meat, milk, fruits, and vegetables) (Pingali, 2006; Kumar et al. 2007).

(2) Agriculture has also commercialized, with the marketed surplus rate rising for grains and dairy (as it is already high in produce). For example, all-India, the share of rice that was marketed went from 31.4% in 1980 to 44.5% in 2000; this was true even for poor states: in Uttar Pradesh, the share went from 29.4% to 41.6%.

(3) India has urbanized from 19% to 28% from 1991 to 2001 alone.

(4) There has been an increase of the coverage of mandis and haats from 1970 to 2005, which mirrors the above commercialization, diversification, and monetization trends, and reflects public investment in this.

(5) While the volume (in kgs/capita) of processed food has risen over the past two decades, there has also been a rapid transformation of the processed food industry itself. Much of the agro-processing was "de-reserved" in the mid/late 1990s, which meant that the reservation (de facto policy protection) of small informal firms ended then; at the same time, foreign investment restrictions were greatly relaxed. Imports of processed foods were also substantially de-protected. Comparing 1984/85 with 2001, thus capturing the "liberalization" period of the 1990s, one sees spectacular "formalization" and "consolidation" (with the share of the informal sector in total food processing assets going from 74% to 39%, and in output, from 36% to 19%. Moreover, there was a five-fold capital deepening over the period, vastly reducing the employment impact of agro-industrial growth. That capital investment was driven by intense competition in the food industry,

along with cheapening of processed food products. (Bhavani et al. 2007) In that context of intense competition and rapid loss of share of small, informal firms, the latter have to compete. The merely "cheap labor" of small firms has not been enough to outweigh the cost competitiveness of large firms that rely on economies of scale.

(6) While merely at the beginning of transformation, urban food retail is starting on the path that urban food processing has already taken. Modern retail has a mere 3-4% of overall food retail as of 2007, but is expected to be some 10-15% by 2015; it is spreading quickly from Tier 1 cities to Tier 2 and 3 cities and will probably follow the same path as it has in Indonesia and China and enter large rural towns in the next decade (Reardon et al. 2008). Over time this will both increase opportunities and pose challenges as it induces another wave of transformation of agrifood systems facing farmers.

In sum, the direction ahead is more and more modernization and transformation of the food markets facing farmers, and thus more and more need for good rural services.

3. Taxonomy of the broad family of "rural services platforms" in India (of which RBHs are one species)

Here we introduce a broad concept into which the more specific form of the RBH fits. That broad concept is the "rural services platform." We start with this because we will show that there is a family of different specific approaches or models to accomplish broadly the same objectives, and that the program and policy design debate over time should be to figure out whether the approaches are competitive or complementary, and which ones are best according to the "CISS" criteria, and thus merit more attention and investment. Doing that evaluation is beyond the scope of this chapter and study, and we leave it as a future, important, exercise, and confine ourselves here to definitions and examples.

We present (there is no reference, as we contribute this now to the literature) the idea of the "rural services platform," and define it by several criteria:

(1) It is a "platform" in two senses: (a) the "spatial" sense, in that it has a relatively confined and identifiable location, say over a district, a set of towns in a district, or a town, or a particular store location; (b) the "functional" sense, in that it is a base or foundation that can be "populated" with various services (processing, retail, wholesale, but not primary production, as the latter is not a service, but rather supplies intermediate inputs to the services or uses factors from the services)

(2) It is "rural" in the sense that it is either literally located in a rural area fitting the Indian definition of that, or it is "close" to rural areas so as to be accessible (in the sense that a mandi in a city is, near enough for farmers to get to it).

(3) The "services" it "includes" are pre-harvest (retail or wholesale of farm inputs, equipment, extension/information, farm credit, and so on) and post-harvest (logistics, warehousing, processing, wholesaling, retailing of output), and/or unrelated to farm production (retail of consumables such as food, durables, health services, rural training, entertainment). The essence is that the services together supply inputs to, or use outputs from, the farms, and are either a final or an intermediate link to final stages of processing or retailing of the products. The services are thus the complement to farming in the supply chain.

(4) While there is variation, in the various "species" of the rural services platform "family", in the above attributes (platform, rural, and services), by far the most heterogeneous is the concept of "includes," and it is the latter heterogeneity that in fact most differentiates the different species. There are two dimensions of the including of services:

The first dimension of that variation is in the extent or number of services that are included; we define no specificity here, and so a platform can contain one service (such as procuring/wholesaling output, or processing the output, or supplying farm inputs to farmers, or logistics); most commonly in practice there is some combination of services. There is in fact no specificity or clear mapping from number of services to the various types of platforms; for example, RBHs can contain a single service (input provision), or many (all those listed in the introduction); a Mega-food Park or a "public-sector initiated rural business hub of the PPPP variety" (discussed more below), can contain a set of services (such as processing companies and logistics companies located in a cluster), or a single service (a processor for example). Perhaps most specific is the Agribusiness Terminal or the public mandi which are private and public sector, respectively, platforms for a single service (usually), that is, wholesaling. The reason we allow this flexibility in definition regarding the number of services is that there is variety and even fluidity over time of what most of the platforms offer; for example, the Vashi Mandi in Mumbai started with purely wholesaling services, and later were added cold chain, processing, and logistics services; or the RBHs by various private companies started as just procurement and then added input provision, or vice versa.

The second dimension is the organization of the platform. This turns out to be a crucial point of emerging policy and program debate about these platforms; the debate is also akin to that in the (Coasian) new institutional economics literature regarding whether a firm should internalize or externalize a given enterprise or service inside the company or simply buy or sell to that enterprise externally. The analogy for the platforms is whether a single company has in its private purview a cluster of services it produces and markets (or out-sources yet has the out-sourcee operating on its platform, such as Hariyali having ICICI Bank operating a booth in Hariyali's RBH), or whether to accomplish roughly the same general set of functions, different companies cluster in a given space/platform, such as in a Mega-food Park where it is expected that clustered together will be a processor and a logistics firm and so on, complementary services in the sense that together they accomplish the intermediate tasks in the supply chain. The options are whether the platform is:

(1) owned or managed by a single entity and the one or more services operating from it are run by that entity, a common case for the RBHs; or

(2) whether there is a "mix," where on the platform there are services run by the owning/managing entity plus other services run by other companies or entities that are leased or donated by the companies or entities; this is a common case for the RBHs (for example, with a company like Hariyali owning the platform, and ICICI as banking service operating on the premises as a concessionaire; this is also common for Agribusiness Terminals and mandis such as the Vashi case above, where there is the municipal platform of the mandi, and then attached to it are cold chambers and processing facilities operated by private companies or other state or central entities; or

(3) there are several companies located in a "cluster" on the platform; this is common for the "Mega-Food-Parks" and the "PPPP public-sector initiated rural business hubs" discussed below. In the latter cases, there will not necessarily be a cluster of complementary firms, but possibly a cluster of like firms in a given segment of the supply chain, such as a cluster of pickle processing SMEs in a given space.

It is straightforward, using the above grid of variables defining a "rural services platform," to locate in that multi-variable grid a given initiative or company. Here then is a classification of the models or approaches.

(1) The traditional public-sector mandi (APMC), and the "private mandis," "collection centers", and "Agribusiness Terminal" and Terminal Markets (the latter being set up by NIAM, part of Ministry of Agriculture) are relatively single-

service (or mainly wholesale plus some logistics and processing), operated by government or a single private management company, and contain either a single company (such as a collection center of a retailer, such as Reliance or Spencer's), or clusters of like-service companies, ranging from SMEs to large companies (for example, from small traders to large wholesalers). Note that all of these are in barely-emerging or only-planned status. Those just starting have not been evaluated externally to date. The "private mandi" is a wholesale entity that in principal acts as a procurement point for a wholesaler or processor; the "Agribusiness Terminal" and the "Terminal Markets" are again wholesale entity or a processing entity that procure from local farmers; both of these are managed by either the private-sector or a cooperative entity. An example of the latter is the Safal market operated by the National Dairy Development Board (NDDB) for fruits and vegetables in the Bangalore area.

(2) The "Mega-Food Park" is also in planning stage (awaiting approval from the Ministry of Finance), a program of the Ministry of Food Processing Industries. It will in principal be a multiple-service platform, with some "anchor investor," like a processing firm, and then other complementary services, some of which may be provided by the anchor investor or by other private companies (such as wholesaling, logistics, and so on), and by the government through public investments in required infrastructure for the platform (such as go-downs, cold chain, and so on). (The preceding information is from our interview at the Ministry of Food Processing Industries). As noted above, this is, in spirit, similar to the common "Integrated Rural Development Projects" of the 1970s, but now with a more explicit focus on attracting a major (or several major) private-sector "anchor investors." This approach was common in most developing countries in the 1970s, and similarly, a number of countries, such as Indonesia and China, have the equivalents of Mega-Food Parks today.

(3) The "Public-Private Partnerships Program (PPPP) public-sector initiated rural business hub" (our term for it, to distinguish it clearly from the (private-sector)

RBH), promoted by the Ministry of Panchayati Raj in alliance with the CII, is in essence or spirit roughly similar to the planned “Mega-Food Park”, in that it also either seeks to “match-make” anchor investors with local communities/platforms, or find out what local communities/platforms want to develop and go find an investor or a company (or a set of smaller companies) willing to be the motor in terms of being the procurement entity, and linking the supply from that local area to the national or export market. This program started two years ago, and there has been no external evaluation on it to date. This model fits into the rural services platform with either a cluster of like-service companies, sourcing from local farmers. The key difference with the Mega-Food Park is the addition of the “panchayat” which is a local governance entity (at district, block, and village levels); these groups are in principal to formulate requests for investors or participating companies, or interact with interested anchor investors or other companies who want to procure from the area and want to interact with potential suppliers, and finally, to act in governance and fund-channeling capacities that can, for example, be used to created needed complementary infrastructure or provide access to commons resources. (The preceding information is based on our interview at CII.) Hence, in essence, this model is similar to the Mega-Food Park but with a more flexible (and open) form and approach, and with the explicit addition of a local public governance mechanism and entity. This approach or model is very common since the early 1990s in Latin America, and in the 2000s in Southeast Asia (such as Thailand). In Latin America it is called “concertacion” with municipal governments or village councils (the same as panchayats) serving in that role, and then have round tables of meetings among these councils, private sector investors, local farmers, and various experts and service representatives brought around the table.

(4) Given the above context and taxonomy, the place of “RBHs” in this family of rural service platforms is clear and specific. The majority of the RBHs are multi-service providing (as will be discussed in detail in the next section), more focused and limited than the PPPP rural hubs in spatial location, and similar to the Mega-

Food Park in having a "campus", but sometimes more complex than the latter in having a "hub and spokes" design where there is a central hub or campus along a major road or peri-urban area in a rural area, and then spokes of go-downs or distribution or procurement points out in the countryside. Moreover, a single company owns the platform and leases or joint-ventures with other service providers, and thus there is a de facto cluster of companies, but coordinated on one platform by one company. There is typically no public sector involvement, except in the form of grain inspectors or KVK extensionists that join occasionally in some event. Moreover, the infrastructure is typically owned or leased by the single company. Yet in other aspects the RBH is similar to the PPPP rural hubs or the Mega-Food Parks, or even the Agribusiness Terminals, in that they assemble various services needed for intermediation between farmers and some eventual final market. A difference in application but not in principal is that that final market is often the RHB company itself (for example, ITC's Choupal Saagar procures wheat that is then sent to ITC processors to produce Aashirvaad wheat flour).

In the next section, we go into more depth on the set of services assembled by the RBHs.

4. RBHs in India: Actors, services, and taxonomy

In this section, we first do a brief inventory and several examples of the companies involved in rolling-out RBHs, then put most emphasis on a categorization of services, and then return to a brief taxonomy, and then note the continued evolution of the companies.

4.1. Inventory and examples

There are a number of companies that already have some variant of RBHs; in subsection 3 we do a rough taxonomy. These companies include mainly large conglomerates or large agrifood companies that have been in existence for decades, and recently open RBHs:

DSCL (Hariyali Kisaan Bazaar), ITC (Choupal Saagar as hub and e-choupals cum go-downs as spokes), Future Ventures India and Godrej Agrovet in joint venture (Aadhaar Retailing), Tata (Tata Kisaan Bazaar), and Reliance (Ranger Farms, and future Reliance Rural Business Hubs) as full or nearly full service hubs, extant or planned, and Mahindra (Mahindra Krishi Vihar) and Triveni with current focus on input provision. The small input-only stores are typically about 2000 square feet (small); the stores (not full versions of RBHs but in same network) tend to be 3000 square feet (small medium), in some companies with attached go-downs, and the RBHs as full-services hubs tend to be from 5000 to 15000 square feet, thus like small to small-medium supermarkets. The full service RBHs are typically divided into an area of consumables, an area of inputs, training/extension, and equipment, and an area with the attached go-down (with seed and fertilizer). Some RBHs with procurement activities, such as large Choupal Saagars in Madhya Pradesh that procure soy and wheat, have weigh-station and large go-downs. Some RBH "spokes" like the e-choupals are just procurement cum information and input provision points in the rural areas manned by lead farmer cum procurement agents.

Below we give three examples of RBH companies.

First, DCM Shriram Consolidated Ltd (DSCL) Hariyali Kisaan Bazar DSCL is a large diversified Indian company that has a substantial agribusiness division. In 2002 it started its chain of Hariyali Kisan Bazar (HKB) RBHs. The typical catchment area of an HKB is 25 kilometers radius and 20,000 households. The "center" is a larger format, with consumables, farm inputs, with initiating crop procurement, extension services, fuel station, farm demonstration areas, and a platform for other service providers (such as ICICI for financial services in many locations, and Fortis for health services in some locations), covering 3-4 acres with a 10-15,000 square foot covered area, while a "store" is half that size and focuses mainly on inputs. The first HKB was in Uttar Pradesh in 2002. The total number of Hariyali outlets stood at 160 as of April 2008, with a catchment area of 2.4 million farmers. They plan to expand to 300 outlets by December 2008 catering to cultivable land of around 30 million acres with a clientele catchment area of 10 million farmers. The sales of an outlet are roughly 10-30 million rupees per a year, say with an average of 20 million rupees or 500,000 dollars. Hence by end 2008 the rough gross sales will be 150 million dollars – not far from the gross sales of 200 million of the food grocery supermarkets of the leading supermarket chain (Pantaloon) in India in 2006, and the leading milk retailer (Mother Dairy) in 2007! This competitive and rapid up-scaling can be compared to the more cautious, 20 new centers a year, the pace in the early years of 2002 to 2007. Note that the investment cost of one center is 40 million rupees, roughly 1 million dollars. Hence, in 2008 alone, Hariyali is investing 140 new centers times 1 million dollars, or 140 million dollars in new centers in 2008 alone.

Second, Godrej Aadhaar has RBHs roughly similar to those of Hariyali, but at present with much more emphasis on procurement of vegetables for retail operations of the Godrej company, and as of 2008, when 70% of Aadhaar was acquired by Biyani's Future Group (with Pantaloon retails and Food Bazaar and Big Bazaar supermarket chains, the leading modern retailers in India), Godrej Aadhaar is starting to be a procurement arm for vegetables for the Future Group, in addition to the other services of its RBHs. The first Aadhaar Center was started in 2003 in Pune District in Maharashtra. Now there are 65 Aadhaar Centers and the company plans to set up over 1000 Godrej Aadhaars over the next five years.

Third, ITC Choupal Saagar is a chain of RBHs operated by ITC. ITC built these RBHs up from the initial network of e-choupals: the initial e-choupal network was augmented in 2004 with rural go-downs that acted as procurement points and input marketing points for farmers working with the e-choupal network. ITC further built from that go-down network base with a hub and spoke network of rural stores and central "hubs" of the type of the HKB type, except that beside the other services, there is a heavy emphasis on output procurement (mainly of rice, wheat and soy) that feeds into the ITC massive processing operations. This will be augmented in the year to come with more procurement of vegetables. At present, the roll-out rate of Choupal Saagar is somewhat slower than the other two chains noted as examples.

4.2. Services

While we can add substantial detail to this classification of services, and discuss specific companies in detail, for the reasons we discuss below about the difficulties of doing taxonomies of the companies (as they are mixed service sets over formats in the same companies, and the companies are evolving and apparently converging toward multiple service), it is useful to set out the key services. This information is based on: (1) field visits to ITC's RBHs (hub as Choupal Saagar and spokes as e-choupals cum go-downs) in Madhya Pradesh and DSCL's RBHs (Hariyali Kisaan Bazaar) in Haryana and Uttar Pradesh, and Reliance Ranger Farms in Rajasthan and Uttarakhand; (2) interviews in Delhi with managers from DSCL, ITC, Aadhaar Retailing, and Reliance, and in Mumbai, with Mahindra.

(a) Output Procurement

a.1. Procurement for own and others retailing operations in urban areas; examples include: Aadhaar Retailing procures vegetables and fruit for their own retail chain in Mumbai and starting in 2008, for Big Bazaar and Food Bazaar); Reliance's Ranger Farms (which is a collection center cum rural cash&carry or wholesaler) procures for its own wholesale and retail in rural areas, as well as for Reliance stores in urban areas. Choupal Saagar is procuring fresh vegetables for ITC's retail operation, Choupal Fresh, as well as for others' retail (Big Bazaar).

a.2. Procurement for own or others processing operations in rural or urban areas, usually done off-site (of the RBH); examples include: ITC through its spokes (e-choupal, go-down) network feeding into its hub (Choupal Saagar) procures wheat, rice, soy, and potatoes to send on to its processing operations, which in turn retail in the RBHs, the ITC urban retail stores, and on-sell to other retailers, modern and traditional, under branded label.

a.3. Complement other procurement operations in the area: an example is Hariyali, which in sugar zones where DSCL has sugar plants has set up RBHs to service first the sugar farmers and eventually other farmers with inputs, and eventually the other services.

a.4. Logistics of procurement: various companies are working on this, but one has started, and that is Aadhaar Retailing, with a joint venture with Acme (cold chain); Acme will equip the RBHs with cold chain, and the RBHs will supply vegetables to Acme's own retailing operation. We believe that the logistics sales and use of the RBHs will increase vastly over the next several years as a main focus of investment to meet a perceived major gap, and also to allow the RBHs to move into dairy and produce and enable farmers to also make that diversification move.

(b) Input provision and annex services

b.1. Equipment sales and rental: most of the RBHs sell and/or rent the standard farm equipment such as tractors; several of them have alliances with companies such as Mahindra and John Deere who use the RBHs as distribution points (complementary to their own distributorship networks in rural areas). There are also sales of non-traditional equipment that is hard to find in traditional shops; for example, Aadhaar markets IPM equipment such as fly traps, composters that make biogas, and drip irrigation equipment. Moreover, many RBHs sell vehicle fuel (usually in joint ventures with petrol companies).

b.2. Farm variable input sales: this is the most ubiquitous, over companies, of services. Fertilizers and chemicals are typically sold both as own brands (Tata, Hariyali, etc.) and others brands (acting as distributorships for Bayer and others). Certified seed is also an essential staple of most of the operations; a few (such as Hariyali) have contract schemes in the RBH areas to produce this seed.

b.3. Farm information services: This includes "free" farm visits, help desks, soil testing, and training sessions. It also includes market information, either via the e-choupal model in units near farms, or the Hariyali or Reliance model of market information received by internet and posted at the RBHs. There tend to be no or only few links with public extension (KVK). Some RBH companies have started "training of rural youths;" this is for example a new program of Aadhaar Retailing; they tend to employ the trained youths in their stores and programs. Other RBH companies are considering similar activities. Note that most of these information services are offered "free" by the companies in order to attract farmers into their networks of output suppliers or input buyers, and obtain a competitive advantage vis the traditional wholesaler who has credit, personal relations, and other similar advantages that the RBHs perceive need to be countered with a series of services that the wholesalers cannot offer, and that are "missing" from public sector services.

b.4. Credit and Insurance: This is mainly now via alliances with banks such as SBI and ICICI who have kiosks at the RBHs. Some, such as ITC, has Kisaan credit cards for members. Apparently there has been little uptake, and some failures, on the insurance side. The credit side is also perceived to be in an early and "feeling their way" stage. There is certainly a perception by RBHs and farmers that there needs to be far more supply by the RBHs of credit in order to attract and keep farmers in the networks.

(c) Consumables and other services

c.1. Consumables: include food and non-food consumable items, mainly fast moving consumer goods and some durables, sold in the RBHs, typically some 40-50% of sales of the mixed centers.

c.2. In some RBHs, there is a new service offered of health services, mainly via alliances with health service providers such as Fortis and Apollo. The latter has, for example in some of the Choupal Saagars, a computer link with hospitals in cities in order to show the client and discuss symptoms with doctors. We believe this, as well as the sale of medicines, will be a major area of expansion.

c.3. Most of the companies plan to roll out roadside restaurants as part of their operations.

4.3. Taxonomy

We provide a rough taxonomy based on a four-quadrant classification, with the service categories as the quadrants: (1) output procurement; (2) input provision and related services, extension and credit; (3) consumables retail; (4) other services (health, education/training, insurance).

There are several difficulties in applying this classification that are themselves instructive of the phenomenon.

(1) While the classification is useful to analyze a given RBH store or unit, it is in some ways difficult to use it to classify an RBH company or chain, because of the "hub and spokes" model used. For example, ITC's Choupal Saagar, the "hub", provides all four of the services; however, the "spokes", which are combination of e-choupals (which are units in the farm areas that are manned by a lead farmer who gets a commission for farmer deliveries to ITC, and who provides internet services and farmer training as attraction to local farmers to help create a network of suppliers, and go-downs to receive the product from the farmers and deliver farm inputs to those suppliers. The "hub" thus covers all the four quadrants, while the spokes cover only procurement and input provision, and somewhat cover extension through the information service.

(2) All of the companies are, as we note below, in rapid evolution. While many started mainly by providing inputs (the case of Hariyali, Triveni, Tata, Godrej (now Aadhaar Retailing), and Mahindra, most or all of them are starting to, or have plans to, increase output procurement (for example, Hariyali has started with certified rice seed and now is moving into vegetables among other things). Reliance started with a rural collection center two years ago, then a year ago added wholesale and inputs, and will roll out full 4-service category RBHs later

this year. The most likely is that over time, there will be a convergence toward the 4-service model by most of the companies.

The first are "input-focused rural hubs" that emphasize delivering a variety of agricultural-input services, such as selling inputs, providing technical assistance, and in experimenting with providing credit to farmers (such as Hariyali Kisaan Bazaar). They are also starting health care.

The second are "input provision and output procurement focused rural agribusiness-hubs" such as ITC Choupal Sagar (linked with e-choupal and Choupal-Fresh), that combine supply of inputs with procurement of output mainly as an agribusiness operation.

The third are "output procurement focused rural service center with some input provision as well as rural wholesaling and retailing." An example of this is Reliance's "Ranger Farms" that procure fresh produce from farmers, wholesale that to local retailers and traders, retail produce to local consumers, and sell some inputs.

4.4. Evolution

Finally, note that there is rapid growth and diffusion – as well as evolution – of the private RBHs.

On the one hand, the roll-out of these private-sector RBHs has been very rapid and very recent. For example, in just five years, Hariyali has rolled out 160 centers in four states, and has plans to double to 300 centers within another year alone. Other companies are in a similar "race" to occupy rural space with these RBHs.

On the other hand, as noted above, there has to date been significant variation in the types of RBHs that the companies, with on-going experimentation. It is increasingly apparent, from our initial examination of the situation, that over time, because the rural services vacuum is three dimensional and any missing element cripples market, business, and rural development, the service clusters in the RBHs will need to provide a triple set of services, three legs of the stool, of input (and associated credit and insurance) services, output procurement, and retail of that product (and other products for rural households) to create a sustainable market. This may be done by individual companies in one-stop-shop, or by companies partnering or clustering.

For most companies, these rural service activities are starting, are in trial mode, or are developing now in new directions and with scaling-up with plans for them to number many thousands and serve millions of rural households. There is a strong perception of lack of information and much uncertainty about how the business models should be designed or modified, what to retain or drop or change or add in scaling up, what is working and what is not, with whom to partner to provide services, and how to improve implementation, sustainability, and monitoring and evaluation.

5. Hypothesized impacts of RBHs on small farmers and rural areas, in the context of CISS

This section lays out hypotheses, mainly qualitative, on the impacts of RBHs on small farmers and rural areas. It is important to note that this exercise is based on our initial observations, and is hampered by important gaps in knowledge, both due to the limitations in resources for the study and thus the scope of this chapter, and so can rely only on the field visits to stores, company interviews, and interviews with a few farmers per site. These are then impressions and hypotheses to be tested with further field survey.

The relatively certain assumption of impact that we can make is that of coverage - based on the expansion plans and current coverage of the RBHs is to estimate the catchment area of the top 4 RBH companies will be approximately 6 million farmers by the end of 2010. This is a conservative estimate based on doubling the base set of the leading four companies providing rural services hubs/centers and matching each with 5000 farmers (the typical actual-clientele in a catchment zone of typically 20,000 farmers) and (minimum) doubling over the next two years from the current number.

A second assumption that we can make, based on information from the RBH company informants, is that switching from chemical and fertilizers and seeds supplied by traditional traders to the higher quality inputs supplied by the RBHs results in approximately a 20% yield increase, and thus farm income increase. Even though farm income is only about half of total income, much of the other income activities are in some ways related to farming in upstream or downstream or consumption linkages, and so it is safe to assume that if this yield effect is verifiable, that it extends in good part to overall incomes.

Furthermore, as indicated in the Tables in annex, some 25-30% of paid-out costs of production of rice, soy, and wheat, are from fertilizers, pesticides, and seeds. Savings on, and greater quality in, these inputs would have an impact on incomes directly.

Having proffered those points on quantitative impacts, mainly measured from the input side, we can hypothesize other impacts on farmers and rural areas, stated in qualitative terms, and focus on areas pertinent to "CISS".

a) Increased farmer incomes: RBH services noted above appear to and can potentially increase farmer incomes by: (a) improving output procurement (reducing payment waiting time that farmers tend to have from the wholesale market, increasing differential payment for quality, and reducing transaction costs to farmer by having go-downs in the rural areas to collect the product); (b) improving the quality of farm inputs available to the farmers (farmers complain about adulterated inputs from traders), and thus the effective or implicit price, and also thus the productivity of the inputs; (c) improving the information available to the farmers by the direct extension services of the RBHs, which is particularly important given that farmers complain about near absence of effective extension services available presently; in some of the RBHs (such as the Choupal Saagar which is linked in hub and spoke model to the e-choupals and the go-downs for inputs and outputs associated with them), this also implies market and weather information provided to farmers that they normally would not have; (d) improving financial services available to farmers, via the RBHs usually sharing their platform with banks such as SBI and ICICI, via the RBHs rolling out their own credit schemes, and via links between the RBHs and new schemes like the kisaan credit card scheme – all of which lower interest rates and increase access to loans by farmers without having to have to use expensive village moneylenders or rely on tied output-credit market credit from the commission agents and local traders of outputs and inputs; (f) the retail at low cost (such as in the tie-up between Apollo Pharmacies and Godrej and with Choupal Saagar, and the initiating tie-up between Fortis and Hariyali) allows farmers to access health services; studies have shown a clear link between better health and farm productivity.

b) Increased income for women farmers and farm workers: The points that we make above concerning how RBH services and coverage may help farmers incomes in general, apply to women farmers per se, and to a large extent to farm workers. In terms of women farmers, the points to emphasize beside the general points about productivity, include the importance of the retailing of consumables at the RBHs (which allow women farmers to waste less time shopping for consumables like food staples and household items far from where they buy inputs and market their output), extension (women get specific extension help at some of the RBHs and that could be amplified), and getting health services, which to some extent already, and could much more, include maternal health care services. As for farm workers, among the poorest persons in Indian society, the open access by the RBHs bringing credit and health services into the fabric of rural society, would tend to improve their welfare. Moreover, the companies undertaking RBHs tend in general to be promoting agricultural diversification by farmers in order to procure more high-value products like vegetables and fruits, as well as milk, from farmers. Relative to staples like grains, these high value products are more labor intensive, and studies tend to show that such diversification into high value products increases use of labor and thus employment and wages of landless laborers.

c) Improved access to markets for smallholder farmers: the hypothesized effect of RBH services on market access is treated above in point 1, and also can be addressed by our noting that most of the RBH companies are potentially very effective conduits for small farmers to gain direct access to markets to dynamic segments of the emerging modern food industry in India, as well as to exports; for example, Hariyali's RBHs are becoming back-end operations for vegetables for several key supermarket chains; as of this year that also started in Godrej Aadhaar (itself acquired by the leading supermarket chain); ITC's Choupal Saagar procures wheat and soy that go directly to their own mills and into retail stores across India, and progressively they will source vegetables to go into their Choupal Fresh supermarkets and be sent to other supermarket chains. That creates a market for quality in both staples and high-value products, which opens those markets, and the better remuneration that attends them, to poor local farmers.

d) Enhanced agricultural value chains that enable market development and increased trade: The value chain includes all of the segments that are in fact parts of the RBH set of services – input supply, wholesale or output procurement, links to processing and retail, as well as the "lubricants" or concomitant services such as extension and finance that permeate the chain to make it work. Thus, the RBH is first and foremost and essentially a motor of development of agricultural value chains, bringing the modern sector into this arena in the rural areas.

e) Increased use of systems/approaches that lead to better management of water resources: Some of the RBHs are retailing equipment for water management; for example, Godrej Aadhaar is looking to expand its marketing of drip irrigation and sprinkler systems; other RBHs market well pumps. Perhaps most broadly, the extension services of all the RBH companies that we have interviewed tend to have water management as a key part of their extension services to local farmers.

f) Increased institutional capacity for support to the agriculture sector through educational/extension services, applied research, information dissemination: The RBHs themselves have extension services, and some, like Godrej Aadhaar with the help of the NGO Pratham (and several other are thinking about this) have rural education for rural youths that they then help with employment in their operations as well as just provide the education generally for good relations with farm communities.

g) Effective technologies and practices adopted into training and technical assistance curricula of public and private institutions: The RBHs' survival and business profitability depend on introducing and supporting technologies that improve farmer incomes and productivity, and thus win clients. The training and technical assistance they do somewhat now and may extend much further, is part of this.

6. Gaps in knowledge

From the point of view of promoters of rural development (a perspective the companies themselves share as they are depending on the deepening and broadening of their rural market via win-win marketing and product choice strategies), there are important uncertainties and gaps in knowledge for assessment of the impacts of RBHs knowledge and for design of RBH business models that will lead to what we term "CISS" – including Competitiveness (for small farmers), Inclusiveness (of small farmers), Scalability (to reach many small farmers and rural poor and women) and Sustainability (to sustain profitably for farmer and company, in a win-win mode, the approaches that are used).

The specific gaps in knowledge are as follows:

(1) There is nearly complete lack of information about how these new initiatives are affecting farmers in terms of incomes or investments in technology, affecting other rural service providers, rural families, and the food supply system. Is this adding costs or reducing costs? Are the providing higher quality inputs and services or the same as traditional sector?

(2) There is a dearth of information on how to design these business models organizationally and institutionally – should there be partnering among service providers and converge in these service-triangles? Should these induce the

formation of farmers' companies or coops to be more effective counterparts? What is the best sequence of roll-out of services?

(3) There is little known about how these should differ by context such as by state or region, and thus how to scale up sustainably.

(4) There is little known as to how responsive farmers are and how they should respond in terms of self-organization.

(5) There is little systematically known about what the role of governments or donors should be or not be to facilitate CISS in these major new private initiatives – what is the best enabling environment, what investments are needed.

7. Recommendations

We finish the chapter with recommendations to the Bill and Melinda Gates Foundation (BMGF) regarding RBHs:

First, it is crucial that BMGF invest in moving from this initial rapid appraisal of this important new phenomenon, to testing hypotheses and exploring the impacts of these on farmers, and understanding how to design RBH services (types, design, and delivery modes) to reach small farmers, which will require a special effort.

Second, all of the activities of the RBHs fit into the general category of improving farmer incomes (output procurement, input provision, extension, credit) and thus fighting rural poverty. Most of these activities require physical assets such as go-downs, weigh-stations, cold chain equipment, dairy facilities, and so on. BMGF can invest in these physical assets. That will also help the RBHs to extend their operations to the hinterlands and the small poor farmers who have least access to local infrastructure.

Third, training of the rural people that are employed doing this work is a crucial area for investment. BMGF can invest in this training. The latter can be done also by helping NGOs to undertake the training; a model is Aadhaar Retailing's tie-up with Pratham to do training of rural youths.

Fourth, the RBHs appear to us to be excellent channels of effective rural retailing of medicines, anti-malaria gear, and health services. BMGF can marry economic growth and poverty alleviation goals with helping RBHs to roll out faster and more effectively to the village level (in hub and spoke system with the RBHs) the health services, perhaps in a triangular relationship with health care providers like Fortis or Apollo.

Fifth, as BMGF undertakes other rural investments – in communities and cooperatives, and in NGOs, they can look for links with the RBH network that allow them to use the latter to link their rural efforts with effective conduits for linking with the markets.

Sixth, it is important for small farmers to group or cluster in order to aggregate output to market to RBHs; this will extend the reach of the RBHs in the catchment areas and help small farmers. BMGF can assist farmers in such clustering; one way to do this is to enlist the help of NGOs that specialize in helping farmers form effective marketing cooperatives.

Seventh, like many effective private sector companies, the RBH companies tend to have their core competencies, and these center on growing the business, minding profitability in order to survive, pleasing their clientele, and solving technical and management challenges as they arise. Corporate social responsibility initiatives aside, it is usually not the day to day core competence of the staff to have the expertise to "stretch" to resolve constraints holding the business back from reaching the largest number of poor farmers possible. They need help in doing this. An interesting solution to this dilemma has been used by the government of Chile, called ProChile; in it, the government places technical personnel skilled in relevant areas to the business but also knowledgeable in finding ways to extend the business services to small-scale suppliers; this helps the business, helps the small farmers, relieves short-run constraints in capacity and competence to do this, and creates a longer run solution as these activities are graduated over to the regular staff of the company; yet at the same time these actions are internal, not external to companies, so the implantation and infusion of these goals and practices and competences have been facilitated by this successful program. Piloting such a program would be a useful activity of BMGF for the RBHs.

Chapter V

The impact of modern open-source intermediaries on smallholders and the way forward

1. Introduction

In this last chapter, we document the impact of the modern open-source intermediaries on smallholders and we then look at possible ways forward. We discuss explicitly the benefits of three modern-open source intermediaries, i.e. futures exchanges, modern spot exchanges, and rural business hubs. We do so by looking in detail how they might be an improvement to the existing traditional marketing systems and how smallholders are affected by it. Given that we lacked the resources and the time to collect primary data to exactly and quantitatively evaluate the impact of modern open-source intermediaries, this section is mostly based on qualitative observations, focus interviews, and case studies.

Future exchanges have shown rapid growth in the last years in India. As in other developing countries, mechanisms for direct participation of the smallholders in commodity exchanges are currently not in place yet in India and more support is seemingly needed as to allow for direct access. We discuss first the performance on the core functions of commodity exchanges, i.e. price discovery and price hedging. In response to deficiencies in agricultural markets, commodity exchanges in India – as well as in other developing countries – have developed an array of activities that have significant impacts on smallholders beyond the benefits of traditional futures markets (Unctad, 2007). These activities include information dissemination, facilitation of physical commodity trade, facilitation of financing, and market development. The impacts of these are also discussed in detail below.

Modern spot exchanges also exclude smallholders directly because of its requirement on the size of the lot, which is often beyond the quantities produced by smallholders. However, modern spot exchanges, as described in our analysis in chapter 3, rely significantly on supplies of smallholders' associations. They are currently the major sellers on these exchanges. We look in this chapter at the benefits of being connected to these modern spot exchanges for those sellers that participate in it.

The third modern open-source intermediary, the rural business hub, might fulfill an important service role as there is a rural services vacuum in India, with missing or inadequate rural-services clusters. This is a major problem constraining agricultural and market development. The services provided might be different and are: (a) agricultural-input services (technical assistance including retailer-driven farm extension services, marketing of correct quality inputs, training, financial services, and risk management/insurance); (b) agricultural-marketing services (procurement by buyer, market information, risk-reduction via contracts and physical warehousing); (c) agricultural-household-consumer services (health and child nutrition, affordable consumables). These services are interdependent and missing one hurts access to others. In this chapter, we look at the potential benefits of these rural business hubs on the agricultural sector and on the smallholders in particular.

The structure of the chapter is as follows. We discuss the likely impact on smallholders of futures exchanges in section 2, of modern spot markets in section 3, and of rural business hubs in chapter 4. We then present possible ways forward in section 5.

2. The impact of future exchanges on smallholders

2.1. General overview

Table 1 gives an overview of the basic statistics of the two major future exchanges in India, MCX and NCDEX (These two exchanges represented 96% of the value of all futures trade in 2007 in India). The turnover of the two exchanges combined in the year 2007 was almost 1 trillion $. While MCX is significantly bigger than NCDEX, NCDEX is however more important for agricultural trade, i.e. the agricultural turnover of MCX was only 15% of the agricultural turnover of NCDEX in 2007 (Table 1). The three most important crops that were traded on these platforms in 2007 were guar seed, chickpea, and soya oil in 2007, relatively less important crops in India. Table 1 also shows the physical deliveries of products that were facilitated through these exchanges. They represented in 2007 about 426 thousand tons.[36]

Table 1: Basic statistics on the two major commodity exchanges in India

	MCX	NCDEX	Combined
1. Characteristics members			
Number of members	1,700	890	2,590
Number of terminals	7,500	20,000	27,500
Number of cities present	400	655	1,055
2. Turnover			
Total turnover (billion Rs)			
2005	6333	9082	15416
2006	20257	12433	32690
2007	27298	7750	35048
Agricultural turnover (billion Rs)			
2005	990	7970	8959
2006	1687	10156	11843
2007	1058	6852	7910
3. Products traded			
Number of commodities traded	58	54	
Most important agricultural product traded (2007)			
1st product	soya oil	guar seed	guar seed
2nd product	mentha oil	pepper	chickpea
3rd product	guar seed	chickpea	soya oil
4. Physical delivery			
Number of centers	750	725	1,475
Quantity (metric tons)			
2008	NA	512,146	NA
2007	51,194	375,624	426,818
2006	30,391	404,063	434,454

Farmers in India do mostly not participate directly in the futures markets. There are different reasons why they are deterred from participation. First, the minimum sizes of traded lots that are required for future exchanges are too large (usually 10 tons) for smallholders to participate; Second, eligibility to the futures platform requires specific formalities which might be difficult to fulfill for smallholders, e.g. a PAN number, a sales

[36] To put this number in perspective, the arrivals of apples in Azadpur, the main wholesale market of Delhi, amounted in 2006-2007 to a slightly higher number, i.e. 571,066 tons (Source: Agmarknet, 2008).

tax number, and a trade account; Third, commodity exchanges are governed by strict rules and large membership fees. When rules are not respected, this might result in severe penalties. The upfront costs and the possibility for penalties when rules are not followed might be hard to bear for the smallholder; Fourth, there are significant variable transaction costs related to assaying, transport to delivery centers, and storage which lead to the exclusion of some of the smallholders; Fifth, smallholders often lack awareness on the functions of the futures markets (as described in chapter 2).

However, even if they do not participate directly, the presence of an active future exchange might help the agricultural sector, and the smallholders more in particular, through different mechanisms, including price discovery and hedging, and agricultural development activities related to information dissemination, the facilitation of physical commodity trade, the facilitation of financing, and market development. Table 2 gives an overview of these development activities by the two major commodity exchanges in India, i.e. MCX and NCDEX. They are discussed in the sections 2.3 to 2.6 below.

It is generally assumed that the major functions of the futures market, i.e. price discovery and hedging, lead to improved efficiency in production, storage, marketing, processing, and financing of the agricultural sector (e.g. Pope et al., 1983). Some argue that the price discovery function of the commodity exchanges on its own would already justify the existence of commodity exchanges as reliable futures prices that can serve as reference prices for production and marketing decisions in developing country settings are often extremely difficult to get a hold of (Rutten, 2007; Gabre-Madhin and Goggin, 2005). We test in section 2.2 to what extent the futures exchanges in India delivered these services for these products in which futures contracts were actively traded in their first years of existence.

Table 2: Development impacts of futures exchanges on smallholders in India

	MCX	NCDEX
1. Price dissemination		
a. Price collection spot markets	polling of spot prices on selected mandis	54 products followed on 260-300 mandis (by CMIE & Crisil MW)
b. Price dissemination	500 electronic price screens 60 villages information through India Post 300,000 SMS messages 25 newspapers	445 price ticker boards TV channels Kisan call centers
c. Weather information		weather information collected from 410 stations across country
2. Facilitation physical commodity trade		
a. Online spot markets	started up for fruits and vegetables (SNX) planned for staples (NSE Ltd)	investments planned In improved spot exchange
b. Infrastructure enhancement	Warehousing created (2 million tons)	Warehousing created (1 million tons)
c. Quality upgrade	market for premium quality spread of testing equipment	increased use of certification objective grades in cotton, rice, maize
3. Facilitation financing		
a. Warehouse receipt financing	NBHC links with major banks NBHC has facilitated finance against commodities for $370 million for 100,000 farmers higher % of lending on value (80%)	NCMSL links with major banks NCMSL has faciltated finance against commodities for $150 million higher % of lending on value (70%)
4. Market development		
a. Education, capacity building and research		certification course - 20,000 students awareness programs
	MCXMAER	NCDIR
b. ICT upgrade	price tickers VSATs	price tickers
c. Industry growth	an estimated 300,000 people employed through activities of all exchanges	

2.2. Price discovery and hedging

In Chapter 2, we looked in detail at the core functions of commodity exchanges, i.e. price discovery and hedging, and evaluated how the Indian commodity exchanges have fulfilled these roles. We tested the performance of the future markets with different econometric techniques based on price data between 2004 and 2007, the first four years of their operation, and based on the results of a primary survey conducted with a large number of farmers, processors, and traders. The results of these tests are summarized in Table 3. They show price behavior on the Indian futures markets was too problematic to make it a good tool for price discovery as well as hedging: convergence between futures and spot prices was lacking in most commodities; the basis risk was not significantly lower than the spot price risk; prices were integrated in the long-run but short-run market efficiency was missing; returns to hedging were not sufficient to enable hedgers to full hedge their stock; and futures prices were in some cases causing changes in spot prices.

Given these results, few processors and traders reported to use the futures during this period for hedging. Consequently, few impacts were seen on trade margins as no significant declines in the wholesale-retail margins were found. However, despite these problems, which might have been due to start-up problems, we also found positive impacts. The presence of futures markets seems to have led to better integrated agricultural markets in India and even more importantly, the results of a primary farmer survey shows that the prices that small farmers received, have increased more rapidly than for the bigger farmers. It is estimated that the prices of crops that were actively traded on the exchange has relatively improved for the smallest farmers by 10% since the start of the trade on the futures exchanges (Chapter 3). However, this analysis is based on a simple comparison of small and big farmers and more detailed econometric analysis, controlling for several potential confounding factors, is required to assign exact causality of the commodity exchange on these price changes. This is planned in future work.

Table 3: Performance evaluation commodity exchanges in India

Impact	Requirements for well-performing futures	Outcome test
Relationship futures and spot prices		
	1. Convergence	Lacking in most commodities
	2. Basis risk is lower than price risk	Mixed results
	3. Market efficiency	Co-integrated in the long-run Short-run market efficiency is lacking
	4. Hedging returns are attractive	Returns not sufficient to enable hedgers to fully hedge their stock
	5. Causality not from futures to spot prices	Mixed results
Wholesale-retail price relationships		
	6. Decline in wholesale-retail margin	No decline in margin
	7. Better integration of markets	Better integration of markets found
Participation and knowledge of stakeholders		
	8. Farmers aware of futures prices	Few farmers are aware
	9. Traders and processors hedge on futures	Few processors use futures
Impact on small farmers		
	10. Prices for farmers increase	Prices of small farmers increased by 10%

Source: Naik, chapter 3

This differential impact of the presence of the future exchange on the small farmer might have different reasons. Efficient price discovery and dissemination of price information helps farmers overall to get better prices for their produce. If information is not easily available, small farmers suffer more compared to large farmers as they have to spend a relatively higher amount per unit of goods they sell in acquiring information. It is also difficult for them to predict futures prices, again due to higher cost of acquiring relevant information. The dissemination of prices by the exchanges indirectly helps small farmers as information about prices becomes easily available and allows them in taking better decisions regarding planting crops or selling them. While planting decisions are also influenced by many other factors, availability of more and better information on prices is likely to be useful to small farmers. With easy availability of information in the market place, small farmers might gain more as their bargaining power improves. Additionally, there is also likely to be more competition among the buyers in the market place.

While the futures exchanges in India were not attractive for hedgers and few hedgers in the value chains thus used them, the limited use of commodity exchanges - even when they are more mature - for hedging purposes is not unique in India. In our case study of China (annex 1), we also find that hedgers are underrepresented in the futures markets, but to a lower extent than in India. Even in developed countries, people use hedging less than would have been expected and researchers have been struggling to find out the exact reasons why. For example, Pannell et al. (2008) argue that low levels of risk aversion, transaction costs, basis risk, and uncertainty about production are main explanations for why farmers or farmer organizations refuse to take part in hedging. In any case, it seems that with better price behavior over time, the exchanges in India should be able to draw in hedgers to a larger extent than is currently the case.

While there are clear benefits from having well-functioning futures markets on the agricultural sector and for smallholders, they are however not very easy to quantify. We illustrate below through the case study of cardamom how well-functioning future exchange markets and in-depth investments of futures exchanges for specific crops can have a significant impact on the way value chains are structured. However, the cardamom success story is only one example on how commodity exchanges might influence agricultural marketing systems. In the early stage of commodity exchanges in India, few other examples could be found where the commodity exchange had this type of transformative effect on the value chains.

The potential impacts of futures trading:
The success story of cardamom

Cardamom is a spice that is mostly grown in the district of Idukki in the state of Kerala in India. While starting from a low base, production has increased from about 4,000 tons in the early 1990s up to almost 12,000 tons in 2006-07 (Rasquinha, 2008). The cardamom plant is a perennial crop that comes to bearing only three years after it has been planted (but one has to wait until the fourth year before it starts bearing a significant harvest). The harvest is influenced significantly by climatic conditions as the plant requires spells of rain interspersed with periods of good sunshine (Rasquinha, 2008). The harvesting season of cardamom starts in August and extends usually until January. The peak harvesting season is in October and November (Rasquinha, 2008).

Futures trade

Futures trade in cardamom started in February in 2004 for the 6 mm grade by the NMCE, one of smaller futures exchanges in India. The Multi Commodity Exchange of India (MCX) started another contract for the 7mm grade and above in February 2006. The contrasting experiences indicate how appropriate decisions by commodity exchanges and liquid futures trade can make a difference on the structure of value chains. The NMCE warehouse is located at Cochin or at about 150 kms from the producing area. This location has two problems. First, the costs of transportation for the growers are high. Second, Cochin is characterized by a humid climate which is not very suited to storage. There have thus been concerns regarding the quality from the buyers that have taken delivery at this warehouse. MCX on the other hand has built its warehouse in the producing areas and has provided its warehouses with appropriate storage technologies. Since the launch by MCX, its cardamom contract has been traded actively on the commodity exchange and the contract has quickly overtaken the NMCE as the most important one. The cardamom contract has achieved liquidity in a short period and it was estimated that the trading volume was approximately 10 times the production volume in 2006.

The changes triggered by the futures trade

Unctad (2007) and Rasquinha (2008) report how the trading in futures markets have led to significant changes in the cardamom value chains, including better warehousing, quality improvements, better access to export markets, reduction in information asymmetries and shorter value chains, more employment opportunities, and access to financing. We discuss these reported benefits below.

First, MCX established two warehouses in the growing areas with a total capacity estimated at 380 tons (Shunmugam, 2008). Given the specificity of cardamom storage, warehouses were explicitly designed such that cardamom could be stored for a longer period without discoloration or any other quality issues. This was in strong contrast with the other storage possibilities in the area, and led to lower wastage levels and value losses in the value chains.

Second, the MCX quality led to the development of new quality awareness in the area. The establishment of the MCX delivery warehouse induced the emergence of new grading and processing facilities in the neighboring areas (Unctad, 2007). The obvious drawback is that the lower quality cardamom receives significantly lower prices and that income for the lower quality oriented farmers might actually have gone down.

Third, the stringent quality requirement led to a new brand recognized as the "MCX grade". Exporters had major difficulties before the establishment of futures trading to find quality produce. It involved a lengthy process of bulk buying, processing, and grading. Now, it is however easily available and the 7 mm prices quoted on the futures exchanges have become the reference price for these export markets (Unctad, 2007).

Fourth, information asymmetries were reduced and shorter value chains were created. Figure 1 shows the structure of the value chain before the introduction of the futures markets. Total margins in the value chain between planters and exporters/wholesalers amounted from 15% to 20% depending on the channel followed by the produce (Shunmugam, 2008). Since the introduction of the futures exchange, exporters, traders and wholesales now have the facility to get the produce directly from the MCX warehouses without having to rely on the traditional costly system of auction centers and/or local traders (Figure 2). Trading margins have thus gone down significantly, i.e. between 10% to 15% (Shunmugam, 2008).

Fifth, the introduction of the futures exchange created new employment opportunities. A survey conducted with value chain participants suggests that employment increased by 200 people since MCX introduced the contract, due to the manning of 60 terminals and the creation of a number of processing centers, each of which employ 15-20 people (Unctad, 2007).

Sixth, access to financing in the value chain improved due to the presence of the futures markets. Unctad (2007) reports that Geojit Finance, linked with a brokerage company that was hedging on the commodity exchanges, was offering loans up to 90% of the value of the planter's produce. However, the interest rates that it was offering (14%) were slightly higher than those offered by the commercial banks.

The example of cardamom futures trading thus illustrates that when commodity exchanges pay attention to the structure of the value chain and when they succeed in attracting major players in the value chain such as exporters and traders, they can become a powerful trigger for achieving more efficient trade that might lead to large benefits for the agricultural sector and for the farmers.

Figure 1: Traditional marketing of cardamom

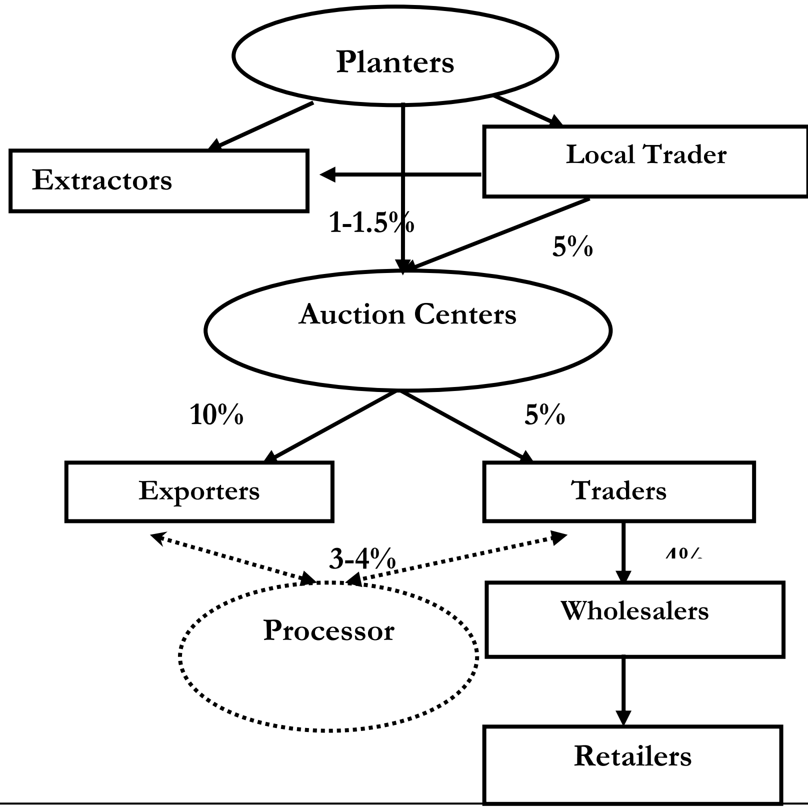
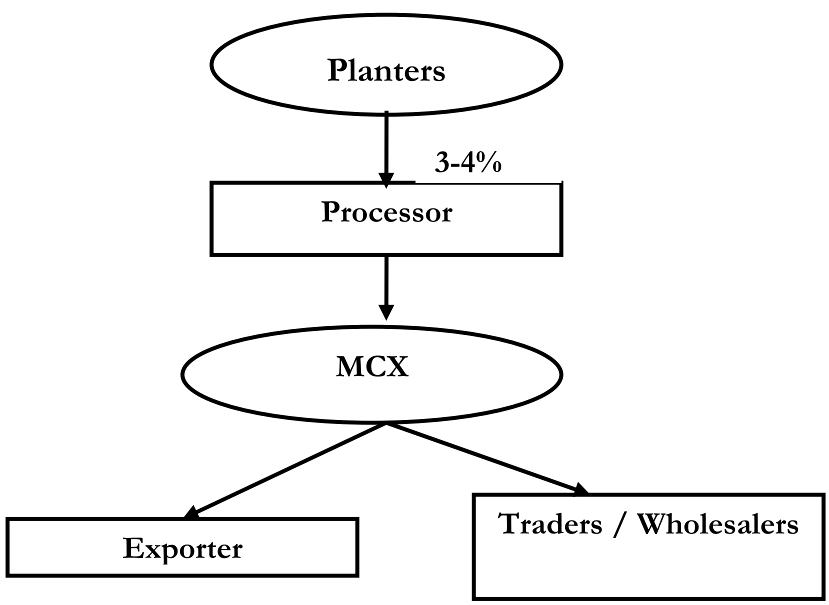


Figure 2: Marketing channels of cardamom after futures contracts took off



2.3. Information dissemination

Both commodity exchanges NCDEX and MCX have made significant investments in price dissemination activities. The futures prices of MCX are disseminated through different means including about 500 electronic price screens MCX set up in different markets.[37] Three hundred thousand SMS messages featuring the futures prices were sent out over a 12-month period ending May 2007 (Unctad, 2007). MCX has also started an experiment of a joint venture with India Post to disseminate price information. This experiment is currently tried out in four districts or about 60 villages. Other distribution channels for these prices include radio, television, newpapers, and the internet. The other exchange NCDEX relies on 445 price ticker boards that they installed in the mandis, as well as TV channels, radio, and newspapers. It also uses the Kisan call centers of the Ministry of Agriculture to spread their prices.[38]

Interestingly, both MCX and NCDEX are also involved in the gathering of spot prices as to allow participants on the exchange to make better informed decisions. MCX collects spot prices from a selected number of mandis and calculates a national market price through a pre-defined formula. NCDEX has put into place a more ambitious monitoring system. Prices are collected, independent of the exchange, by the CMIE (the Centre for the Monitoring of the Indian Economy, an independent economic think-tank) and Crisil Market Wire (India's largest credit rating agency). 54 commodities are followed twice a day on 260 to 300 mandis. The collected prices are entered and then aggregated as to arrive at a daily benchmark price which is disseminated on the day itself by NCDEX.[39]

NCDEX, in collaboration with its partner NCMSL, has further installed 410 weather stations across the country, covering 16 states and 81 districts. It regularly and timely

[37] The number of states where this is done is however concentrated. There are about 290 mandis covered in the state of Maharashtra, 150 in the state of Andhra Pradesh and 64 in Madhya Pradesh (Unctad, 2007).
[38] Kisan call centers were set up by Ministry of Agriculture as to provide extension advice to farmers.
[39] The government also collects prices through its Agmarknet system. However, only price ranges and modal prices are published. Prices are also not collected by type of variety which makes it difficult to use the information. Prices are also posted one-day late.

tracks weather in these locations which are generally not covered by the India Meteorological Department (IMD). These stations have been set up in relevant crop areas. NCDEX has plans to collect this information even at a more disaggregated level such as at the block level in the future. This information is then disseminated and it is planned that it will further be used towards the construction of a rainfall index and towards the facilitation of the launching of weather derivatives (however, an amendment of the Act in vogue would be needed).

2.4. Facilitation physical commodity trade

Exchanges are involved in different ways to improve the facilitation of physical commodity trade. We discuss online spot markets, infrastructure enhancement, and quality upgrades.

(a) Online spot markets

Both exchanges have started up or are in the process of starting up on-line spot exchanges. In a unique initiative, the Safal National Exchange of India Ltd (SNX) was recently created as a commodity online exchange platform to start trading horticultural crops. The Exchange is a joint venture of renowned players in this area, the National Dairy Development Board (NDDB), the Multi-commodity Exchange of India Limited (MCX) and the Financial Technologies India Limited (FTIL). This project started at the end of 2007 (December 14th). Its initial membership is estimated at around 250 and the members include growers of horticultural crops, traders, self-help groups, growers' cooperatives, input distributors, etc.

Both MCX and NCDEX are further planning to invest in the set-up of electronic spot markets for staple crops. However, regulatory restrictions have prevented them until now from doing so. Following the example of SNX, MCX is planning to start together with FTIL and with Nafed (the National Agricultural Cooperative Marketing Federation of India Ltd) the National Spot Exchange (NSEL). This is scheduled to start in the next months and it is expected to be accessible to the farmers and the traders in all the blocks of the country. The platform would trade standardized contracts with clear quality indications for a range of commodities for immediate delivery at specific delivery centers (Unctad, 2007). After a long delay, the NSEL is planning to start trial operations in August 2008 (Economic Times, June 2, 2008). It would offer agricultural produce to competitive bidders from all over India and it would facilitate the purchase of farm inputs. The National Spot Exchange (NSEL) would be accessible through 100,000 common service centers (CSC) in rural areas within a year and it would reach out to more than 500,000 villages through the network of these centers. NCDEX is also scheduling to start online spot markets but it seems that their plans are less concrete than the ones of its main competitor.

The experience of the exchanges with online transactions in the futures markets bodes potentially well for the experiments in the online spot exchanges. In the set-up of the SNX, the pioneer of multi-product online exchanges, one thus sees features appearing that are typical for the futures markets transactions (including margin money, well defined quality characteristics as practiced in futures markets, similar set of the trading screens, etc.).

(b) Infrastructure enhancement

Commodity exchanges require warehousing facilities that meet the requirements for physical delivery when futures contracts expire. These requirements include quality of storage, communication systems to account for delivery, and adequate capacity to meet the delivery requirements. Both exchanges have initially relied heavily on the public warehouse system (the Central Warehouse Cooperation and the State Warehouse Cooperations)[40]. However, the varying quality of infrastructure has prompted the exchanges to look for alternative solutions as the quality of the delivered produce could not be guaranteed sufficiently.

[40] which are mostly used towards storage of buffer grains stocks.

Certified warehouse infrastructure has thus been created by both exchanges. The parent company of MCX founded the National Bulk Handling Cooperation (NBHC) in 2005 to provide warehousing and services in the bulk handling of agri-commodities.[41] The company had established by 2007 over 1,200 warehousing facilities supporting 35-40 commodities and covering about 2 million tons of warehouse space. The National Collateral Management Services Ltd (NCMSL) was jointly created in 2004 by NCDEX (which holds a 15% equity in it), by several leading banks in the country, by co-operative bodies and by a global collateral manager based at Geneva. It has since created 1 millions tons of warehouse space covering 725 delivery centers. These companies have been the drivers for a warehousing boom - with an emphasis on quality storage - that has taken place in India in recent years.

(c) Quality upgrade

In the futures contracts that are traded on the exchanges, grades and standards have been developed that might not have existed before the introduction of the futures trading. This requirement has thus helped in putting in place a visible benchmark that the physical markets can potentially adhere to. By a better definition of qualities, this will improve price transparency and give incentives for quality enhancement. To illustrate the phenomena, a quality brand 'MCX grade' was created in the cardamom market which is now commonly used in the spot market. The common use of quality definitions in trade might effectively lead to quality upgrades. For example, since the clear quality definition in the mentha oil future market, Unctad (2007) has noted the shift away by growers from the lower quality to the better quality.

To bring in the capacity on quality certification, exchanges have relied on certification agencies and assayers.[42] While in the beginning, contracts were launched where quality indicators were too vaguely or too loosely defined, this has seemingly been rectified and

[41] The services that are offered include warehousing, bulk handling, grading and inspection, commodity care, pest management, and collateral management of commodities (Singh, 2007).
[42] In the case of NCDEX, e.g. Dr Amin, Comgrade, J.D. Boda, Kerala State Warehousing Corporation, and the Central Silk Board.

a more appropriate set of standards and grades acceptable to value chain participants seems to be developing over time.

2.5. Facilitation of financing

Exchanges in India have further been crucial in facilitating finance, based on receipts given by the commodity exchanges. The National Collateral Management Services Limited (NCMSL) and the National Bulk Handling Corporation (NBHC) have been working with over a dozen banks in India in the area of lending against the collateral of commodities. Lending against commodities is assumed to be a high-risk business and has had limited appeal previously. It is estimated that less than 1% of aggregate bank credit was allocated for commodity finance.

Based on the warehouse receipt that these accredited warehouses give out to farmers or to institutions that store there, banks are generally willing to grant loans to about 70% or 80% of the value of the commodity held. It is estimated that NBHC has facilitated financing over two years for over 370 million USD (Unctad, 2007). This compares to 150 million dollars until March 2008 by the NCMSL (own communication, 2008). NBHC estimates that warehousing funding is facilitated for about half of the bulk handling that it does. To extend warehouse receipt financing, NCDEX has also tied up with e.g. Food Corporation of India and Punjab Markfed (a large cooperative in the Punjab).

Given the government requirement for banks to use part of their loan portfolio for the agricultural sector (18% of their total loans), banks have been happy to work with these warehouse agencies to extend loans to farmers this way as these are one of the few set-ups in rural areas that will guarantee them less default rates and less erratic performance, a major issue in this type of lending (Unctad, 2007). The basic value added of the accredited warehouses that work with the exchanges is thus to assure that the level of risk faced by the lenders is reduced significantly. For both companies, no incidences of default have yet been recorded.

It is estimated that with the entry of private players such as these founded by the commodity exchanges, financing against warehouse receipts has gone up significantly, i.e. from 300 million $ in 2001 to about 1,750 million $ in 2007 (Singh, 2007). Banks are further extending warehouse receipts loans below the benchmark 'prime lending rates' because of the reduced risks. Singh (2007) reports that banks used to provide loans against commodities before at 2-3 percent above this 'prime lending rate'.

2.6. Market development

In its international comparative study, Unctad (2007) identifies different market development impacts that are generated by commodity exchanges internationally. We discuss three of them in the Indian context: (a) education, capacity building and research; (b) ICT (Information and Communication Technology) upgrade and promotion; and (c) industry growth.

(a) Education, capacity building and research

Farmer awareness programs have been conducted by MCX as well as NCDEX. However, their number has been limited given the national scope of the exchanges. A total of 10 programs covering more than 2,500 farmers across 5 states were organized by MCX. It conducted also 25 programs in collaboration with the Forward Marketing Commission to about 6,000 farmers and other supply chain participants. NCDEX has conducted similar awareness programs. On top of these programs, NCDEX has developed a certification course on Commodity Futures Markets in which 20,000 students have participated so far. Thirty hours courses have also been conducted in a number of management institutes. However, despite the attempts in outreach, futures markets are not well understood by smallholders (chapter 3). Sahadevan (2008) argues that this lack of understanding is a major obstacle to their direct participation in the future exchanges.

To strengthen their knowledge management, both of the commodity exchanges have further started up a research arm that analyzes the economics of commodity exchanges as well as commodity trade: MCX started the MCX Academia of Economic Research and NCDEX started the Institute of Commodity Markets and Research (NICR). These organizations produce daily, weekly and monthly reports on various products, organize seminars, publish a scholarly journal (“commodity vision”), and prepare topical analysis on a range of topics. They thus contribute to better knowledge in this area.

(b) ICT upgrade and promotion

International evidence indicates that commodity exchanges also might help in upgrading and promoting ITCs. Exchanges are in general at the forefront of extending modern technology to farmers including advice electronic-delivered services such as banking, insurance, weather information, etc. (Unctad, 2007). This is also the case in India. Both commodity exchanges have put price tickers in rural areas with high footfalls, such as mandis, warehouses, rural bank branches, and agriculture-based organizations. Internet access is a key requirement for trading in the future markets and exchanges have facilitated the access to it. As of March 2007, MCX had over 7,000 trading terminals while NCDEX had 20,000 terminals accessible from over 700 centers. MCX has even gone as far as installing technology in remote areas that allows farmers access to the internet through satellite connections (by using the VSAT (or Very Small Aperture Terminal) technology) with add-ons that provide permanent electricity supply.

(c) Industry growth

The development of the commodity exchanges has created new demands for all type of services related to broker firms, dissemination of information, the use of warehousing, etc. This has thus generated employment opportunities and led to industry growth. It is estimated by insiders that an industry of over 300,000 people might have been built up around the commodity exchanges in India (Unctad, 2007), including people employed by the exchanges and the brokers, the warehousing companies and logistics, and grading and certification services. While the exact numbers are difficult to verify, it seems however that the development of futures exchanges has also had important effects on employment.

3. The impact on smallholders of modern spot markets

Modern spot markets might potentially have important benefits on the smallholder. As the modern spot exchanges are even more recent players in the agricultural markets than the commodity exchanges, the evaluation of their impact is purely based on qualitative observations. We illustrate in this section how online exchanges and modern wholesale markets have significant advantages compared to the traditional marketing system. Table 4 first summarizes, by channel, the differences of assessments in quality and quantity, in services delivered, in transactions costs, in the role of the broker, and in the type of clients that use this channel.

We further compare the different systems by looking at the marketing costs faced by the farmer and by evaluating the price realization of the farmer in each channel. As to better quantify the different costs faced by the farmers in the different channels, detailed interviews were conducted with farmers, retailers, and wholesalers in the city of Bangalore. While the results of these surveys are not based upon a representative scientific survey, we believe that they are however largely indicative of the situation on the ground.[43] The information collected allows us to make a distinction in the structure and the costs of the different value chains.

As we are specifically interested in effects on the prices for the farmer, we look at the cost in the value chain of each channel. We compare the cost structure of the different value chains of representative products of the fruit and vegetables value chains in the Figure below. While we assume that the wholesale prices are similar for the e-auction (the SNX model) and for the centralized electronic auction (the Safal Market model), this is not based on any statistical analysis.[44] The results of the simulation show how the prices that are offered to the farmer in the centralized electronic auction model (the Safal

[43] To come to these numbers, we had to make several assumptions. For example, we assumed a commercial load of 750 kgs, i.e. 20 bags of 15 kgs each, to arrive at the costs per unit.
[44] Diekman et al. (2008) did recently an analysis of differences of prices (of tractors) on eBay and in-person auctions. They could not detect any differences between the two for the most traded product.

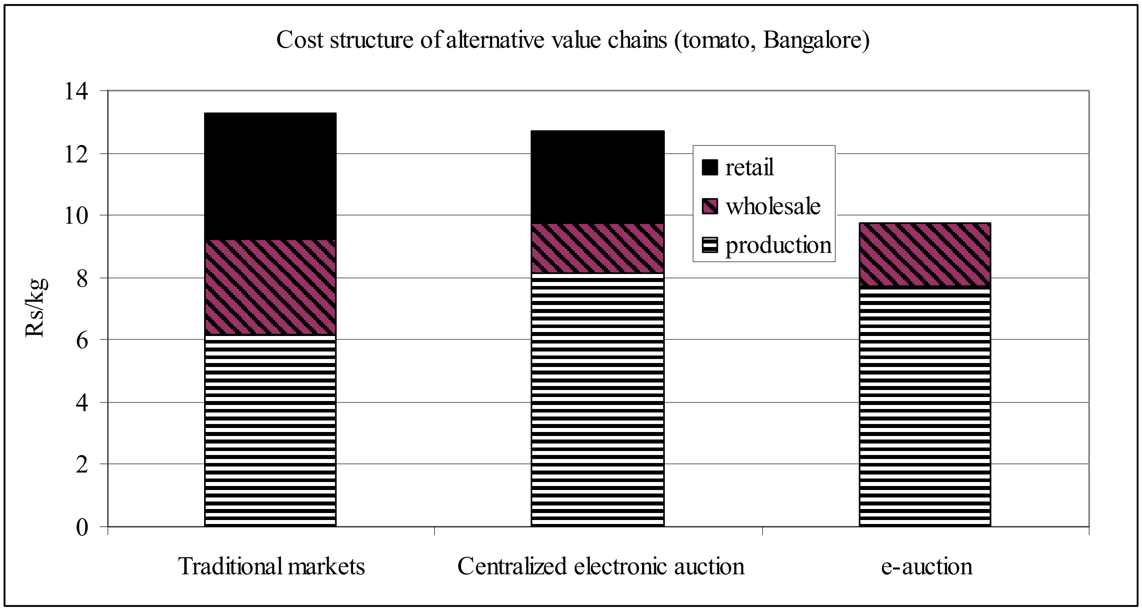
Market) are significantly higher than in the traditional marketing system. Simulations on the benefits of the online auctions also indicate that benefits to the farmer would be in the same range as for the Safal model. It is estimated that the marketing costs between producers and the wholesale market in the case of tomato would be reduced from 3 Rs/kg to 2 Rs/kg in the case of the on-line auction and to 1.2 Rs/kg in the case of the electronic auction.

Table 4: Characteristics of the different supply chains in spot markets

	Traditional* markets	Centralized electronic auction	e-auction
Assessments quality and quantity			
quality	all qualities accepted no grading limited quality rewards	all qualities accepted grading explicit quality rewards	only better quality grading explicit quality rewards
quantity	sometimes weighted	weighted	weighted
Services			
delay payments	immediate	up to 7 days	2 days
input advances	possible	no	no
insurance/credit	possible	no	no
warehousing	traditional	modern	traditional
Transaction costs			
transport of produce by farmer	to wholesale market	to collection center	to collection center/none
personal travel by farmer	to wholesale market	to collection center	to collection center/none
packing material for transport	traditional bags	crates	traditional bags
time lost for transaction	long	short	short
Broker role			
costs	10% of value	5% of value	1.5% of value
aggregation	no	yes	yes
association of farmers	no	yes	most likely
Clients			
type of clients	small retailers	small retailers large wholesalers processors modern retail	large wholesalers processors modern retail
charges to clients	0% of value	1.5% of value	1.5% of value

These simulations thus show that there might be significant benefits of these modern open-source intermediaries. We estimate in the case of the on-line exchanges that the prices that are offered are about one-third higher than compared to traditional channels.

We also find that similar high prices are offered in the case of modernized wholesale markets. These modern spot exchanges might often lead to better price realization as farmers do not have to go through brokers or local consolidators that charge higher margins than the modern spot exchanges do.



Each of the modern spot exchanges has benefits that would make agricultural trade more efficient compared to the traditional structure and part of the efficiency gains shows seemingly up at the farm level. An on-line spot exchange might be an effective price discovery tool for farmers as prices for well-specified commodities are displayed throughout terminals in the country. Access to this information alone might already lead for some farmers to better price realization. On-line exchanges might further lead to better standardization and grading procedures which are currently largely absent in traditional markets. This is important as to cater to changing market demands as graded and standardized products are increasingly demanded by modern retailers, exporters, as well as processors.

Conventional auctions have the disadvantage of the requirement that produce has to be centralized at a specific location. This can then be more costly than direct buying or selling. An advantage of online auctions is that they allow for impersonal transactions where no physical verification by buyers or sellers would be needed. They could perform the important function of discovering prices that will equate short-run demand and supply (Tomek and Robinson, 1991). It would especially be an effective mechanism to reduce the *thin market* problem if there is widespread participation by buyers and sellers.[45,46]

While most of the benefits of online auctions would also hold for the electronic auctions cum wholesale markets, the latter might however play some additional functions on top of the electronic exchange. Similar as in the online auctions, farmers would be exposed to more buyers in this environment and given the set-up of a hub-and-spoke model, the number of intermediaries in the value chain would also be reduced. However, because of the improved supply chain management and better facilities, it could also be expected that wastage levels, that are usually estimated to be high in traditional Indian marketing settings, would significantly come down.

The type of clients that participate in these modern spot exchanges might be different and attracting them might be the major bottleneck for fast growth. The traditional channel seems very well oriented towards the small retailer as small quantities are auctioned in the neighborhood of where the retailer has his activities. However, small retailers do currently not participate directly in the online auctions. It is to be seen if an intermediate group will emerge and start catering to their needs (and will thus take on the role of a local wholesaler in the area of the retailer). It seems that the buyers that will participate on the e-auctions, and especially so in the initial phase, will be relatively larger ones, potentially including processors and modern retail. Small retailers do participate in the electronic auctions and modern wholesale market but only those that are located close in the neighborhood of the modern wholesale market. Given their relatively high transaction costs, location with respect to their sourcing point seems extremely important for these small traders. They might currently thus benefit more from these electronic auctions - in

[45] A *thin market* problem is one in which few transactions establish prices. *Thin markets* are associated with problems of pricing imperfections, price manipulations and unstable prices (Tomek and Robison, 1991).
[46] Tomek and Robinson (1991) further argue that the success of online auctions is most likely to occur when the following conditions hold: (1) commodities and their quality characteristics can easily be described; (2) the costs of accessing computers is low; (3) trust that buyers will pay the negotiated prices and that sellers will deliver the specified quality and quantity must be generated in the system.

contrast with the online auctions - as Safal reaches out to them through their expanded distribution system. However, the inability of the modern wholesale market to attract the traditional buyer to their platform has led to significant underutilization of their facilities.

4. The impact on smallholders of rural business hubs

The private-sector Rural Business Hubs (RBH) is a modern private sector platform that provides an "umbrella" for the retail and wholesale to farmers and rural households of various services. These include: (1) output procurement; (2) retailing of farm inputs; (3) farm extension services; (4) financial services; (5) retail of consumables; (6) other services like rural youth training, health services, and insurance. The goal of the RBH is to supply these at lower cost (either per product or by group products and services into a "one-stop shop" for rural households), and/or higher quality (such as quality assured farm chemicals), or supply services where they are simply missing (such as insurance). Note that this range of services covers a multiplicity of effects on small farmers, as discussed below.[47] The provision of these services leads to direct income effects, an improved and expanded access to markets, as well as other development impacts.

4.1. Direct income effects

The RBH services can potentially increase farmer incomes by:

(a) improving output procurement by reducing the opportunity costs of waiting time that farmers tend to have from the wholesale market, increasing differential payment for quality, and reducing transaction costs to farmer by having storage facilities in the rural areas to collect the product);

[47] Crucially note that these are all hypotheses concerning the effects of RBHs on small farmers; our research's scope did not allow farm surveys and so we could not yet statistically test any of these hypotheses.

(b) improving the quality of farm inputs available to the farmers (farmers often complain about adulterated inputs from traders), and thus the effective or implicit price might decrease to the farmer, showing up in the productivity of the inputs;

(c) improving financial services available to farmers, via the RBHs usually sharing their platform with banks such as SBI and ICICI, via the RBHs rolling out their own credit schemes, and via links between the RBHs and new schemes like the kisaan credit card scheme – all of which lower interest rates and increase access to loans by farmers without having to have to use expensive village moneylenders or rely on tied output-credit market credit from the commission agents and local traders of outputs and inputs;

(d) the retail at low cost[48] allows farmers to access health services; several studies have shown a clear link between better health and farm productivity.

The points that we make above concerning how RBH services and coverage may help farmers incomes in general, apply to women farmers per se, and to a large extent to farm workers. In terms of women farmers, the points to emphasize beside the general points about productivity, include the importance of the retailing of consumables at the RBHs (which allow women farmers to waste less time shopping for consumables like food staples and household items far from where they buy inputs and market their output), extension (women get specific extension help at some of the RBHs and that could be amplified), and getting health services, which to some extent already, and could much more, include maternal health care services.

As for farm workers, usually among the poorest persons in Indian society, the open access by the RBHs bringing credit and health services into the fabric of rural society, would tend to improve their welfare. Moreover, the companies undertaking RBHs tend in general to be promoting agricultural diversification by farmers in order to procure more high-value products like vegetables and fruits, as well as milk, from farmers. Relative to

[48] such as in the tie-up between Apollo Pharmacies and Godrej and with Choupal Saagar, and the initiating tie-up between Fortis and Hariyali.

staples like grains, these high value products are more labor intensive, and studies tend to show that such diversification into high value products increases use of labor and thus employment and wages of landless laborers.

4.2. Improved access to markets for smallholders

Most of the RBH companies are potentially very effective conduits for small farmers to gain direct access to markets to dynamic segments of the emerging modern food industry in India, as well as to exports. For example, Hariyali's RBHs are becoming back-end operations for vegetables for several key supermarket chains; as of this year, that was also started in Godrej Aadhaar (itself acquired by the leading supermarket chain). ITC's Choupal Saagar procures wheat and soy that go directly to their own mills and into retail stores across India, and progressively they will source vegetables to go into their Choupal Fresh supermarkets and be sent to other supermarket chains. That creates a market for quality in both staples and high-value products, which might open these markets to poor local farmers.

It is important to note that while very small and small-medium farmers are some 80-85% of farmers in India, they constitute only some 50-60% of land and output. That means that there is an important group of larger (by Indian standards) farmers that have nearly half the output, and probably considerably more of the marketed output, given that the output of many of the smallest farms is simply consumed at home and not marketed. This implies that the smallest farmers and even small-medium farmers, need to become more competitive even in their local markets, by having increased access to local markets and via those, links to dynamic urban markets. Services such as output procurement by RBHs, especially if made progressively more easy and accessible to local small farmers, may raise the competitiveness with inclusiveness of these small farmers in India.

The RBH also seem to lead to enhanced agricultural value chains that enable market development and increased trade. The value chain includes all of the segments that are in fact parts of the RBH set of services – input supply, wholesale or output procurement, links to processing and retail, as well as the "lubricants" or concomitant services such as extension and finance that permeate the chain to make it work. Thus, the RBH might essentially become a motor of the development of agricultural value chains, bringing the modern sector into the rural areas.

4.3. Other development impacts

The RBHs also do activities that might be good for the development of the agricultural sector as a whole. These include extension, better management of water resources, capacity building, as well as assuring the availability of appropriate technologies:

(a) Access to extension services: Improving the information available to the farmers by the direct extension services of the RBHs is particularly important given that farmers complain about near absence of effective extension services available presently; in some of the RBHs (such as the Choupal Saagar which is linked in the hub and spoke model to the e-choupals and the storage facilities for inputs and outputs associated with them), this also implies market and weather information provided to farmers that they normally would not have.

(b) Increased use of systems/approaches that lead to better management of water resources: Some of the RBHs are retailing equipment for water management; for example, Godrej Aadhaar is looking to expand its marketing of drip irrigation and sprinkler systems; other RBHs market well pumps. Perhaps most broadly, the extension services of all the RBH companies that we have interviewed tend to have water management as a key part of their extension services to local farmers.

(c) Increased institutional capacity for support to the agriculture sector through educational/extension services, applied research, and information dissemination: The RBHs themselves have extension services, and some, like Godrej Aadhaar with the help of the NGO Pratham (and several other are thinking about this), have rural education for rural youths that they then help with employment in their operations as well as just provide the education generally for good relations with farm communities.

(d) Effective technologies and practices adopted into training and technical assistance curricula of public and private institutions: The RBHs' survival and business profitability depend on introducing and supporting technologies that improve farmer incomes and productivity, and thus win clients. The training and technical assistance they do somewhat now and may extend much further, is part of this.

5. The way forward

The ultimate objective of interventions by a foundation in agricultural markets would be to facilitate the building of a sustainable model where it would intervene for a short and limited period to help a promising model get over some start-up costs, to help with some initial investments costs, and to facilitate faster expansion through targeted investments. Special care should be taken that no disincentives or market distortions are created for other initiatives and that competition is done on equal footing as to ensure the sustainability for these modernizing markets. Keeping this in mind, we discuss the overall constraints to up-scaling of these modern open-source intermediaries, the potential investments that could be done in this area and the potential role that a foundation could take on.

5.1. Future exchanges

As shown in Chapters 1 and 2, agricultural commodity exchanges might potentially deliver different benefits for the agricultural sector and the smallholders in particular. Our analysis shows that there were problems with regulation and hick-ups in the initial stages of the commodity exchanges in India, such as too many contracts launched at once which were not grounded in agricultural realities; price behavior that did not make the future exchanges attractive enough for hedgers and they thus failed to participate in large numbers; and not enough self-regulation which might have left some speculators too much leeway. As we have seen in the case of China, such a situation is not uncommon in the start-up phases of commodity exchanges.

However, it seems that the commodity exchanges have gained significant experience in better catering to the needs and demands of clients and there is evidence that smallholders in particular might have benefited from the presence of the futures markets. Based on a primary farm survey, we find in chapter 3 that smallholders have improved their prices by 10% since the start-up of the commodity exchange and the cardamom success story shows how futures markets through well-targeted investments can have a revolutionizing effect on the structure of value chains, to the benefits of smallholders. However, a widespread effect of the presence of commodity exchanges on the agricultural sector in India has not yet been seen as the crops that have been relatively successful on the futures exchange were minor crops (or major crops that lacked liquidity). While the commodity exchanges have seen high growth in recent years, it thus seems that they have not yet fulfilled their potential and possibilities for expansion and for the facilitation of better functioning agricultural markets are still out there.

We compare in Table 4 India with the case of China as to better understand how up-scaling could work, given that China seems to have a bigger and better performing - but also relatively older - future market. After China went through a chaotic period in its futures markets in the 1990s, the government issued strict regulations to control excessive speculations and to assure that its futures markets fulfilled the role that they were designed to do. Table 5 shows that while exchanges in China are less involved in the pure development activities (price dissemination, facilitation of finance, and warehousing) than in India, they showed better performance on their core functions, i.e. price discovery and hedging.

Besides the strict regulation, a major but crucial difference between the futures markets in China and India is that China chose to allow only a very limited number of agricultural products. However, despite the limited offer of agricultural products, the largest Chinese exchange (the DCE) has now become the second largest agricultural exchange in the world (after Chicago). A total of only nine agricultural products are traded on the futures exchange. These nine products are divided between two different exchanges and one product is only allowed to be traded on one exchange, thus forgoing competition between exchanges. This cautious strategy of focusing on a limited number of products that are strictly regulated seems to have paid off as efficiency tests indicate the good performance for these products in price discovery as well as hedging (Table 5).

Table 5: Assessment of performance of commodity exchanges in India and China

	India	China
Core functions		
1. Price discovery		
a. Efficiency: Test of the relationship between futures and spot		
	long-run equilbrium exists	long-run equilbrium exist
	short-run market efficiency is lacking	short-run market efficiency usually exists, except for wheat
b. Impact	exchanges seem to have led to integrated spot markets	exchanges seem to have led to integrated spot markets
2. Hedging		
a. Efficiency: Test on the unbiasedness of futures		
	Risk reduction exist but is not sufficient to enable hedger to full hedge their stocks	hedge ratio satisfactory except for wheat
b. Particpation	% of hedgers low	% of hedgers moderate (16% of volume)

Using China as a model to learn from, it seems that different interventions could be done towards the better functioning and up-scaling of the futures markets in India. They include outreach to more participants in the value chain, an expanded network of physical delivery and warehousing outlets, a change in the role of the government, and changes in regulation.

First, while commodity exchanges have done efforts to reach out to a large number of participants, the major reasons why stakeholders in the value chain are not using the futures exchanges have mainly to do with a lack of understanding on how futures markets function. For example, a primary survey with farmers shows that most farmers are unaware of the functioning of futures markets. There is need for a large-scale campaign to build awareness among various actors in the value chain. The exchanges should play a greater role in awareness and confidence-building programs and demonstrate the use of futures market to various potential hedgers in the value chain. It seems each exchange should focus on a limited number of commodities at a time to involve potential hedgers in the value chain by creating awareness, building confidence to hedge in the futures, and fine-tune their systems and processes to facilitate user requirements. As is not uncommon in the early stages of a commodity exchange, there is currently still a strong perception in the minds of potential hedgers that large players could be manipulating markets. It is important for the exchanges to allay these fears by reducing daily price limits, reducing the role of market makers, and strengthening self-regulation.

Second, physical delivery centers, certified warehousing, and credit facilities are needed to a larger extent. While commodity exchanges have done significant efforts to create certified warehousing (3 million tons in total), they are still not present in all agricultural areas of the country. Warehouses might also not be attuned to the storage needs of specific crops. Both commodity exchanges have thus plans to significantly invest and expand their warehouse capacities in the years ahead. The government or donors could facilitate the use of infrastructure such as warehousing, grade standards, and credit facilities through involvements of institutions such as banks, etc. Institutional arrangements such as aggregators should also be increasingly brought in.

Third, the government could play an important role in helping to build a well-functioning futures market. Use of futures trading by various government agencies dealing with buying and/or selling of commodities could be encouraged to hedge their risk in the commodity futures. As these agencies generally deal in large volumes, their participation will increase hedging substantially, which in turn will help in strengthening physical and futures markets and build confidence among the other players in the market to use the futures market. Additionally, as many government agencies will look for physical delivery, it would help to streamline the delivery mechanism in terms of processes and grade standards. This will help other players to understand the futures mechanism well and also help in strengthening physical and futures market integration.

Fourth, different changes in regulation could improve the business of the commodity exchanges. These required changes include: a/ a greater autonomy of the Forward

Marketing Committee of the government as to allow for more efficient functioning; the fact that futures market in commodities are being regulated through an archaic Act, enacted in 1952, which does not address various challenges being faced by modern regulator and markets, does not help in inspiring confidence; b/ To make the markets work efficiently, an optional product mix is needed. However, the present regulatory provisions prohibit the launch of options, index futures, weather derivatives, and various cash settled derivatives. Introduction of these products would not only provide alternate risk mitigation tools, but would also add to the liquidity and depth of the markets;

A foundation could take on some of these functions of these commodity exchanges as to help in upscaling. For example, it could finance the operations related to the launch of futures contracts of crops mainly grown by smallholders or it could facilitate the infrastructure expansion needed for these exchanges to function better and on a larger scale. While future markets clearly deliver benefits to the agricultural sector, there are however two risks for a foundation for being involved in expanding the reach of commodity exchanges. First, while price discovery and price hedging contribute to the better functioning of the agriculture sector, they however contribute only indirectly to the welfare of the farmers and it is hard to directly quantify the exact benefits and the impact on smallholders. Second, there are political risks of being involved in futures markets given their perceived link, for some politicians, to inflation. Given potential unpredictable political developments in India, it is unclear if successive governments will allow futures exchanges to continue their operations freely in India and thus linking with them involves some level of unknown risk.

5.2. Modern spot markets

Despite the hype, there are relatively few success stories of online auctions in agricultural markets in developing countries.[49] It is however possible that India might become a leader in this because of two advantages. First, the unique characteristic of on-line

---

[49] However, online auctions are used in more developed countries. For example, all Belgian and Danish auction houses are connected on-line and any buyer can do bids from anywhere and physical presence of persons is not required at all.

exchanges in India is the involvement of a commodity exchange which has significant experience with on-line agricultural transactions. One does thus see features of the futures markets transactions in the spot exchanges (including margin money, well defined quality characteristics as practiced in futures markets, etc) that would make for a sustainable model. Second, India has successfully experimented with the e-choupal model where millions of farmers are part of a scheme where farmers are provided with real-time market information and where they can transact through computer terminals. The e-auction model might then be a logical extension of this scheme.

To modernize spot markets to the benefit of smallholders, it seems that several efforts would be needed. They include the creation of extension efforts, aggregation capacities, credit access, payment facilities, lowering of transaction fees, access to terminals, and a change in marketing regulations. We discuss these consecutively.

First, as on-line transactions are new for most farmers in India, widespread extension efforts would be needed to explain the concept of these on-line exchanges. About two-thirds of the staff of the SNX is currently involved in these extension activities and concept building exercises and it is estimated that two to three years will be needed to make the enterprise profitable. The number of farmers and buyers that can be reached through these extension agents is obviously limited and further up-scaling of these efforts would increase the reach.

Second, significant effort would be needed on the education in grading practices and on building aggregation capacities. Adjusting to grading and assaying might take time for some farmers and might even be an impediment for participation for some farmers. SNX and Safal Market both have spent significant resources before their start-up as to train their members to effectively grade their produce. However, better and transparent rewards for grading and quality might over time also lead to better agricultural practices, and potentially better food safety. It is expected that these characteristics will be increasingly demanded in the rapidly changing agricultural markets of India.

Third, in the current set-up of the modern spot exchange, there are no or only few facilities for credit or input advances. As traditional brokers often fulfill these functions (it is however not clear how important this function is and how it differs over space)[50], the modern spot exchanges should ideally start providing some of these services for some of their clients as these services are often crucial for part of the farmers. For example, SNX is already planning to link with banks as to allow for this type of facility for some of their members.

Fourth, the modern system as it is currently organized has a built-in delay for payment to the farmers. Farmers who participate in the modern wholesale market only receive the payments for the goods that they delivered on average one week after the transaction took place. Payments for the members that transact on the e-auction are paid one day late. As members are usually not the farmers themselves, the delay before it reaches the farmer might in reality be a bit longer.

Fifth, fees for trading on the e-auction are currently still relatively high (1.5% for the buyers and 1.5% for the sellers). While the costs are less compared to the traditional system, they are relatively higher for the SNX than for the coffee e-auctions that were recently started up in India (where the charges are 0.5% of the value of the produce). However, when economies of scale are reached in this type of market over time, it can be expected that prices would decrease.

Sixth, access to well-functioning terminals is a necessity to be able to participate in these modern spot exchanges. The use of terminals might be limited for the farming population for three reasons: lack of understanding, lack of terminals, or lack of access to broadband technology. These different constraints could potentially be overcome by increasing investments. The access hurdle could potentially be overcome through the building of rural kiosks or through the use of cheaper devices such as mobile phones for online trading.

[50] For example, focus groups interviews indicate that agricultural brokers are seemingly little involved in credit and inputs in the state of Uttar Pradesh but they are clearly very much involved in this in the state of Haryana and Punjab.

Seventh, an obvious requirement for these modern markets to take off is changes in marketing regulations. The first initiative in this area could be started by the SNX and the Safal Market because of their linkages with the NDDB as they are exempt from the APMC Act in a number of states. However, as to allow for more players to come in that will set up such modern spot exchanges, more liberalization of the marketing rules is required and private wholesale markets should be permitted to be set up outside the purview of the APMC Act or within a strongly liberalized Amended APMC Act setting.

The pioneering firm that we study in this report, SNX, is already planning several extensions to its model as to further upscale its activities. It does plan to do so by allowing for easier access to trading terminals as well as by offering different types of contracts. The costs and use of computers for trading might be prohibitively high but SNX is considering extending its system through the use of mobile phones as well as through the establishment of kiosks in traditional wholesale markets. SNX is further planning to introduce commodity specific memberships. These might include for example cold storage potato memberships, i.e. only those people that would have potato in cold storage would be targeted in trading.

The next important question is then what the role is that a foundation could take on in the promotion of this type of modern spot market. Given the list of constraints stated above, it seems that a foundation could help firms to overcome some of the seemingly temporary hurdles in the expansion of the system. The major promising possibilities include: 1/ support of the promotion of the concept and extension efforts. The foundation could potentially pay for the outreach in those specific districts in which it would like to make a difference. The payment of these activities could focus on the training of extension agents, the salaries and the working costs of the agents, the training facilities in the villages, etc.; 2/ create access to terminals. The foundation could pay for some of the infrastructure, e.g. rural kiosks and broadband connection, in these areas that it would like to focus on.

The foundation could chose different potential partners to collaborate with. First, SNX would be an obvious partner as they are already functioning and the foundation could be of help towards the expansion of their activities in areas that they are currently not active yet. The limit of working with SNX is their sole focus on fruits and vegetables due to its linkage with the National Dairy Development Board (NDDB). Second, MCX and NCDEX are both planning to invest in on-line spot exchanges for staple products in the near future. Given the experience of these commodity exchanges with on-line transactions, they would be ideal firms to partner with as to try to build up this promising model.

However, it is important to point out that these modern spot exchanges are only being started up and it is difficult to evaluate their potential after a few months of operation. Ideally, a more thorough and quantitative impact analysis at the farm level is planned later on as to better understand how they might affect value chains and improve the welfare of farmers, and especially so for the smallest ones.

5.3. Rural business hubs

The rural business hubs (RBH) might be a promising and important vehicle to reach out to poor and marginal farmers in India as they seemingly bypass many hurdles that currently exist in the rural landscape. Given that these rural business hubs are new and innovative, it might however be too early to go ahead full-scale and better understanding of their impacts are urgently needed. If the rural business hubs do in reality deliver some of the benefits that were identified during our rapid appraisal exercises, we believe that the foundation could use them to have a real impact on the rural poor and we suggest some potential ways in how it could do so below:

First, it is crucial that the foundation would invest in moving from this initial rapid appraisal of this important new phenomenon, to testing hypotheses and exploring the impacts of these on farmers, and understanding how to design RBH services (types, design, and delivery modes) to reach small farmers, which will require a special effort.

Second, all of the activities of the foundation fit into the general category of improving farmer incomes (output procurement, input provision, extension, credit) and thus fighting rural poverty. Most of these activities require physical assets such as storage facilities, weigh-stations, cold chain equipment, dairy facilities, and so on. The foundation can invest in these physical assets. That will also help the RBHs to extend their operations to the hinterlands and to the small poor farmers who have least access to local infrastructure.

Third, training and capacity building activities of the rural people that are employed doing this work is a crucial area for investment. The foundation can invest in this training. The latter can be done also by helping NGOs to undertake the training.[51]

Fourth, the RBHs appear to us to be excellent channels of effective rural retailing of medicines, anti-malaria gear, and health services. The foundation can marry economic growth and poverty alleviation goals with helping RBHs to roll out faster and more effectively to the village level (in a hub and spoke system with the RBHs) the health services, perhaps in a triangular relationship with health care providers like Fortis or Apollo.

Fifth, as the foundation undertakes other rural investments in communities and cooperatives, and in NGOs, they can look for links with the RBH network that allow them to use the latter to link their rural efforts with effective conduits for linking with the markets.

Sixth, it is important for small farmers to group or cluster in order to aggregate output to market to RBHs; this will extend the reach of the RBHs in the catchment areas and help small farmers. The foundation can assist farmers in such clustering; one way to do this is

[51] A model is Aadhaar Retailing's tie-up with Pratham to do training of rural youths.

to enlist the help of NGOs that specialize in helping farmers form effective marketing cooperatives.

Seventh, like many effective private sector companies, the RBH companies tend to have their core competencies, and these center on growing the business, minding profitability in order to survive, pleasing their clientele, and solving technical and management challenges as they arise. Corporate social responsibility initiatives aside, it is usually not the day to day core competence of the staff to have the expertise to “stretch” to resolve constraints holding the business back from reaching the largest number of poor farmers possible. They need help in doing this. An interesting solution to this dilemma has been used by the government of Chile, called ProChile; in it, the government places technical personnel skilled in relevant areas to the business but also knowledgeable in finding ways to extend the business services to small-scale suppliers; this helps the business, helps the small farmers, relieves short-run constraints in capacity and competence to do this, and creates a longer run solution as these activities are graduated over to the regular staff of the company; yet at the same time these actions are internal, not external to companies, so the implantation and infusion of these goals and practices and competences have been facilitated by this successful program. Piloting such a program would be a useful activity of the Foundation for the RBHs.

Annex 1

Agricultural commodity futures exchanges in China

1. Introduction

Futures trading in agro-commodities play a crucial role in today's global commodity markets and the agricultural futures market in China is becoming quickly an important player in this. However, very few comprehensive studies have been done on the Chinese commodity futures market till date. As a consequence, many key questions remain unresolved such as: why did some commodities survive in the futures market, and others did not; what was the role of regulations in the evolution of the futures market; what is the relationship between commodity futures markets and spot markets; are smallholders able to participate in the futures markets; and what are development impacts of agricultural commodity futures markets in China. These are important policy questions and this chapter aims to address them to the extent that this is possible with the data available.

The first modern futures market in China was set up in 1990. It was then barely a grain wholesale market in an inland province of Henan. In 2007, with a total trading volume of US$ 5.8 trillion, China's futures markets outweighed China's GDP (US$ 3.43 trillion) (Wang 2008). The total trading volume almost doubled itself within one year, and the trend is expected to continue so that the trading volume could reach US$ 10 trillion in 2008 (Li 2008). While the share of agricultural in China's GDP accounted for only 11% in 2007 (CIA 2008), the agricultural commodity futures accounted for about 42% of total trading volume in 2007 (US$ 2.4 trillion). This latter share increased to 59.3% in the first quarter of 2008 (Zhang 2008).

In 2007, China was reported to be the largest futures market for soybean meal in the world, and second and fourth largest for corn and soybean. The country has three futures exchanges located in Zhengzhou (ZCE), Dalian (DCE) and Shanghai (SHFE) respectively. The DCE has become the second largest agricultural commodity exchange in the world (Fu 2008), specializing in wheat, cotton, sugar, mungbeans, palm oil, and pure terephthalic acid (PTA); ZCE focuses on corn, soybean, soybean meal, rapeseed oil, soybean oil, and low density polyethylene (LLDPE); and SHFE provides futures trading services for non-agricultural commodities such as copper, aluminum, natural rubber, fuel oil, zinc and gold. More than 24 agricultural commodities were introduced into China's futures markets in the last 15 years, but only 9 of these survive today (Table 1).[52]

Table 1: Commodity Contracts Evolution in Chinese Futures Market

Agricultural Commodities	Year of Trading	Non-agricultural Commodities	Year of Trading
Soybean	1993-now	Veneer	1993-1998
Wheat	1993-now	Cooper	1992-now
Cotton	2004-now	Aluminum	1992-now
Rice	1993-1998	Fuel Oil	2005-now
Corn	1993-1998, 2004-now	PTA	2006-now
Soybean Oil	2006-now	LLDPE	2007-now
Soybean Meal	1993-1997, 2000-now	Gold	2008-now
Sugar	2006-now	Treasure Bond	1992-1995
Palm Oil	2007-now	Tin	2007-now
Rapeseed Oil	2007-now	Natural Rubber	1993-now
Mungbeans	1993-2000	Others[53]	1993-1998
Redbean	1995-1998		
Coffee	1995-1997		
Sorghum	1995-1997		
Barley	1995-1997		
Peanut[54]	2003-2004		

Data source: CFA website 2008

This chapter is organized as follows. In section 2, we review the evolution of Chinese futures markets, in which we focus in particular on the agricultural commodities. In

[52] These include soybean, soybean meal, soybean oil, wheat, corn, palm oil, cotton, sugar and rapeseed oil. Others including rice, mungbeans, peanuts, barley, coffee, cotton yarn, sorghum, sesame and redbean could not survive either due to too much speculation or lack of trading volume.

[53] Others include 20-30 commodities (like steel, silk, concrete, glass etc) which were traded discontinuously from 1993 to 1998.

[54] Peanut was listed from 2003-2004, but no trading volume.

section 3, we discuss the roles of regulation in the evolution of futures market and in section 4, we look at the evolution of the trade in specific products. Section 5 describes the structure of Chinese futures market. Section 6 discusses the efficiency of commodity futures markets. In section 7, we discuss participants in futures markets and the development impacts of commodity exchanges, with a special emphasis on smallholders. We conclude the chapter with policy implications.

2. Evolution of the Chinese futures market

2.1. Phase 1: The early stage (1990-1996)

The earliest commodity exchange in China was established in the 1920s in Shanghai, Asia's financial center till 1949 (Chang 2007). Cotton and cotton yarn were the main futures commodities traded in the Shanghai commodity exchanges. In 1936, after ten years of existence, there were as many as 11 commodity exchanges, hundreds of brokerage firms, and thousands of agents active in the market.[55] Due to wars, the futures markets were closed from 1937 to 1945. Some of them were resumed shortly after World War II to be closed again in 1949 when the Chinese Communist Party came to power as the futures markets were considered as one of the reasons behind the hyperinflation in China. The futures markets then completely disappeared in mainland China until 1990. A few state-owned enterprises (SOEs) were however occasionally allowed by the Chinese government to participate in overseas futures markets. These enterprises hedged to manage risks from international trade in the 1970s (Chang 2007).

Before China's economic reform in the early 1980s, the Chinese economy was a centrally planned economy. The economy was based on a system of state ownership, administrative planning, socialist competition, and controlled labor assignments. While the efficiency of this centrally planned economy was poor, it did however have the advantage that the government, SOEs, and consumers did not need to worry much about inflation and market volatility because prices were fixed by various government plans.

[55] Interestingly, Chiang Kai-shek, who served as Generalissimo of the national government of the Republic of China from 1928 to his death (1975), was one of those pioneer agents in Shanghai in early 1920s.

However, with the gradual introduction of the market system in China in the 1980s, this advantage decayed quickly. China's economy experienced severe inflation and commodity price volatility, which became one of the major concerns to Chinese reformers. In 1986, Chinese economists visited the New York Board of Trade (NYBOT) and learned how futures markets had had a stabilizing impact on commodity prices in the US. This marked the beginning of an era where large interest was generated to better understand futures markets and its potential applications in China.

In the late 1980s, the central government in China in collaboration with economic researchers chose the four provinces of Henan, Hubei, Jilin, and Sichuan for the start-up of futures markets on an experimental basis. The reason for choosing these particular four provinces was that they were major agricultural production areas: Henan is located in the wheat belt of northern central China, and Hubei, Jilin, and Sichuan are main production areas for rice, corn, and hog respectively (Tian 2006).This indicates that from the very beginning, the main focus of Chinese futures markets has been on agricultural commodities.

In 1990, the first experimental futures market was started in Zhengzhou.[56] However, it was barely more than a grain wholesale market as ZCE officials were advised, after they consulted other functioning exchanges (including CBOT) in the late 1980s (Williams et al. 1998), to start a wholesale market before attempting to begin futures trading. Accordingly, the ZCE started a grain wholesale market in 1990, which was also a new concept for China at that time. In 1991, the first forward contract was traded in the ZCE. It did not take long for the ZCE to inaugurate real futures contracts in mungbeans, wheat, sesame, corn, and soybean in 1993, and the first day trading volume amounted to about 2 million US dollars (ZCE 1994-2007).

The Chinese futures markets expanded quickly. The daily trading volume of the ZCE increased 20 times in 7 months and 100 times in one year. The available futures contracts

56 The central government invited top officials from the four provinces to discuss the possibility of futures markets in their provinces. However, only one top official from Henan province was interested in agricultural commodity futures markets because his father was one of brokers in Shanghai futures market before 1949 (Tian, 2006).

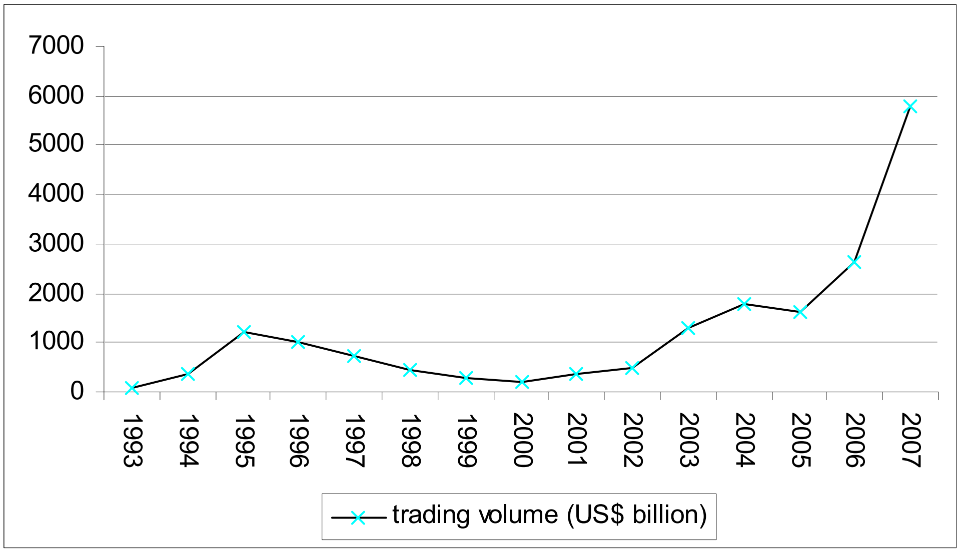
in ZCE also increased from 5 to 12 within one year. The new products included rice, peanuts, soybean meal, redbean, aluminum, cotton yarn, and two treasury bonds (ZCE 1994-2007). This spurt in futures trading spread across the whole country, and in 7 months, more than 38 organizations in multiple cities began calling themselves futures exchanges. At least 55 different contracts were introduced in the futures market (Peng et al. 2006) and the number of specialized futures brokerage firms reached 300. On top of these, more than 2,000 various firms traded futures contracts for clients.

The Chinese central government soon became aware of the chaos in futures market and it ordered the Chinese Securities Regulatory Commission (CSRC) to control it. In order to get the market functioning correctly, the CSRC shut down most of the troublesome exchanges. By the end of 1994, only 11 futures exchanges remained active and the number of brokerage firms decreased sharply as well (Chang 2007). In the next two years (1995-1996), the futures markets gradually stabilized and evolved into a phase of steady development. The number of futures exchanges increased again from 11 to 14 and several regulations to oversee futures exchanges and futures transactions were issued by the Chinese government. The total trading volume of the futures market increased from US$ 367 billion in 1994 to US$ 1,204 billion in 1995 (Figure 1). This was seemingly a sign of healthy development of the Chinese futures market.

2.2. Phase 2: The recession (1997-2002)

However, with the start of the Asian financial crisis in 1997, the Chinese futures markets dipped into a six-year long severe recession from 1997 to 2002. Strangely, this crisis could not hit the Chinese futures market directly as foreign capital was not allowed to enter into Chinese futures market. Anyhow, the financial crisis was a warning for the Chinese government of the potential risks of financial markets. Accordingly, the Chinese government decided again to shut down a large number of futures exchanges and only three of them (ZCE, DCE and SHFE) survived by the end of 1998. In the meanwhile, also 23 products had been removed from the market and only 11 products were allowed to be traded. Most of these were agricultural commodities (Chang 2007).

Figure 1: Chinese Futures Markets Trading Volume (data: CFA website, 2008)



After several scams, financial futures and exchange-traded options were also banned. Financial institutions were not allowed to participate in the futures market anymore except for limited clearing-related activities. Regulation further prevented overseas participation in Chinese markets, as well as most Chinese participation overseas. Only a few of SOEs were given permission to hedge on overseas futures markets (UNCTAD 2007).

As a consequence, the total trading volume of futures market shrank from US$ 1,012 billion in 1996 to only US$ 194 billion in 2000, a loss of 80% of its initial value (Table 2). For the ZCE, the total trading volume decreased from US$ 281 billion in 1997 to US$ 19.3 billion in 2000, a loss of 90% (ZCE 1994-2007). This dramatic decline made stakeholders pessimistic about the further fate of the future market in China. However, this recession turned out to be a useful lesson for the Chinese government and the futures industry. Appropriate attention was now given in establishing strict rules and in enforcing better monitoring systems. In 1999, the first regulation about futures market was issued by the Chinese government. The next year the national futures market association was founded with full support of the government.

2.3. Phase 3: The boom (2003-2007)

After China recovered from the Asian financial crisis, its financial industry revived quickly as well. With rapid growth of the economy in the last decade, Chinese futures market also embarked on a high-growth path. The total trading volume increased from US$ 476 billion in 2002 to US$ 5,771 billion in 2007 (Table 2). The trading volume of the futures market increased by more than 10 times in the last 6 years. The growth even accelerated in the last two years, with the total trading volume doubling within one year, in 2007. The trading volume of the ZCE in 2002 was only US$ 27 billion but it increased more than 30 times and reached US$ 834 billion in 2007 (ZCE 1994-2007). This trend is expected to continue in 2008.

Table 2: Trade in Chinese futures markets (data: CFA website, 2008)

Year	Trading volume (Billion US$)	Transactions (10,000 units)
1993	96	890
1994	367	12,110
1995	1,204	63,612
1996	1,012	34,156
1997	737	15,876
1998	446	10,445
1999	270	7,363
2000	194	5,461
2001	364	12,046
2002	477	13,943
2003	1,309	27,986
2004	1,774	30,570
2005	1,623	32,284
2006	2,625	44,900
2007	5,771	72,800

During this third phase, the number of new futures contracts is still under strict control of the CSRC and only 8 new products have been introduced into the market in the last 6 years. These included corn and cotton that were previously banned from the markets and other new products like PTA, rapeseed oil, soybean oil, LLDPE, fuel oil, and zinc. The CSRC now appears to be more cautious about the risks in futures exchanges and it puts numerous checks and balances as to ensure that rapid growth does not turn into a new chaos.

China's futures markets are now more integrated in global commodity markets. However, financial institutions and overseas participants are still not permitted to trade[57], while SOEs are only allowed to participate in a hedging capacity. The Chinese futures market can thus be largely considered as a market in which speculative participation has been limited to domestic retail investors or private enterprises (UNCTAD 2007), and Chinese futures market has thus not completely been integrated into the international futures market system.

Different causes contributed to the high growth in futures markets. With the national saving rate at 40% in 2002 (He and Cao 2007), Chinese emerging investors were in high need to find profitable ways to invest their money.[58] However, China is yet to expand its investment options for them due to various reasons. Firstly, the inefficient banking system, weak intermediary institutions, and law enforcement fail to provide people sufficient confidence for investing in small business. Secondly, Chinese private funds still find it difficult to enter into industries like aerospace, petroleum, and banking which are dominated by large SOEs, or in real estates and mining industry which are controlled by local governments. Thirdly, China has very strict rules on investing in overseas financial markets for its citizens. Lack of alternative outlets may thus be a reason for new investors being attracted to brokerage membership at the ZCE (Williams et al., 1998).[59]

[57] There are some loopholes about this: for example, many soybean crushers in China are joint ventures between Chinese and foreign firms, with the foreign firm active in CBOT and the Chinese firm active in DCE (UNCTAD 2007).

[58] The rapid economic growth in China at an average annual rate of 8%-9% in the last 25 years has reduced poverty level from 33% of population in 1978 to 3% in 2001. But the Gini coefficient has increased from 0.21 in 1978 to 0.46 in 2000, placing China among the economies of the world characterized by strong inequality in the distribution of wealth (Gulati, Fan et al. 2005).

[59] Similar evidence from China's stocks market conforms to this. Chinese share prices had climbed over 500 percent in the span of two years (2005-2007), setting off a nationwide stock buying frenzy (Barboza 2008).

Market volatility in global commodity markets in recent years also contributed to the rapid growth of futures markets. Processing firms or trading firms were in need to rely on hedging to manage risks from market volatility. For example, major soybean oil processors in China buy soybean and soybean meal futures in CBOT, and sell soybean and soybean meal futures in DCE. The hedging helps them deal with risks due to oil price fluctuations during the delivery period from overseas to China (Guo 2007).[60]

3. The importance of regulation

3.1. The regulatory vacuum in Phase 1

Regulations were crucial for the healthy development of the Chinese futures markets. At the early stage of China's futures markets, most of exchanges had no strict regulations on futures transactions. The central government failed to enforce rules on futures markets and it was never clear during this phase who the regulator was for the futures market. This regulatory vacuum was perceived as one of the main reasons for the chaos in the market. For example, given that there was no regulation segregating the customer and brokerage firm funds at that time, most brokerage firms traded both for customers and for their own accounts, creating a conflict of interest (UNCTAD 2007). As a consequence, at least 10 major scandals occurred in various commodities from 1994 to 1997, leading to estimated losses of over US$1 billion by Chinese traders active in overseas futures

[60] Though China is a major production nation in many important agricultural commodities in the world, China has not got large bargaining power in the international commodity markets. Lack of the ability to influence prices at global futures market is believed to be one of main reasons for this disadvantage (Chang 2005). For example, the Chinese food oil industry depends on imported soybeans for two-thirds of its production demand, and has to rely on the CBOT as a venue for hedging. Chinese soybean importers complain that the dominance of US traders in the CBOT soybean pricing make the market price consistently high for Chinese buyers, but low when China's own soybeans are put to market (UNCTAD 2007). The situation is similar in other commodity markets such as petroleum and natural rubber market as well. Therefore, some Chinese officials and scholars suggest that China needs its own commodity exchanges to avoid the losses in global commodity markets. However, Peng et al (2006) argue that the agro-commodities from China fail to earn favorable prices vis-à-vis overseas products in international futures market.

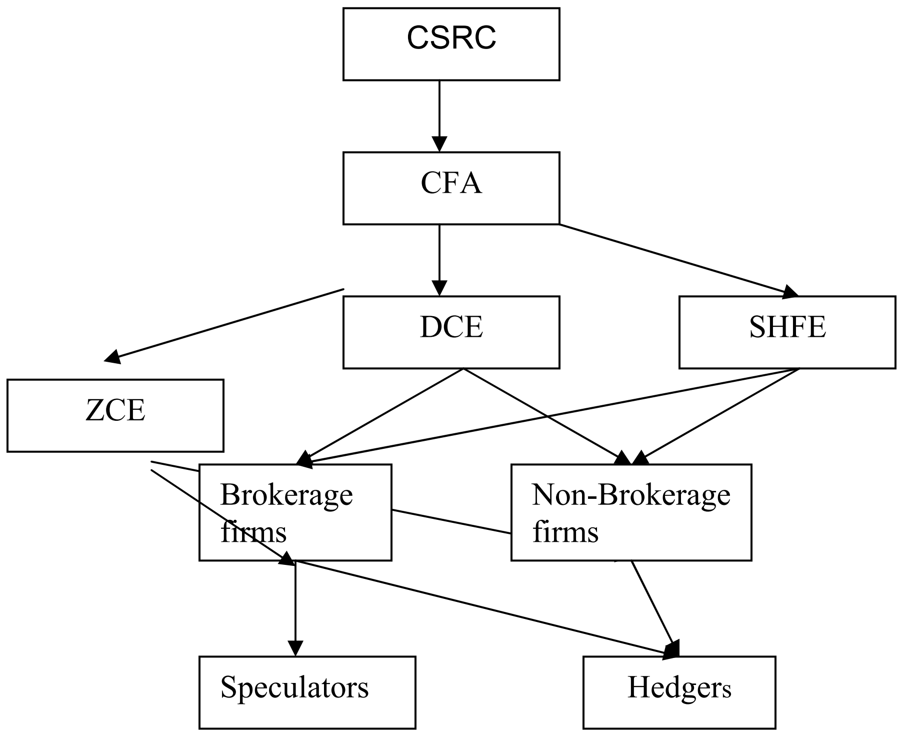
markets (Wang and Gorham 2002). This was one of main reasons[61] for the Chinese government to intervene with market rectifications from 1997 to 2002.

3.2. The development of appropriate regulations in Phase 2

At the end of 1993, the CSRC was given regulatory responsibility for the futures market. It took however several years for the CSRC to understand which interventions were needed. Several important regulations were issued by the CSRC to rectify the chaos. In 1999, the first regulation, the Futures Trading Management Temporary Statute, was issued by the Chinese government, and the National Futures Association was founded in the next year. The Chinese futures market had from then on three layers in its regulatory system (see Figure 2): the CSRC, the external government regulator with overall responsibility for market regulation; the China Futures Association (CFA), an industry self-regulatory body which all intermediaries are required to join; the Exchanges (DCE, ZCE and SHFE), which oversee trading, clearing and settlement functions.

[61] Another reason is Asian financial crisis started from 1997.

Figure 2: The structure of the futures market in China



The first regulation on the futures market acted as the core of the regulatory system. Exchanges were required by law to put in place five risk management mechanisms: a strictly applied margin, a daily net clearing, a price limit, a position limit, a large open position reporting system, and a risk reverse system.

In times of volatility or irregular trading patterns, the exchange is allowed to raise the margin level, adjust the price limit, set maximum position limits for members or clients, and even temporarily suspend trading. Exchanges must also obtain approval from the CSRC for amending its articles of association or business rules, listing or delisting new products or contracts, and for mergers and other structural changes. Furthermore, exchanges are mandated to publish in a timely manner authentic and accurate trading volumes, prices, position volumes, highest and lowest prices, and opening and closing prices (UNCTAD 2007).

There are also some important restrictions on brokerage firms and participation of the futures market: First, state-owned enterprises are allowed to participate only in a hedging capacity. Speculative participation has been limited to retail investors or small enterprises. Financial institutions and overseas participants are not permitted to trade; Second, brokerage firms are required by law to have a minimum registered capital of RMB 30 million, qualified management with proven good character, and an effective internal risk management controls; Third, brokers are limited to only trade on behalf of clients (UNCTAD 2007).

These rectifications along with the enforcement of strict rules and a well established monitoring mechanism built a strong base for the development of the futures market in phase 3.

3.3. Practicing the regulations in Phase 3

It is hard to strike the correct balance between market regulation and market development and some argue that the regulations imposed on the futures market in China are too harsh (Yam 2007). In other words, market development might be hampered by the strict rules. For example, prohibiting foreign capitals from entering into China's futures market could drive a wedge between the domestic futures market and the global market, thereby weakening the function of the futures market.

In 2004, the Chinese government issued a guiding document ("nine articles") on the development of the financial market in which the regulatory constraints on futures market were relaxed and a number of new futures contracts (corn, fuel oil, cotton, sugar and soybean oil) were introduced into the market. In 2007, the new regulation on futures market ("The General Regulation on Futures Trading") coupled with two other measures ("The Regulations for Futures Exchanges" and "The Regulations for Futures Brokerage Firms") were issued by the CSRC. This started a new era of China's futures market.

Under the new regulations, there are at least nine significant changes:

1. The categories of contracts are expanded. Besides commodity futures, financial futures and option contracts will soon be introduced into the futures market;

2. For the first time, futures brokerage firms are explicitly defined as financial institutions;

3. The prohibition of banks to participate in futures markets is removed, thereby allowing financial institutions to enter into futures market in future. However, the details have not been publicized yet;

4. Futures firms are allowed to provide consultation service for their clients, and they may apply for overseas futures brokerage;

5. New regulations require CSRC to establish a fund to protect investors' interests in case the brokerage firms go bankrupt;

6. The new regulations have more comprehensive requirements about risk management of brokerage firms;

7. The futures exchanges can be a profit limited company, instead of only a non-profit self-regulated organization;

8. The new regulation has a clear definition and provides more detailed indications on "disguised futures";

9. The new regulation requires the SCRC to establish a real time margin monitoring system for the better management of futures market risks.

These new regulations provide a more flexible environment for China's futures market to grow more rapidly but the balance between market regulation and market development is simultaneously expected to be maintained.

4. Discovery of the appropriate products

In this section, we try to understand why some commodities survived and why some did not. At the beginning of China's economic reforms, clear strategies were laid down by the Chinese leaders. Mr. Deng Xiaoping (the father of Chinese economic reform) described the Chinese reform strategy as "crossing a river by feeling the stones". When Chinese reformers started the futures market in early 1990s, they were not sure on how to choose the right commodities. Two immediate references were available to them: First, experiences from developed marketing economy (CBOT, NYBOT etc); Second, vague memory from Shanghai's futures experience before 1949. However, the objective was clear. The government wanted to use the futures market to overcome market volatility during the economic transition. However, questions remained such as: Do the lessons from CBOT or NYBOT work in China? How to avoid disasters such as hyperinflation before 1949? Chinese reformers had to cross the river by feeling the stones.

4.1. Trial and error in Phase 1 (1992- 1996)

China's economic reform started from the agricultural sector (Gulati, Fan et al. 2005), and market volatility also originated mainly from this sector. Therefore, China's futures markets were originally designed to avoid agricultural commodity market volatility. Accordingly, ZCE chose five agricultural commodities initially: mungbeans, wheat, sesame, corn and soybean. With the arrival of other exchanges, the futures contracts were soon extended to many agricultural and non-agricultural commodities (redbeans, cotton yarn, glass, concrete, zinc, lead, treasure bonds etc). In the absence of a common regulatory framework, new futures contracts were created by their own decision. The same futures contracts were traded at different exchanges simultaneously, which induced exchanges to compete fiercely for clients because the profit of exchanges mainly came from transaction commissions. By the end of 1996, at least 24 agricultural commodity futures and 17 non-agricultural commodity futures were listed on 14 exchanges. However, some of them never took off after they were introduced into the market (CSRC 1997).

Table 3 presents us the distribution of futures trading in phase 1 (1993-1996). 11 agricultural products and 3 major non-agricultural products are listed in the Table, and other minor futures contracts are included in the category named “others”. Most major crops like wheat, rice, and corn were launched in this phase. However, they did not take off in terms of trading volume. The main reason was that these crops were subject to different government regulations (price control or supply quota etc) at that time. Interestingly, mungbean performed well during this period. The share of mungbean increased significantly from 1993 to 1996, and it accounted for 33.9% of the total trading volume of the futures market in 1996 even though it only accounts for a very small share (<0.1 %) of Chinese agriculture. The share continued even to increase to 58% in 1998 (Table 4) and total trading volume of mungbeans was as high as 285 million tons while the total production of mungbeans in China was about 8 millions, indicating that there was too much speculation in the mungbeans futures market (Li 2000). This led the Chinese government to ban mungbeans futures from 2000 onwards.[62]

[62] Mungbeans futures contract is still listed on ZCE, but the margin is very high (20%), which actually ban the mungbeans trading.

Table 3: Commodity futures trading distribution (1993-1996)

Year	US$ billion	mung-beans	rubber	corn	soy-bean	palm oil	soy meal	coffee	Wheat
1993	turnover	3.3	1.1	1.4	4.5	0	0.01	0	0.48
	Share	3.1%	1%	1.3%	4.2%	0	0.01%	0	0.5%
1994	turnover	69.5	1.3	12.1	21	6.9	0.53	0	0.58
	Share	15.4%	0.3%	2.7%	4.6%	1.5%	0.1%	0	0.1%
1995	turnover	328	93	80	27	23.6	8.0	6.8	2.1
	Share	27.1%	7.7%	6.6%	2.2%	1.9%	0.66%	0.58%	0.17%
1996	turnover	343	153	0.24	89.3	1.63	9.6	110	0.27
	Share	34%	15.2%	0%	8.8%	0.16%	0.94%	10.9%	0.02%

Year		Barley	rice	Sor-ghum	Ve-neer	Cop-per	Alumi-nium	Other
1993	turnover	0	0.5	0	0.32	63.1	10.7	21.1
	Share	0	0.48%	0	0.3%	59.3%	10%	20%
1994	turnover	0	6.37	0	30.7	68.4	32.6	162
	Share	0	1.4%	0	6.8%	16.1%	7.2%	36%
1995	turnover	2.92	11.5	1.1	372	81.8	16.2	158
	Share	0.24%	1%	0.1%	31%	6.7%	1.3%	13%
1996	turnover	10.9	10.8	11.6	153	48.4	2.3	66
	Share	1.1%	1.1%	1.1%	15.2%	4.8%	0.2%	6.6%

Data source: CFA website 2008

The shares of other cash crops like soybean and natural rubber increased at a slower rate. Other commodities such as palm oil, barley, and sorghum were de-listed soon after they were introduced because they were never attractive to participants in the market. Coffee was introduced into the market in 1995, and its trading volume increased almost 20 times within one year (1995 to 1996), indicating excessive speculation. It was removed in 1997 after several speculation scandals. Among non-agricultural futures, only copper and aluminum performed well. Others like veneer were also removed due to excessive speculation.

In the first phase of China's futures market, many commodities were introduced into the futures market and most of them had short lives in the market due to either too much speculation or lack of liquidity. The regulatory vacuum and loopholes in transaction mechanisms were responsible for most speculative scandals. Trading in some products lacked liquidity either due to too much government interference or due to difficulties in standardization. At this stage, the futures market functioned as an experimental one, and Chinese government and futures industry seemingly learned a lot from this period.

4.2. The lean period in Phase 2 (1997-2002)

Due to the 1997 Asian financial crisis, the Chinese government shut down most of futures exchanges and suspended new futures contracts approvals. Accordingly, the number of futures contracts was significantly reduced. Only six futures products (wheat, rubber, soybean, soybean meal, copper and aluminum) with good performance and no speculative excesses survived. Soybean and copper became two major futures products at this stage. Mungbeans were banned in practice by raising the margin to 20%. Coffee, rice, palm oil and veneer were removed from futures market due to too much speculation, and corn, barley and sorghum were de-listed due to lack of trading volume (Table 4).

During phase 2, the Chinese government and futures industry designed stricter rules and a better monitoring system. The first regulation about futures market was issued in 1999, and other important regulations about exchanges, brokerage firms, and other participants were also issued at this stage. The national futures association was founded in 2000. It was designed to help the CSRC to establish a well-functioning futures industry. All brokerage firms were required to become members of the association. This institutional arrangement provided the framework for the healthy development in the next stage.

Table 4: Commodity futures trading distribution (1997-2002)

Year	US$ billion	mung-beans	rubber	corn	soy-bean	palm oil	soy meal	Coffe e	wheat
1997	turnover	300	94	0.05	126	0.24	18	49.4	1.6
	Share	40.8%	12.8%	0.01%	17.2%	0.03%	2.44%	6.2%	0.22%
1998	turnover	250	11.7	0	81.6	0	0	0	9.5
	Share	58%	2.7%	0	19%	0	0	0	2.2%
1999	turnover	132	3.4	0	77.6	0	0	0	1.05
	Share	49%	1.26	0	28.7%	0	0	0	0.39
2000	turnover	0.5	10.8	0	116	0	2.6	0	18.9
	Share	0.3%	5.6%	0	47.3%	0	1.3%	0	9.7%
2001	turnover	0	0.64	0	231	0	7.7	0	22.2
	Share	0	0.18%	0	63.4%	0	2.12%	0	6.1%
2002	turnover	0	48.5	0	233	0	19	0	27.2
	Share	0	10.2%	0	48.8%	0	4%	0	5.7%
Year		barley	rice	sor-ghum	ve-neer	cop-per	alumi-nium	Others	
1997	turnover	0	0	5.05	9.8	45.2	25.1	18	
	Share	0	0	0.7%	1.3%	6.5%	3.4%	2.4%	
1998	turnover	0	0	0	0.48	69.8	5.9	0.4	
	Share	0	0	0	0.1%	16.3%	1.4%	0.1%	
1999	turnover	0	0	0	0	51.3	4.6	0	
	Share	0	0	0	0	19%	1.7%	0	
2000	turnover	0	0	0	0	60.8	8.83	0	
	Share	0	0	0	0	31.3%	4.6%	0	
2001	turnover	0	0	0	0	78.6	24.1	0	
	Share	0	0	0	0	21.6%	6.6%	0	
2002	turnover	0	0	0	0	111	38.6	0	
	Share	0	0	0	0	23.3%	8.1%	0	

Data source: CFA website 2008

4.3. The cautious expansion in Phase 3 (2003-2007)

As the macroeconomic environment improved, several new futures contracts (fuel oil, PTA, LLDPE, gold, rapeseed oil, and soybean oil) were introduced into the market, and some products like corn, cotton, sugar, palm oil, zinc[63] were reintroduced.[64] In 2003, wheat futures were divided among strong gluten wheat and hard white winter wheat.

[63] Cotton, sugar, and zinc were listed at the first stage, which were included in the “others” in table 4 because their trading volumes were small and were removed from the market soon.
[64] Non-GMO soybean futures were separated from regular imported soybean futures in 2004. GMO soybean however accounted only for a very small share of soybean futures (<1%) because of the strict rules imposed on these by the government.

Strong gluten wheat dominates the wheat futures market. The share of hard white winter wheat is accordingly very small (<1%).

In this new phase, incumbent futures contracts including soybean, soybean meal, wheat, rubber, copper, and aluminum grew at a stable rate. Their total share decreased marginally because many new products came into the market. However, the share of these six futures products still accounted for more than two thirds in 2007, indicating that these six old futures products are the base of the futures market. Among them, natural rubber, soybean meal and copper increased considerably in term of trading volume compared to the slower growth of the other three (Table 5).

Table 5: Commodity futures trading distribution (2003-2007)

Year	US$ billion	rubber	corn	cotton	Sugar	soybean	soy meal	palm oil	wheat
2003	turnover	431	0	0	0	402	79.4	0	94.8
	Share	33%	0	0	0	31%	6.1%	0	7.3%
2004	turnover	176	16.3	45.7	0	435	164	0	95
	Share	10%	0.9%	2.6%	0	24.5%	9.2%	0	5.4%
2005	turnover	188	66.5	189	0	279	223	0	72
	Share	11.6%	4.1%	11.7%	0	17.2%	13.8%	0	4.4%
2006	turnover	697	255	38.3	294	73	184	0	63.3
	Share	26.5%	9.7%	1.5%	11.2%	2.8%	7%	0	2.4%
2007	turnover	1,229	279	61.1	496	527	551	8.34	213
	Share	21.3%	4.8%	1.1%	8.6%	9.2%	9.6%	0.1%	3.7%
Year		fuel oil	PTA	LLDPE	soybean oil	rape-seed oil	zinc	al	cop-per
2003	turnover	0	0	0	0	0	0	38.8	261
	Share	0	0	0	0	0	0	3%	20%
2004	turnover	15	0	0	0	0	0	142	686
	Share	0.84%	0	0	0	0	0	8%	38.7%
2005	turnover	67.9	0	0	0	0	0	45	489
	Share	4.2%	0	0	0	0	0	2.8%	30.2%
2006	turnover	107	1.88	0	11200	0	0	356	417
	Share	4.1%	0.1%	0	5.3%	0	0	13.6%	15.9%
2007	turnover	120	54.5	7	306	8.3	348.6	132	1429
	Share	2.1%	1%	0.1%	5.3%	0.1%	6.1%	2.3%	24.8%

Data source: CFA website 2008. Soybean futures include non-GMO and imported regular soybean, and wheat includes strong gluten wheat and hard white winter wheat.

Among the new futures products, sugar, soybean oil, and zinc attracted a lot of investors. The share of these three accounted for almost 20% of total futures market trading volume in 2007 (Table 6). The performance of cotton, corn, and fuel oil were reasonable good even if they did not experience rapid growth like others. For palm oil, rapeseed oil, PTA, and LLDPE, it is too early to evaluate their performance since they have been introduced into the market only recently.

In 2008, the CSRC approved gold to enter into futures market, but it has not approved financial futures officially even though the China Financial Futures Exchange (CFFEX) has developed online mock trading on financial futures for almost two years. This is a good sign for China's futures market as it suggests that the Chinese government is very cautious about new futures contracts, especially so for financial futures. The CSRC is currently also taking new commodity futures such as live hog, steel, coal, and rice into consideration. However, approvals depend on the performance of the current futures market as well as macroeconomic conditions (Guo 2008).

5. The current structure of China's futures market

The current Chinese futures market is composed of a regulator (CSRC), futures associations (CFA), exchanges, brokers, speculators and hedgers (see Figure 2). We have discussed the roles of the CSRC and the CFA in the section above and we now discuss the other components consecutively: exchanges, brokers, speculators and hedgers.

5.1. The futures exchanges

At the early stage of China's futures market, there were more than 38 various exchanges (Peng et al. 2006). This number decreased to 14 after government rectifications. However, incidences of scandals in futures market could not be stopped. Following the Asian financial crisis, the Chinese government decided to close most of exchanges in 1998, with only three commodity exchanges (ZCE, DCE and SHFE) surviving till date[65]. We discuss them consecutively.

[65] With the approval of CSRC, China Financial Futures Exchange (CFFEX) was founded on September 8, 2006 in Shanghai. However, it has not started financial futures trading until now, which indicated that Chinese government is very cautious on the development of futures market.

ZCE: The ZCE was the first commodity futures exchange in China. Initially it traded in wheat, mungbeans, sesame, corn, and soybean futures. Now, the ZCE trades also wheat (including strong gluten wheat and hard white winter wheat), cotton, sugar, PTA, and rapeseed oil futures. Its share in trading volume is about 14% of that of the entire futures market in 2007 (Table 6). ZCE has more than 226 members across China. Most of them are brokerage members and about 30 are non-brokerage members (ZCE 1994-2007).

DCE: The DCE was founded in February 1993. It showed a steady growth since its start and has become the largest agricultural commodities futures exchange in China. Currently, the DCE trades non-GMO soybean (soybean No.1), imported regular soybean[66] (soybean No.2), soybean meal, soybean oil, corn, LLDPE, and palm oil futures. By the end of 2007, it accounted for 29% of the total trading volume of China's futures market. The DCE has 188 members across China, among them, 173 are brokerage firms and 15 are non-brokerage members (DCE 2008).

SHFE: SHFE was formally founded in 1999 by the merger of a couple of exchanges. It specializes in non-agricultural commodity futures. At present, there are six contracts including copper, aluminum, natural rubber, zinc, gold, and fuel oil. The share of SHFE increased rapidly in recent years, and it accounted for 56% in 2007 (Table 6). SHFE has about 219 members, of which 183 are brokerage firms, and 36 are non-brokerage members (SHFE 2008).

From the evolution of exchanges (Table 6), we can see non-agricultural commodity futures increased significantly in recent years. The DCE has outweighed the ZCE to become the largest agricultural commodity futures exchange in China. Since exchanges do not trade the same products in China, choosing the right products is the key to the growth of exchanges.

[66] Imported regular soybean does not specify soybean as GMO or Non-GMO, but in practice it mainly is GMO soybean because most of imported soybean are GMO soybean.

Table 6: Value of trade in different exchanges in China (US$ Billion), 1993-2007

Year	ZCE	Share	DCE	Share	SHFE	Share	others	Share	Total	Share
1993	5	5%	0.2	0%	68	63%	35	32%	108	100%
1994	40	9%	14	3%	79	17%	321	71%	455	100%
1995	142	12%	26	2%	55	4%	993	82%	1,216	100%
1996	243	24%	88	9%	28	3%	653	65%	1,012	100%
1997	281	38%	125	17%	34	5%	295	40%	735	100%
1998	254	57%	81	18%	57	13%	52	12%	445	100%
1999	133	49%	78	29%	59	22%	0	0%	270	100%
2000	19	10%	94	49%	80	41%	0	0%	194	100%
2001	22	6%	239	66%	103	28%	0	0%	364	100%
2002	27	6%	252	53%	198	42%	0	0%	477	100%
2003	96	7%	482	37%	731	56%	0	0%	1,309	100%
2004	141	8%	616	35%	1,018	57%	0	0%	1,775	100%
2005	261	16%	573	35%	790	49%	0	0%	1,624	100%
2006	397	15%	656	25%	1,576	60%	0	0%	2,630	100%
2007	833	14%	1,680	29%	3,258	56%	0	0%	5,771	100%

Data source: CFA website 2008

The exchanges are self-regulated non-profit organizations according to their bylaws. However, the Chinese central government has full control over the administration of exchanges. The revenue of exchanges mainly comes from the commission of transactions in futures market. The commission rates differ slightly by product. For example, for non-GMO soybean, the commission is about 4 RMB (US$ 0.57) per 10 ton. Rates of similar magnitudes apply to other futures contracts.

The revenue from the commission is split between exchanges and brokerage firms. However, the exchanges have more power to decide on the distribution of this revenue. This is because exchanges are rule makers for the brokerage firms. In 2004, the exchanges' revenue from commission was about 4.32 billion Yuan (US$ 0.52 billion), while total revenue of brokerage industry (200 firms) from commission was only 1.42 billion Yuan (US$ 0.17 billion). The three exchanges thus enjoy a substantial share of the revenue vis-à-vis the 200 brokerage firms (He and Zai 2007).

5.2. The brokerage firms

About 200 brokerage firms are active in the commodity futures market. Most of them are members of more than one exchange because there is no overlapping on futures contracts among exchanges and because these firms usually deal with the whole range of products. To establish a brokerage firm, the firm must get permission from the CSRC and has to abide by its rules[67]. Shareholders of brokerage firms can be private or state-owned firms, and foreign investors can only be minor shareholders of a brokerage firm.

A substantial part of the revenue of brokerage firms comes from the commission of futures transactions. The average ratio of net commission revenue to trading volume was about 0.025% in 2000, and the ratio decreased to 0.0165% in 2002 due to fierce competition among brokerage firms (Li and Xu 2008), implying that the futures market is competitive at the brokerage level. The fierce competition among brokerage firms did not prevent some firms from getting a larger share of the market. In 2006, the top 10 brokerage firms accounted for almost one third of market share in term of trading volume, and the top 20 accounted for 74% of the total profit of the brokerage industry (Li and Xu 2008).

5.3. Speculators and hedgers

There are two kinds of clients for brokerage firms, i.e. speculators and hedgers. However, it is hard to distinguish them in practice. The only information available is the number of legal entities clients and natural person clients. For example, DCE has 173 brokerage firms and 15 are non-brokerage members. The 173 brokerage firms have in total 13,490 legal entities clients and 346,868 natural person clients (DCE 2008). The 15 non-brokerage members are large agricultural processing firms or trading firms, which can be considered as hedgers. The 13,490 legal entities are small firms and they enter the futures markets through brokerage firms as the membership of exchanges requires a large amount of registered capital and net assets. It can be assumed that a significant portion of

[67] For example, the major shareholder of a brokerage firm has to maintain both registered capital and net asset above 30 million RMB if the shareholder owns 5% or more share of the brokerage firm.

the 13,490 small firms are hedgers as these small firms are in a need to manage risks from commodity market.

96% of the clients of brokerage firms (346,868) are natural person clients. As the Chinese average farm size is too small (less than 1 acre) compared to the minimum of trading volume (10 tons for most contracts) of exchanges and as the margin requirement of futures trading is large, i.e. usually 5%, this prevents most small farmers from participating in the futures markets. Therefore, most of natural person clients are individual investors and they can be largely considered as speculators.

In the ZCE mungbeans futures market, the open interest of around 300,000 contracts in 1996 was approximately equal to three times the national production of mungbeans (Williams et al., 1998). By way of comparison, the open interest on the CBOT's agricultural futures markets represents less than half the annual production of the U.S. Thus, it would seem that the CZCE has attracted considerable speculative interest, including short speculation, a necessary component of a successful futures market.

Even though speculators might dominate the market in terms of their number, it does not mean that they do so in terms of absolute trading volume. Hedgers are big processing firms or trading firms, they control more commodities sources, and they have more financial capacity than small speculators. Therefore, even though the number of hedgers is small, it does not necessarily mean they are weak or underrepresented in the market. In 2007, it was estimated that hedging accounted approximately for 16% of total trading volume in China's commodity futures market and more than half (54%) of open interests was held by hedgers (Guo 2007).

6. Efficiency of commodity exchanges

A well-performing and efficient commodity futures market performs two basic functions: price discovery and risk management through hedging. Price discovery means that if the futures market is efficient, prices will behave in such a way that it reflects the real equilibrium price level in the spot market. Efficient futures prices help the formation of a rational market expectation of price in both the short run and the long run (Du and Wang

2004). Therefore, we can examine the relationship between prices in futures and spot markets to test efficiency of a commodity futures market. On the other hand, we can also examine whether futures market helps firms or farmers to manage market risks through hedging. This is a second indicator of the efficiency of a futures market.

6.1. The roles of price discovery

Price information from futures market helps people to make better use of information allowing for better decisions on production as well as consumption. As mentioned before, the original objective of Chinese futures market was to help the government, producers, and consumers deal with market volatility in agricultural commodity markets; therefore, the key question for the future development of the market is whether the Chinese agricultural commodity futures market fulfilled this role.

Williams et al. (1998) compared the ZCE mungbeans futures and wholesale prices from 1994 to 1997. They found that the Zhengzhou wholesale mungbeans price and the nearby futures price tracked each other. However, the two series often diverged by 15 to 20%, far beyond the costs involved in any arbitrage operation. However, they argued that this difference could be due to the imperfect data series from the mungbeans wholesale market. Thus, they examined the relationship among the futures prices themselves to evaluate the presence and effectiveness of arbitrage. They found that significant intertemporal arbitrages developed in the mungbeans market in ZCE in 1997; however, arbitrage did not exist in the beginning, indicating that arbitrage itself is a skill to be learnt by players in the new futures market.

The efficiency of Chinese wheat and soybean futures markets has further been tested by Wang and Ke (2005). They examined the relationship between spot market prices and futures market price to test whether there exists any cointegration between two prices. Cointegration means long-run equilibrium relationship between two non-stationary time series and the cointegration between two prices is a necessary condition for market efficiency (Lai and Lai 1991). Formal statistical tests were conducted through Johansen's cointegration approach.[68] Their results suggested that a long-term equilibrium relationship between the futures price and the spot price for soybeans and a weak short-term efficiency of the soybean market existed. The futures market for wheat however was found to be inefficient.

Liu and Zhang (2006) also used the co-integration approach to study the efficiency of soybean and soybean meal futures in the DCE from 1997 to 2004. The results were similar to those of Wang and Ke (2005), indicating that there exists a long-run relationship between futures prices and spot prices for soybeans and soybean meal, while the long run relationship does not exist in the wheat market.

Wang et al. (2006) used the Johansen's co-integration approach and bi-variate Granger causality test to examine the efficiency of soybean futures market from 1997 to 2003. They also found a long-run relationship between futures price and spot price. Interestingly, the Granger causality test indicated that the futures price could be used to forecast spot prices, but not vice versa, implying that the soybean futures fulfilled its price discovery function in the soybean market.

Peng et al. (2006) found that futures contracts of agricultural products seem to perform the functions of price discovery and risk transfer less well than the futures contracts in copper and aluminum.

The economic framework and econometric tools used in the above studies are similar, and the results in general indicate that the soybean futures market might be a better functioning market than the wheat market. This is because the wheat market is subject to more government interventions than the soybean market. Good co-integration in soybean market could also partly be explained to lower access costs and geographic proximities between soybean spot market and the futures market. This result is in conformity with our analysis of the determinants of a successful futures market in China. However, the results might potentially not be robust, due to data problems, especially so for the data

---

[68] Three different spot prices from three grain wholesale markets were used; the futures prices came from the ZCE and the DCE with different forecasting horizons ranging from one week to six months.

from spot markets. For early mungbeans futures market, Williams et al. (1998) pointed out that the major problem of the market was too much speculation. Their results were confirmed by the subsequent development of the mungbeans futures market. Since other commodity futures such as corn and cotton have only been recently reintroduced into the market, no studies about these commodity futures market are available at present.

6.2. The roles of risk management

Agents in commodity markets face multiple sources of uncertainties: some of these are hedgable such as price uncertainty, while some are not such as production risk (Brown and Toft 2002). Hedging can help agents reduce price risks if the agent owns the commodity or the agent will acquire (or need) the commodity in the future and if there are market prices uncertainties during the period. As the futures market is a new concept for Chinese firms or smallholders, using hedging to manage price risks is a new skill for Chinese firms, and even more so for Chinese smallholders.

Hedging can be effectively used by firms to manage risks under two conditions: First, an efficient futures market exists, i.e. futures prices converge to spot prices with maturity date coming; Second, price volatility is enough of an incentive for firms to participate in the future market.

Even though these two conditions might be satisfied, it is difficult for commodity traders to select the exact proportion in practice of positions that should be covered by opposite positions on futures markets. This is generally referred to as the problem of choosing an optimal hedge ratio (Myers and Thompson 1989). The optimal hedge ratio in general depends on conditional covariance of futures and spot prices, and conditional variance of futures prices. But how to estimate the ratio correctly is not straightforward because autocorrelation and co-integration in time series data need to be carefully understood.[69]

[69] Economists have developed various methods to solve these problems. Myers and Thompson (1989) provided methods to estimate the optimal hedge ratio by a simple regression using price changes. They applied the method to an empirical study using CBOT data and spot price data from Michigan. Baillie and Myers (1991) estimated the optimal hedge ratio by assuming GARCH models in six commodities price series from spot and futures markets. They estimated time-varying optimal hedge ratios. They found that

All research on efficiency for hedging in China indicates that the soybean future market is relatively efficient. This allows firms in soybean industry to hedge to manage risks from high volatility in the international soybean market. In the case of wheat, the futures market is found not to be efficient, so hedging would not be attractive.

Several studies came to this same result. Wang et al. (2005) studied the wheat and soybean futures contracts during 1998-2004 in ZCE and DCE, and compared the optimal hedge ratio between soybean and wheat market. They found that the four-week's best hedging ratio of hard wheat and soybean futures (0.28 and 0.48 respectively) are higher than a one-week's and a two-week' ratio. The four-week' performance index are 10.27 and 18.85, indicating that the performance of hedging in soybean market is better than that in wheat futures market.

The most important hedgers in China's future market are commodity processing firms and trading firms. It seems that an increasing number of processing firms and trading firms hedge to manage market risks. For example, by the end of 2007, most large firms in the soybean and the corn industry used hedging to manage price risks. While the number of hedgers only accounted for less than 5% of total clients in DCE, the trading volumes of these hedgers accounted however for 30% of total trading volumes; open interests of these hedges accounted for 40% of total open interests in DCE soybean markets (Guo 2007). This evidence indicates that it is becoming a more widespread custom among large firms to hedge in order to manage price risks in commodity markets. Small firms are also increasingly catching up.[70] However, it is still difficult for smallholders, especially poor farmers, to use hedging to manage price risks in China. On the other hand, it seems that the futures market might affect their operations through other indirect channels.

---

the previous constant optimal hedge ratio assumption is inappropriate. Lien (1996) estimated the optimal hedge ratio under the co-integration condition, and found that the optimal hedge ratio would be larger than the ratio if the co-integration relationship between spot and futures prices were omitted.

[70] For example, a small SOE in a county in Heilongjiang province started to do soybean hedging in 1996, and the firm avoided millions RMB profit loss due to hedging.

7. Development impacts of commodity exchanges on smallholders

UNCTAD (2007) gives a general overview about the development impacts of commodity exchanges and impacts on smallholders in 5 middle income developing countries (Brazil, China, India, Malaysia and South Africa). In this section, we follow their outline to analyze the impacts of commodity exchanges on the smallholders in China.

7.1. Core functions

(a) Price discovery

As discussed in section 6, the function of price discovery by commodity futures in China could be found in some commodity market such as soybean and soybean meal markets, but it is not evident to exist in other markets such as wheat and cotton markets. Better price discovery through futures market could affect Chinese smallholders in at least 5 perspectives:

1. Price discovery induces more transparent pricing in commodity markets; hence, it is easier for smallholders to find out right prices for their products. The available information increases smallholders' bargaining power by reducing information asymmetry between smallholders and relatively large traders. For example, in March 2005, thousands of small soybean farmers in Wangkui county in Heilongjiang province were able to raise their soybean selling price by 10% due to the information from the DCE (Guo 2007). This case shows that the futures price could be of help to small farmers to deal with information asymmetry. However, the process of disseminating price information to small farmers still remains a challenge.

2. If it is easier for smallholders to find out the price trend on a specific commodity, it helps them to make better decisions on the timing of the sale. For example, in November 2005, most soybean farmers expected the soybean price to go up because local soybean production decreased due to bad weather; however, some soybean farmers observed soybean futures price were decreasing because American soybean had a good harvest that

year. These informed farmers sold their soybean before soybean price dropped in the local spot market (Guo 2007).

3. Price discovery helps smallholders compare prices of different crops, which helps smallholders to make better decisions on what to grow next season. For example, in the spring of 2004, DCE informed farmers in north-eastern China to grow more soybean because soybean futures prices indicated a rising trend (Guo 2007). In the spring of 2006, a brokerage firm suggested to small farmers in the Hailun county of Heilongjiang province to grow more corn than soybean because futures prices of corn indicated significantly better prices. At the end of that year, small farmers in that county made an additional profit of 1 billion RMB by growing soybean (Guo 2007).

4. Price discovery helps the spatial integration of spot markets. For example, the soybean price difference between production area (Heilongjiang province) and consumption area (Dalian) used to be 200RMB/ton before soybean futures markets existed. Since the start of commodity futures markets, the difference is only about 80RMB/ton (reflecting the transportation costs) (Guo 2007).

5. Price discovery helps to reduce transaction costs in the commodity markets. Access to price information enables people in spot markets to effectively bargain on prices because of the reference prices from the futures market.

(b) Price risk management

Even though smallholders might not participate in commodity futures markets directly, indirect market access via various channels such as cooperatives, help them to receive the benefits of price risk management without needing to devote considerable time and resources that direct involvement in commodity futures markets would require (UNCTAD 2007).

Two examples demonstrate these impacts in the case of China:

1. Some smallholders participate in corn futures markets through a cooperative in Jilin Province. Before sowing began in the spring of 2006, 150 major grain growers of the village of Lazigou in Jilin Province sold their corn through their grain cooperative. The purchaser was the Pingdong Depot of nearby Siping City and the price was agreed upon for the reference futures price of 1200 Yuan/ton. The Depot then hedged their risk in the futures market. Through this operation, both parties were able to stabilize their income: the farmers were guaranteed a basic profit for their crops, and the Depot was guaranteed a dependable grain source whilst avoiding the risk of fluctuating prices cutting into their margins. Subsequently, corn prices rose to over 1500 Yuan/ton and Pingdong Depot sold corn orders in the futures market. As a result, and according to a profit-sharing agreement with the farmers, the Depot passed 270,000 Yuan from the extra profit it had earned in the futures market to the 150 farmers (UNCTAD 2007).

2. Even smallholders, who have no access to futures markets, can still get benefits through other firms participating in futures markets. It is common for soybean processing firms to hedge to manage market risks, which help to stabilize the domestic soybean prices, and hence reduce the price risks in spot markets. For example, the China Grains and Oils Group Science and Technology Corporation (CGOGST) trades about 6-7 million tons of corn and soybean per year. They hedge 50% of their trading in the futures market, which helps to stabilize the domestic corn and soybean prices (UNCTAD 2007). China National Cereals, Oils and Foodstuffs Import & Export Corporation (COFCO), one of largest SOEs in China, hedges all imported soybean with the DCE to deal with the price risks during transportation.[71]

7.2. A channel for investment

Before the era of agricultural commodity exchanges, little private investments entered into the agricultural sector. Moreover, there were significant capital flights - from capital generated in the agricultural sector - out of rural areas (Huang et al. 2006). It seems that commodity futures exchanges helped the agriculture sector attract private investment. For example, the daily deposit for futures contracts in DCE is more than 4 billion RMB,

[71] This information comes from author's interview with COFCO.

implying that about 1 trillion RMB stays in agricultural commodity markets annually through futures market. Most of this capital is from individual investors. This money would not have been used for agricultural commodity markets without the futures.[72]

7.3. Other functions

Agricultural commodity exchanges might also help in a number of other functions:

1. Commodity futures markets can facilitate the spot markets in many ways. Firstly, it can help towards the use of better standardization in the commodity spot market. Standardization in futures market facilitates the spot market transactions because people in spot market could easily refer to the standards of futures markets. For example, a South-Chinese soybean processing firm used to purchase soybean from overseas instead of northern China because of the lack of standards in these local markets. After the soybean firms started participating in the futures markets, the soybean from northern China was increasingly used in South-China because of their adherence to these futures standards (Guo 2007). Secondly, the futures market has a standardized warehouse requirement. In order to become a qualified warehouse for futures markets, depot firms have to upgrade their warehouses to meet these standards.

2. Futures market induces smallholders to get organized. Since it is difficult for small farmers to enter into futures market directly, the smallholders increasingly form cooperatives in order to participate in the futures market. The cooperative could organize the farmers to do farming together, which reduce production costs for each farmer. For example, the cooperative in Wudong village in Wangkui county organized its members to grow soybean together. The harvest costs were reduced by at least RMB 30 per mu for all farmers of the cooperative (Guo 2007).

---

[72] There is an important debate on whether large inflows of funds into commodity markets cause prices rises, possibly to higher levels than are justified by economic fundamentals (UNCTAD 2007). For example, some believe that speculation is responsible for recent gas price rises. However, it is hard to arrive at a definite conclusion right and further careful studies would be required.

3. Since the futures market can help smallholders and processing firms to manage market risks, it is easier for smallholders and processing firms to have access to credit markets due to a lower default risk.

4. The development of the commodity futures markets in China has also changed the landscape of international trade in soybean and corn. CBOT experts now study the evolution on the DCE and CZE futures as the Chinese futures market has become one of the most important commodity markets in the world and China's hedgers and speculators affect many farmers elsewhere in the world through their futures activities.

8. Conclusion

China's commodity futures market went through phases of chaos and recession to attain the recent prosperity, though it is too early to claim Chinese commodity futures market as 'successful'. Many agricultural commodities were introduced into the market in the last 15 years and only a small part of them survived. Most of them were not successful either because of too much speculation or due to lack of liquidity. However, both the Chinese government and the futures industry seemingly learned from these failures and successes. The major lessons are summarized below:

1. Well-established regulatory institutions and monitoring mechanisms are a pre-condition for a healthy futures market. The regulatory vacuum at the early stage of China's futures market was the main reason of the chaos during that period.

2. Appropriate and up-to-date technology provided the necessary tools for a good monitoring mechanism. The Chinese futures market is an electronic futures market and all transactions were done by an integrated electronic system in China from the first futures transaction onwards. Currently, the CSRC has established a real time margin monitoring system (CFMCC, China futures margin monitoring center), which allows the CSRC to closely monitor each transaction in futures market. The gives the CSRC the opportunity to predict market risks effectively (CSRC 2008).

3. Same futures contracts traded in many different exchanges in the early phase was one of the reasons of the chaos. Fierce competitions for clients among exchanges induced exchanges not to stick to strict rules as exchanges were too much focused on generating profits for the exchange.

4. A small number of exchanges is convenient for monitoring by the regulator as well as for generating more liquidity.

5. Prohibiting foreign capital entering into the newly formed futures market in China was seemingly a good idea because it allowed the government and futures industry to learn to manage a volatile futures market in the beginning. This also reduced the political risks for government and futures industry. Learning by doing and cautious openness to foreign investors were necessary for the healthy development of China's futures market.

6. Choosing right commodities was important for the success of China's futures market. As shown in settings in other parts of the world, it seems that an appropriate commodity needs to have following features:

(a) The spot market of the commodity is reasonably volatile, which provides firms sufficient incentives to participate in futures market. For an agricultural commodity, market volatility due to seasonal production cycles is the basis of success of futures market;

(b) The commodity should be easy to standardize and store;

(c) Too much government interference (price control and supply quota etc) deters participants from trading in the futures market;

(d) A large and competitive spot market of the commodity is crucial for a successful futures market. Large spot market means sufficient liquidity, which is a basis for futures transactions and delivery. A competitive spot market prevents monopoly or oligopolies from manipulating prices in the market, which is also a key to a healthy futures market.

(e) The commodity should have a long supply chain, implying that many firms along the supply chain need to manage market risks using futures market.

7. Good infrastructure (highway and warehouse etc) and banking system are very important for a well-functioning futures market.

The price discovery and hedging functions of the futures market are well fulfilled in some commodity markets, but not in all. China's young commodity futures markets still face a lot of challenges under increasing volatile global financial and commodity markets. However, the agricultural commodity futures market is not only becoming increasingly important to the Chinese agriculture but also for the agricultural market at the global level. It is affecting millions of smallholders in the world via various direct and indirect channels. Given its rapid growth and importance in global agriculture and food security, it seems that more research and a better understanding of its impact is called for.

References

Acharya, S.S. (2004), Agricultural Marketing in India, Vol. 17, Millennium study of Indian farmers, Government of India, Academic Foundation, New Delhi.

Akridge, J.T. (2003), E-business in the Agricultural Input Industries, Review of Agricultural Economics, 25(1): 3-13.

Athukorala, P.C., Jayasuriya, S. (2003), Food Safety Issues, Trade and WTO Rules: A Developing Country Perspective, World Economy, 26(9): 1395-1416.

Aulton, A.J., C.T. Ennew and A.J. Rayner (1997), Efficiency Tests of Futures Markets for UK Agricultural Commodities, Journal of Agricultural Economics, Vol. 48, No. 3, pp. 408-423.

Baillie, R. T. and Myers, R. J. (1991), "Bivariate GARCH Estimation of the Optimal Commodity Futures Hedge", Journal of Applied Econometrics 6(2): 109-124.

Banerji, A., Meenakski, J.V. (2004), Buyer Collusion and Efficiency of Government Intervention in Wheat Markets in Northern India: An Asymmetrical Structural Auction Analysis, American Journal of Agricultural Economics, 86(1): 236-253.

Banker, R.D., Mitra, S. (2005), Impact of Information Technology on Agricultural Commodity Auctions in India, 26th International conference on information systems, pp. 97-107.

Banker, R.D., Mitra, S. (2007), Procurement Models in the Agricultural Supply Chain: A Case Study of Online Coffee Auctions in India, mimeo.

Barboza, D. (2008), "To See a Stock Market Bubble Bursting, Look at Shanghai", The New York Times (04/02/2008).

Barton, B. (2003), The Internet's Impact on Agricultural Input Distribution Markets, Review of Agricultural Economics, 25(1): 14-21.

Beurskens, F. (2003), The economics of Dot.coms and E-commerce in the Agrifood Sector, Review of Agricultural Economics, 25(1), pp. 22-28.

Black, D. (1986), Success and Failure of Future Contracts: Theory and Empirical Evidence. Monograph series in finance and economics 1986-1, Graduate school of business administration, New York University, New York.

Brorson, B. and N. Fofana (2001), Success and Failure in Agricultural Futures Contracts. Journal of Agribusiness 19:129-145.

Brown, G. W. and Toft, K. B. (2002), "How Firms Should Hedge", Review of Financial Studies 15(4): 1283-1324.

Burghardt, G. (2008), Global Futures and Options Trading rises 28% in 2007, Futures Industry, pp.15-26.

Carlton, D. (1984), Futures Markets: Their Purpose, Their History, Their Growth, Their Successes and Failures, Journal of Futures Markets, 4:237-271.

Chang, Q. (2005), Some Advanced Thoughts on Futures Market, Beijing, Machinery Industry Press.

Chang, Y. (2007), "The history of Chinese Futures Market", Chinese Review of Economic History (4): 157-164.

Chowdhury, A.R. (1991), Futures Market Efficiency: Evidence from Co-integration Tests, Journal of Futures Markets, 11(5): 577-589.

CIA (2008), The World Fact Book, Central Intelligence Agency.

CSRC (1997), Chinese Securities and Futures Yearbook, Chinese Statistics Press.

CSRC (2008), "CSRC Futures Department News", http://www.csrc.gov.cn/n575458/n776436/n804995/index.html.

DCE (2008), "The Introduction of DCE", http://www.dce.com.cn/portal/cn/index.jsp.

Diekman, F., Roe, B.E., Batte, M.T. (2008), Tractors on eBay: Differences between Internet and In-person Auctions, American Journal of Agricultural Economics, 90(2):306-320.

Donnet, M.L., Jeitschko, T.D., Weatherspoon, D. (2007), The Impact of e-auctions in Adjusting Procurement Strategies for Speciality coffee, Michigan State University, mimeo.

Du, W. and Wang, H. H. (2004), "Price Behavior in China's Wheat Futures Market", China Economic Review 15(2): 215-229.

Elam, E. (1978), A Strong Form Test of the Efficient Market Model Applied to the US. Hog Futures Market, Ph. D. Thesis (unpublished), University of Illinois.

Elam, E. and B.L. Dixon (1988), Examining the Validity of a Test of Futures Market Efficiency, Journal of Futures Markets, 8 (3), 365-72.

Fafchamps, M., R. Vargas-Hill, B. Minten (2007), Non-staple Food Markets in India, International Food Policy Research Institute, Discussion Paper no 717.

Fama, E.F. (1970), "Efficient Capital Markets: A Review of Theory and Empirical Work", Journal of Finance, Vol. 25, pp. 383-417.

Fama, E.F. and K.R. French (1987), Commodity Futures Prices: Some Evidence on Forecast Power, Premium and the Theory of Storage, Journal of Business, 60, 55-73.

Fama, E.F. (1991), Efficient Capital Markets: II, Journal of Finance, 60 (5), 1575-617.

Fortenbery, T.R. and H.O. Zapata (1993), An Examination of Cointegration Relations between Futures and Local Grain Markets, Journal of Futures Markets, 13 (8), 921-932.

Fraser, P. and R. Macdonald (1992), Spot and Forward Metals prices: Efficiency and Time Series Behavior, Review of Future Markets, 11 (1), 24-34.

Fu, X. (2008), "DCE Becomes the Second Largest Exchange in the World", China Futures Net Volume, DOI.

Gabre-Madhin, E., Goggin, I. (2005), Does Ethiopia need a Commodity Exchange? An Integrated Approach to Market Development, EDRI-ESSP policy working paper no. 4.

Garcia, P. and R. Leuthold (2004), A Selected Review of Agricultural Commodity Futures and Options Markets, European Review of Agricultural Economics, 31(3): 235-272.

Goyal, A. (2008), Information Technology and Rural Markets: Theory and Evidence from a Unique Intervention in Central India, University of Maryland, mimeo.

Gray, R. (1964). The Attack Upon Potato Futures Trading in the United States, Food Research Institute Studies, 4, 97-121.

Gross, A., Santana-Boado, L. (2008), Development Impacts of Commodity Exchanges on Emerging Markets, Commodity Vision, Vol. 1, No. 4, pp. 19-25.

Gulati, A., Fan, S. G., et al. (2005), "The Dragon and the Elephant: Agricultural and Rural Reforms in China and India", Washington DC, IFPRI. 87.

Guo, X. (2007), "Chinese Agricultural Commodity Futures Market and Futures Industry Outlook", http://www.foodqs.com/news/alibaba/info.asp?id=1255199&zt=zx.

Guo, X. (2007), "The Roles of DCE in Modern Agricultural Commodity Markets", Chinese Hog Production Annual Meeting Proceedings (1).

Guo, X. (2008), "New Futures Products are Coming in China's Futures Market", Xiamen Daily (04/08/2008), Xiamen, Xiamen Daily Group.

He, P. (2004), "The Current Chinese Agricultural Futures markets Review—Problems and Suggestions", Grain Market Research (in Chinese), 2004.5.

He, X. and Zai, X. (2007), "Balance Risks and Benefits to Split Appropriate Revenue Shares between Exchanges and Brokerage Firms", http://finance.sina.com.cn/money/future/20070608/00583671676.shtml.

He, X.H. and Cao, Y. F. (2007), "Understanding High Saving Rate in China"; China & World Economy 15(1): 1-13.

Huang, J. K., Rozelle, S., et al. (2006), "Fostering or Stripping Rural China: Modernizing Agriculture and Rural to Urban Capital Flows", Developing Economies 44(1): 1-26.

Johansen, S. (1988), Statistical Analysis of Co-integrating Vector, Journal of Economic Dynamics and Control, 12, 231-54.

Kawai, M. (1983), Price Volatility of Storable Commodities under Rational Expectations in Spot and Futures Markets, International Economic Review, 24: 435-459.

Kofi, T. (1973), A Framework for Comparing the Efficiency of Futures Markets, American Journal of Agricultural Markets, 55 (4), 584-94.

Kolb, R.W. and G.D.Gay (1983), The Performance of Live Cattle Futures as Predictors of Subsequent Sport Prices, Journal of Futures Markets, 3, 55-63.

Kumari, B., Madan, V.K., Singh, J., Singh, S., Kathpal, T.S. (2004), Monitoring of Pesticidal Contamination of Farmgate Vegetables from Hisar, Environmental Monitoring and Assessment, 90(1-3): 65-71.

Lai, K. S. and M.Lai (1991), A Co-integration Test for Market Efficiency, Journal of Futures Markets, 11 (5), 567-575.

Larson, D., Anderson, J., and Varangis, P. (2004), “Policies in Managing Risk in Agricultural Markets”, The World Bank Research Observer, Vol. 19, No. 2.

Leuthold, R.M. (1972), Random Walk and Price Trends: The Live Cattle Futures Market, Journal of Finance, 27 (4), 879-89.

Leuthold, R.M. and P.A. Hartmann (1979), A Semi-strong form Evaluation of the Efficiency of the Hog Futures Market, American Journal of Agricultural Economics, 61(3), 482-509.

Leuthold, R. M. (1994), Evaluating Futures Exchanges in Liberalizing Economy, Development Policy Review, 12:149-163.

Li, L. and Xu, N. (2008), "The Business Models of Chinese Brokerage Firms in New Stage", Dalian, Chinese International Futures Co. Ltd.

Li, Q. (2000), "The Euthanasia of Mungbeans Futures"; The Marketing Daily (01/19/2001), Beijing, The People’s Daily Group.

Li, Z. (2008), "Three Factors will Drive Total Trading Volume Doubled in 2008 in Chinese Futures Market"; Beijing, China Security Daily (01/02/2008).

Lien, D. D. (1996), "The Effect of the Cointegration Relationship on Futures Hedging: A Note ", The Journal of Futures Markets 16(7): 773-780.

Liu, Q. and J. Zhang (2006), "Price Discovery in China's Commodity Futures Market", Review of Industrial Economy 20(1): 11-18.

Maberly, E. D. (1985), Testing Futures Market Efficiency- a Restatement, Journal of Futures Markets, 5 (3), 425-32.

Marshall, F., R. Agarwal, D. te Lintelo, D.S. Bhupal, R.P.B. Singh, N. Mukherjee, C. Sen, N. Poole, M. Agrawal, S.D. Singh (2003), Heavy Metal Contamination of Vegetables in Delhi, report prepared for the UK Department for International Development, mimeo.

Mattoo, A., Mishra, D., Narain, A. (2007), From Competition at Home to Competing abroad, World Bank, Washington Dc.

McKenzie, A.M. and Mathew T. Holt (2002), Market Efficiency in Agricultural Futures Market. Applied Economics, 34:1519-1532.

Ministry of Consumer Affairs, Food and Public Distribution (2008), Report of the Expert Committee to Study the Impact of Futures Trading on Agricultural Commodity Prices, Government of India.

Minten, B., Swinnen, J., Vandeplas, A. (2008), The Broken Broker System? Horticulture Wholesale Markets in India (Uttarakhand), mimeo.

Morgan, C., Rayner, A., Vaillant, C. (1999), Agricultural Futures Markets in LDCs: A Policy Response to Price Volatility? Journal of International Development ,11:893-910.

Morgan, C. (2001), Commodity Futures Markets in LDCs: A Review of Prospects. Progress in Development Studies 1(2): 139-150.

Mueller, R.A.E. (2001), E-commerce and Entrepreneurship in Agricultural Markets, American Journal of Agricultural Economics, 83(5), pp. 1243-1249.

Myers, R. J. and Thompson, S. R. (1989), "Optimal Portfolios of External Debt in Developing Countries-The Potential Role of Commodity Linked Bonds", American Journal of Agricultural Economics 71(2): 517-522.

Naik, G. and S. Jain (2002), ‘Efficiency and Unbiasedness of Indian Commodity Future Markets’, Indian journal of Agriculture Economics, 75, pp 335-56.

Naik, G. and S. Sinha. (1998), International Trading of Pepper Futures: An Analysis, Report, Indian Institute of Management Ahmedabad.

Naik, G. (2008), Study on Impact of Futures Trading in Wheat, Sugar, Pulses and Guar Seeds on Farmers. Indian Institute of Management, Bangalore, April 2008.

Nair, C.K.G. (2004), Commodity Future Markets in India: Ready for ‘Take-off’? NSE news, July 2004: 1-4.

Newbery, D. M. (1987), When Do Futures Destabilize Spot Prices?, International Economic Review, 28, 291-297.

Newbery, D. M. G. (1984), The Manipulation of Futures Markets by a Dominant Producer, in Anderson, R. W., ed., The Industrial Organization of Futures Markets, Lexington, MA.

Pannell, D.J., Hialu, G., Weersink, A., Burt, A. (2008), More Reasons why Farmers have so little Interest in Futures Markets, Agricultural Economics, 39, 41-50.

Palaskas, T.B., Harriss-White, B. (1996), The Identification of Market Exogeneity and Market Dominance by Tests instead of Assumption: An Application to Indian Material, Journal of International Development, 8(1): 11-23.

Pavaskar, R (1975), Futures Market and Price Stabilization, Indian Journal of Agricultural Economics, 30:41-56.

Peck, A. E. (1976), Futures Markets, Supply Response, and Price Stability, Quarterly Journal of Economics, 90: 407-423.

Peng, W., Yong, I., et al. (2006), "Commodity Futures Market in Mainland China: Recent Developments and Issues", China Economic Issues (Dec '06).

Pope, R., Chavas, J.-P., Just, R.E. (1983), Economic Welfare Evaluations for Producers under Uncertainty, American Journal of Agricultural Economics 65, 98–107.

Powers, M. J. (1970), Does Futures Trading Reduce Price Fluctuations in the Cash Markets?, American Economic Review, 60:460-464.

Qingfei, X. (2004), “The Brief History of China’s futures market”, Metal Futures (in Chinese), 2004, 10.

Rajaraman, I. (1986), Testing the Rationality of Future Prices for Selected LDC Agricultural Exports, Journal of Future markets, 6: 523-540.

Ramaswami, B., Balakrishnan, P. (2002), Food Prices and the Efficiency of Public Intervention: The case of Public Distribution System in India, Food Policy, 27(5-6): 419-36.

Reardon, T., Gulati, A., Minten, B., Supermarkets and Food System Development in India, IFPRI/MSU, forthcoming.

Rashid, S., Winter-Nelson, A., Garcia, P. (2007), Purpose and Potential for Commodity Exchanges in African Economies, IFPRI, mimeo.

Rasquinha, S. (2008), Marketing of Cardamom: Role of Futures Trading, Commodity Vision, Vol. 1, Issue 4, pp. 55-60.

Rausser, G. and Carter, C. (1983), Futures Market Efficiency in the Soyabean Complex. Review of Economics and Statistics, 65: 469-478.

Rutten, L. (2007), Researching Commodity Futures Markets, paper presented at the Seminar on agri-commodities futures in India: Impact on production and prices, Mumbai.

Sahadevan, K.G. (2008), Mentha oil Futures and Farmers, Economic and Political Weekly, January 26, pp. 72-76.

Santos, J. (2002), Did the Futures Markets Stabilize US Grain Prices?, Journal of Agricultural Economics, vol. 53(1).

Shim, E. (2006), Success Factors of Agricultural Futures Markets in Developing Countries and their Implication on Existing and New Local Exchanges in Developing Countries, Thesis submitted to the Fletcher School, Tufts University.

Shiva, Vandana (2007), "Corporate Hijack of Retail: Retail Dictatorship vs Retail Democracy." A Report by Navdanya/Research Foundation for Science, Technology and Ecology. New Delhi, India.

Shunmugam, V. (2008), Commodity Futures as Catalysts of Inclusive Growth – The Cardamom Chronicle, MCX, mimeo.

SHFE (2008), "The Introduction of SHFE", http://www.shfe.com.cn/.

Singh, R. (2007), The Role of Warehouse Receipt Systems in Enhancing the Relevance of Futures Markets to Rural India, Financing agriculture, May-June 2007, pp. 3-7.

Stein, J. L. (1961), The Simultaneous Determination of Spot and Futures Prices, American Economic Review, 51:1012-1025.

Swinnen, J. (2007), Global Supply Chains, Standards and the Poor, CAB International, Wallingford.

Taylor, G. S. and R. M. Leuthold (1977), The Influence of Futures Trading on Cash Price Variation, as reprinted in Selected Writings on Futures Markets, A. E. Peck (ed.), Chicago Board of Trade, Chicago.

Telser, L.G., Higinbotham, H.N. (1977), Organized Futures Markets: Costs and Benefits, the Journal of Political Economy, 85(5): 969-1000.

Thompson, S. (1985), Use of Futures Markets for Exports by Less Developed Countries, American Journal of Agricultural Economics, 67: 986-991.

Tian, Y. (2006), "The Founder of Chinese Futures Markets", http://www.xici.net/b700399/d48380619.htm

Tomek, W.G. (1980), Futures Trading and Market Information: Some New Evidence, Food Research Institute Studies, 17: 351-359.

Tomek, W.G., Gray (1970), Temporal Relationships among Prices on Commodity

Futures Markets: Their Allocative and Stabilizing Roles, American Journal of Agricultural Economics, 52(3).

Tomek, W.G., Robinson, K.L. (1991), Agricultural Product Prices, Cornell University Press.

Turnovsky, S. J. and R. B. Campbell (1985), The Stabilization and Welfare Properties of Futures Markets: A Simulation Approach, International Economic Review, Papers and Proceedings, 48: 188-199.

Umali-Deininger, D.L., Deininger, K. (2001), Towards Greater Food Security for India's Poor: Balancing Government Intervention and Private Competition, Agricultural Economics, 25(2-3): 321-35.

Umali-Deininger, D., Sur, M. (2007), Food Safety in a Globalizing World: Opportunities and Challenges for India, in Proceedings of the 26th Conference of the International Association of Agricultural Economists, Blackwell Publishing, pp. 135-147.

Unctad and Swiss Futures and Options Association (2007), The World's Commodity Exchanges: Past, Present, and the Future Geneva: United Nations.

Unctad (2007), Report of the Unctad Study Group on Emerging Commodity Exchanges: Development Impacts of Commodity Futures Exchanges in Emerging Markets, Working Paper, Unctad.

Wang, H and Ke, B (2003), "Is China's Agricultural Futures Market Efficient?" Paper prepared for presentation at the 25th International Conference of Agricultural Economists, August 16-22, 2003, Durban, South Africa.

Wang, H. and Ke, B. (2005), "Efficiency Tests of Agricultural Commodity Futures Markets in China", Australian journal of agricultural and resource economics 49(2): 125-141.

Wang, J., Lu, W., et al. (2006), "Co-integration Testing in Chinese Soybean Market"; Chinese Agricultural Economics, 2006(4): 56-58.

Wang, J., Zhang, Z., et al. (2005), "The Performance of Hedge: Evidences from Chinese Soybean and Wheat Market", Journal of Chinese Agricultural University 10(4): 131-137.

Wang, L (2008), “China's Futures Market Rosy in 2008”, China Daily, 2008-1-28, http://www.chinadaily.com.cn/bizchina/2008-01/28/content_6425036.htm.

Wang, X. and Gorham, M. (2002), "The Short, Dramatic History of Futures Markets in China"; Journal of Global Financial Markets (spring).

Wheatley, W.P., Buhr, B., DiPietre, D. (2001), E-commerce in Agriculture: Development, Strategy and Market Implications, Department of Applied Economics, College of Agricultural, Food and Environmental Sciences, University of Minnesota, Staff Paper P01-6.

Williams, J. (2001), E-commerce and the Lessons from Nineteenth Century Exchanges, American Journal of Agricultural Economics, 83(5), pp. 1250-1257.

Williams, J., Peck, A., Park, A., Rozelle, S. (1998), The Emergence of a Futures Market: Mungbeans on the China Zhengzhou Commodity Exchange, Journal of Futures Markets, vol. 18(4), 427-448.

Working, H. (1977), Price Effects of Futures Trading, as Reprinted in Selected Writings of Holbrook Working, Chicago Board of Trade, Chicago.

World Bank (1999), Dealing with Commodity Price Volatility in Developing Countries: A Proposal for Market-Based Approach. Prepared by the International Task Force on Commodity Risk Management in Developing Countries, Washington D.C.

World Bank (2005), Managing Food Price Risks and Instability in the Context of Market Liberalization, Washington, DC: World Bank.

Xiaoli, G. (2007), “The Roles of DCE in Modern Agricultural Commodity Markets”, Chinese Hog Production Annual Meeting Proceedings (in Chinese), 2007.

Xinyu, F. (2008), “DCE Becomes the Second Largest Exchange in the World”, China futures net (in Chinese). 2008-4-1. http://www.qihuo8.com/news/detail.php?mainkey=50336

Yam, J. (2007), "Developing the Mainland’s Commodity Futures Market (I): The Fierce Tiger is Inferior to the Local Worm", http://www.info.gov.hk/hkma/eng/viewpt/20070322e.htm.

Yang, D., Bin, C. (2004), “The Development of China’s Futures Market”, Cooperative Economy and Science (in Chinese), 2004,10.

Yao, C and Wang, F (2005), “The Efficiency of Chinese Futures Market Analysis: Evidence from 1998-2002”, Research on Financial and Economic Issues (in Chinese), Vol. 1, pp. 43-49.

Zant, W. (2001), Hedging Price Risks of Farmers by Commodity Boards: A Simulation Applied to the Indian Natural Rubber Market, World Development, 29(4): 691-710.

ZCE (1994-2007), ZCE Yearbook; Zhengzhou Commodity Exchange.

Zhang, Z. (2008), "Chinese Futures Market 2007 Review"; China Food Net, (01/08/2008), http://www.foodqs.com/news/alibaba/info.asp?id=596176.

Zhongqiu, L. (2008), “Three Factors Will Drive Total Turnover Doubled in 2008 in Chinese Futures Market”, China Security Daily (in Chinese). 2008-1-2.