



A Need for Paradigm Shift to Improve Supply Chain Management of Fruits & Vegetables in India

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Abstract

As the Indian population is increasing, the demand for fresh fruits and vegetables is also increasing. Owing to the perishable nature and very short shelf life, these items require proper storage and transportation facilities in order to reach to the customer in fresh state. A lack of investment in agriculture makes the country vulnerable to international price shocks as well as exchange-rate volatility. The present study undertakes a thorough review of basic and contemporary literature available and tries to explain the challenges & opportunities in supply chain management to create a bridge between rural & urban market. It also brings out relevant research gaps and overlooked problems in the supply chain. The proposed research work is exploratory in nature using secondary sources.

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Introduction

The Indian economic growth in the recent years has been propelled by the growth of the service and manufacturing sectors, while agriculture sector is still playing a significant role by contributing 17% of the GDP and providing employment to 60% of the population. With the increasing focus and investments from the large national and international players in the food retailing, the agriculture sector is bound to modernize much faster in the coming years. As this sector has a strong social implication, it has also been accorded a high priority status by the Government, which is facilitating its growth by charting favourable initiatives at different policy levels. The changing consumption dynamics coupled with the growth of modern retail sector, like the growing demand for the processed food offers a tremendous opportunity for all stakeholders in the areas of production, processing, marketing, supply chain, infrastructure development, technology up gradation and education. Since organized retail sector has started showing interest in fresh fruit and vegetable marketing and already some of them have entered into food retailing with huge investments, but the

supply chain management i.e., from the farm to fork is still in a very pathetic state. There is a need to manage the whole show in transparent and participatory ways with proper coordination with the stakeholders so that whole agriculture sector in India can derive the benefit effectively. The present study is undertaken after a thorough review of basic and contemporary literature available and tries to identify the challenges & opportunities in supply chain management in creating a bridge between rural producers & urban consumers. It also brings out relevant research gaps and overlooked problems in the supply chain management in India.

Indian food supply chain is full of challenges and throws open several questions which has drawn attention of contemporary researchers. According to Food Corporation of India (FCI) sources, an average of 20%-30% (Bhardwaj and Palaparthi, 2008) of harvested produce is lost during transport from farm to factory. It throws opportunities in the research areas of transportation, storage and logistics, which may concentrate on minimizing these losses. Present trends of food sector demands innovative, competitive and sustainable supply chains in the food sector.

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India is bestowed with one of the best natural resources in the world and several factors like globalization, information technology, and rise of organized retails are gearing up the Indian food supply chains for a better future. If properly utilized, these natural resources can be converted to an advantage. However, the path is full of challenges and hurdles. There is a comprehensive requirement of research in the area not only to fully understand the challenges in supply chains management but to identify the opportunities for improvement and also to reduce several inefficiencies in the supply chains. There is a huge potential for the researchers to take the challenge and develop a body of knowledge, which will help the government, corporate and cooperatives in handling their responsibilities by running the supply chains effectively.

A Need for effective supply Chain Management

Natural resources for agro-based industry

India is a developing country and the economic growth of the country was dependent on agriculture for several decades. Unlike many nations, India has a large pool of natural resources, which can flourish into a large resource of food products for the ever-growing population. It is a known fact that, in India, although half of the total land is cultivable, but productivity per hectare is very low. The Gangatic plain is one of the most fertile plains in the world. India has more than 40 varieties of soil and a regular system of rainfall—the monsoon phenomenon. The irrigation projects, which have come up over a period of several decades, now ensure regular supply of water for irrigation in states like Rajasthan. States like Punjab and Haryana are pioneers in achieving one of highest per hectare production records. According to the FICCI report of October 2004, India is

- Second largest fruit and vegetable producer in the world (approximately 135 million tonnes);
- Second largest producer of milk;
- Fifth largest producer of eggs; and
- Sixth largest producer of fish with harvesting volumes of 5.2 million tonnes.

- The above statistics are encouraging and promise a greater future.

Population and demographic changes

Indian middle and upper middle class population is growing very rapidly and there is also increase in number of young working couples, resulted in increase in demand for semi-processed food, fast foods, packed foods, ready-to-eat foods. Changing taste and preference towards consumption of basic foods items, which is driven by longer working hours, increase in double income families, more exposure to advertising, for comfort and convenience etc. Especially people living in cities are become more health and hygiene conscious. In place of conventional wet markets, they prefer to buy vegetables, fruits and other agri-products from the super markets and modern retail stores, and this leads to the entry of more and more corporate into the agri-food marketing.

Integration of primary sector, secondary sector and tertiary sector

Agri-sectors (primary sector) of many developing countries are undergoing drastic change in their production process and selection of crops and how they are integrating different crops for better production and profit. However, it is a relatively recent phenomenon ([Hobbs and Young, 2000](#)). One of the reasons that can be cited for the phenomenon is the transaction cost economics. According to the theory, economic transactions form a considerable part of transactions in an open market wherein buyer and seller incur costs in conducting a transaction. These costs arise specially when there are a large number of small players resulting in information asymmetry, bounded rationality and opportunism ([Williamson, 1989](#); and [Eggertsson, 1990](#)). However, these costs tend to be low when carried out in an environment of a strategic alliance through contracting, or within a vertically integrated firm ([Coase, 1937](#); and [Williamson, 1979](#)). For many agricultural commodities in the US, the trend has been away from spot market transactions and towards closer vertical coordination along the supply chain ([Hobbs and Young, 2000](#)). In India, setup of retail chains like Reliance Fresh or Food World has low overall transaction costs for a given volume of transactions

when compared to the same volume traded by a large number of small players. Regulatory changes also play an important role in changing transaction characteristics. For example, the apparent negative consumer reaction in Europe to products containing genetically modified organisms may lead to regulatory requirements concerning traceability of these products throughout the food chain. Inevitably, this will lead to closer supply chain relationships (Hobbs and Young, 2000). Some of the examples in India are Reliance Fresh, Spencer's, which depict the phenomenon.

Emergence of organized retail

The emergence of organized retail, which presents superstore as the primary outlet, goes together with new retail strategies demanding emphasis on the establishing retail brand as a source of competitive advantage (Hughes, 1994; and Leahy, 1994). The scale and complexity of the retail store operation, along with these retail branding strategies, requires highly refined operating and control procedures and centralized management structures (Smith and Sparks, 1993). From a supply chain perspective, the more important aspects of emergence of organized retail have resulted in a close focus on identification and exploitation of hidden supply chain costs and efficiencies. In India Reliance Fresh and Spencer's are the pioneers in the organized retail sector. Emergence of organized retail is leading to direct benefits to the farmers, by giving better price by lowering the cost and providing better quality products to the end consumers. Local companies like Dabur, MTR, ITC, Godrej, and Amul are aggressively developing semi-process and ready-to-eat foods. Multiple restaurant chains such as McDonald's, Pizza Hut, Dominos, Coffee day, Qwiky's and Saravana Bhavan, and Sagar Chains are growing rapidly in fast food sector. (Viswanadham, 2007).

Emergence of technologies

One of the major benefits of Electronic Point of Sale (EPOS) technology is that, in concurrence with delivery information and frequent stock counts, the sales data collected presents a very clear picture of market demand patterns. Along with EPOS, sales-based ordering systems are becoming popular which enable orders to be generated automatically in response to customer demand. This provides retailers an opportunity to develop a seamless

information flow, from the checkout to retail stock control and replenishment functions (Stone, 1995; and Collins *et al.*, 1989). EPOS and Enterprise Resource Planning (ERP) are the technologies popular with Indian food retailers like Spencer's and Reliance Fresh. From the economics point of view, the costs associated with these technologies can be justified only in case of large organized and integrated players. In the US, the availability of EPOS data enhanced the attractiveness of centralized distribution (McKinnon *et al.*, 1990), which was rapidly embraced by the major grocery retailers during the late 1980s and early 1990s through the establishment of composite distribution centres. Efficient centralized distribution is dependent on flexible and advanced information systems (Collins *et al.*, 1989). In India, several companies like Reliance Fresh, Spencer's, and McDonald's are utilizing IT for their benefit. Sachin and Kuttayan (2003) conducted a descriptive case study on ITC's (Indian Tobacco Corporation) e-choupal initiative. This study delineates the effect of emerging technologies on Indian food supply chain and describes the benefits of information technology to the supply chain partners (ITC and farmers). It has been found that farmers get the benefits like faster processing time, prompt payment and access to a wide range of information, including accurate market price knowledge, and market trends, it also help them to make efficient selling decisions. The farmers selling directly to ITC through an e-choupal receive a higher price for their crops than they would receive through the mandi (traditional) system, on an average they get about 2.5% higher. The overall benefits to farmers include lower prices for inputs and other goods, higher yields, and a sense of empowerment. E-choupal saves farmers from the dreaded agents, time wasting mandi system and transportation costs. At the same time, ITC also gets the benefits like lowering of procurement costs (it saves the commission fee and part of the transport costs it would otherwise pay to traders who serve as its buying agents at the mandi). ITC recovers its equipment costs from an e-choupal in the first year of operation and the venture as a whole becomes profitable. The system also provides direct access to information about conditions on the ground and weather which helps farmers in planning for the next crop.

ITC's IT initiative has paved ways to educate and update the Indian farmers with the latest happenings in the commodities world and other agricultural products.

Globalization

Many transnational companies have grown so large that their size exceeds that of some nation states. Thus they could override, neutralize, or even counteract the political will of a nation state". Economic globalization is due to capital movements and specifically Foreign Direct Investment (FDI). Julius (1990) described the flow of FDI in the 1980s between the three areas Japan, the EU and North America. This was 'market-driven' trade in services as well as goods. Cable (1999) identifies that the flow to non-OECD (Organization for Economic Cooperation and Development) countries has increased as a share of the total to:

- Asian countries including China, Singapore, Malaysia, Thailand and Indonesia;
- Latin America including Mexico, Chile, Argentina and Brazil; and
- Eastern Europe.

The major beneficiaries of food supply globalization are considered to be consumers who now have greater choice and lower food prices. The 'chain captains'—those who control the supply chain—have also seen significant financial benefits. Organizations, seeking to improve performance, shareholder dividends and share price, are constantly looking to new markets to lower operating costs. Operating in a global rather than a national market will not only give rise to increased opportunities, i.e., a potential reduction in operating costs whilst increasing the size of the market the organization can potentially trade with, but also increased threats, i.e., increased competition in the individual national markets. Gaining globally recognized quality standards such as ISO9000 may mean they can access markets, which are otherwise unavailable to them. Rapid demands of globalization have resulted in Indian companies to gear their efforts to expand their horizons. No wonder the exports have shown a rising trend. They

have increased from Rs. 28,764 lakh in 2002-2003 to Rs. 43,002 lakh in 2006-2007 (www.apeda.com).

Multinational companies have entered the food value chain in India; Cargill and Conagra, Tropicana are few of the examples. These companies will generate competition among the Indian counterparts thereby improving the processes and supply chain practices.

Role of the government

Food and Agriculture are two important national activities and which affect the well being of its people of the country. In formulating the policies of farming, production, processing, distribution and retailing and also in financing these activities the Governments should play a leading role. This becomes all the more important in view of the globalization of the food industry. Allowing foreign operators for food production, distribution and retailing is a decision of national importance. The decisions need to be consistent all along the supply chain and mutually reinforcing and not contradictory.

There are several regulatory measures handled by multitude of departments divided between State and Central governments. While some of this is inevitable but streamlining them would be extremely productive. Further, research should be initiated to develop indigenous packaging materials, machines, laboratories for developing new food products and more importantly protocols for storage and processing food raw materials.

The Government of India is also aware of the importance of the sector and has taken several steps to boost the sector. In the light of high perishability of the products in the sector, the government allows import of cold storage equipment or establishing cold storages in India without any restrictions. Foreign companies are allowed to have a share of up to 51% in cold chain projects. There are several arrangements to provide subsidies in the sector, for example, National Horticulture Board (NHB) drives a subsidy scheme which provides 25% (maximum Rs. 50 lakh) subsidies to the promoter in overall capital investments. There are about 60 Agri-Export Zones (AEZ) in India promoted by Agricultural and Processed Food Products Export Development Authority (APEDA) which are geared to increase

the exports of several agri-products. These zones not only channel proper exports but also tend to reduce inefficiency in the value chains of the agri-products. According to the web sources of APEDA, the following activities are carried to improve the level of various food sector-related processes:

- Development of database on products, markets and services;
- Publicity and information dissemination;
- Organization of product promotions abroad and visits of official and trade delegations abroad;
- Participation in international trade fairs in India and abroad;
- Organization of buyer-seller meets and other business interactions;
- Information dissemination through APEDA's newsletter, feedback series and library;
- Distribution of annual APEDA awards;
- Provides recommendatory, advisory and other support services to the trade and industry; and
- Problem solving in government agencies and organizations, RBI, customs, import/export procedures, problems with importers through Indian missions abroad.

Furthermore, to handle the expected higher agricultural production during the Tenth Plan Period, the Inter Ministerial Task force on Agricultural Marketing Reforms constituted by Ministry of Agriculture, Government of India has recommended the creation of additional cold chain facilities at an investment cost of Rs. 2500 crore of which Rs. 625 crore are to be provided as subsidy and the rest has to come as private investment. They have also suggested modernization of existing facilities with an investment cost of Rs. 2100 crore of which Rs. 525 crore are to be subsidy and the balance to come as private investment.

The state governments also have initiatives in the food processing and cold chain sectors.

For example the Gujarat government has accorded priority to agro processing and horticulture, in view of the high export potential for fruits like mango, banana and chikoo. The government supports the

sector by providing assistance to farmers for agricultural inputs, developing systems like drip irrigation and encouraging development of infrastructure facilities like warehousing, cold chain, etc for better pre-harvest and post-harvest crop management. Gujarat also has good logistical infrastructure such as airport, seaport and extensive road & railway network. Other states such as Maharashtra, Andhra Pradesh, Kerala and Punjab have similar schemes in place.

Agri export zones (AEZs)

The concept of the Agri Export Zone attempts to take a comprehensive look at a particular produce/products located in a contiguous area for the purpose of developing and sourcing the raw materials, their processing and packaging, finally exporting them. Thus, the entire effort is centered on a cluster approach of identifying the potential products, the geographical region in which these are grown and adopting an end to end approach of integrating the entire process, right from the stage of production till it reaches the market. The government helps in sourcing for raw materials, the setting up of processing facilities, providing finance at low interest rates and even matching with international buyers. The export zones mooted by the Agricultural and Processed Food Products Export Development Authority (APEDA) to increase international trade in agri-commodities are an attempt to take a holistic approach to encouraging trade in specific commodities located in contiguous areas. For instance, in Tamil Nadu, the AEZs would focus on grapes, mangoes and chikoo, in Kerala -- vegetables, in Punjab and Haryana -- Kino, wheat and rice, Karnataka -- vegetables and flowers, Maharashtra -- mangoes, grapes and flower, Gujarat -- bananas, mango, castor and garlic, and in Uttaranchal -- litchi and medicinal plants.

State governments have several schemes to boost the efficiency in the sector. For example, Centre for Development of Advanced Computing (CDAC) & Department of Food Processing Industries and Horticulture, West Bengal has jointly submitted a project, "IT-based Horticultural Extension Education for Agri-business in North Bengal" to the Ministry of Communications and Information Technology, Government of India. The project will be taken up on a pilot basis and will assist the

pineapple growers in receiving timely and relevant information. The infrastructure would include V-SAT, Interactive Voice Response Service and Agri-Information portal anchored in local language. CDAC would act as the executing agency and would maintain an interactive multimedia-based educational material for this proposed information dissemination-cum-learning services. Space Application Centre, Ahmedabad has agreed to provide free transponder for this scheme.

Private sector initiatives

There are several private sector initiatives in the food processing and service sector. A number of companies are actively working on integrating the agriculture supply chain.

Here we mention a few of them. These show the feasibility of operating efficient cold chains in the India scenario. They could be treated as pilots and other projects can be built emulating them. Here we consider the following cases

- McDonalds-India, a fast food service operator growing its own ingredients such as lettuce, potatoes, etc;
- Amul which is a highly successful cooperative dairy in Gujarat.
- E-choupal which is an ITC success story of procurement of produce from small farmers is an example of supply chain management Indian style.

There are other examples such as Bombay dabbawallahs which is an excellent example of six-sigma forward and reverse logistics delivery. Also, ITC, Mahindra and Rallis together are creating a network of service providers who offer information on weather and prices, credit, transport and assured demand.

According to Financial Express dated February 27, 2008 Indian IT major Infosys Technologies has developed an information and communication technology-enabled application to help small farmers integrate their business with large retailers and improve efficiencies in agro supply chain. Infosys has developed the application in partnership with the US-based non-profit development organization ACIDI/ VOCA that would help in

cutting down farm-to-market losses by 30% to 40%, the company said here on Tuesday.

The application will minimize inventory requirements, reduce wastes and allow retailers and farmers to be better integrated. "Maintaining on-time, programmed delivery of fresh produce from a large and scattered production base is a complex and critical operation. This solution gives the organized retail sector access to a reliable smallholder production base. It thereby decreases farm-to-market losses, currently estimated at 30% to 40% on certain products," head of India business unit Binod H R said.

The application tackles supply chain management from profiling of farmer clusters to crop planning, scheduling, tracking and forecasting and allows farmers to access technical information including database searches for data and images, access to region-specific weather updates and market information - daily sales volumes and average prices.

Scope of the Study

The proposed researched work is exploratory in nature using secondary sources. The data & information will be collected from various literature reviews, industry trends, newspapers, journals & websites.

Though India is the second highest fruit and vegetable producer in the world (134.5 million tonnes), cold storage facilities are available only for 10% of the produce. In spite of abundant agricultural produce, India ranks below 10 in the export of food products with processing levels in fruit and vegetable sectors at around 2% only (Viswanadham, 2007).

The food supply chain is complex with perishable goods and numerous small stakeholders. In India, infrastructure connecting numerous small stakeholders like farmers, wholesalers, food manufacturers, retailers is very weak. Farmers bring whatever they produced to the market without any knowledge about the demand in the market. Inadequate usage/improper management of cold chains are leading to loss in quality of the vegetables and fruits which in turn is leading to loss of profits and business opportunity. Lot of

investments need to be made in cold chains in India. Weak alignment of supply chain strategy with business strategy is also another major problem with the Indian vegetable and fruit sector. Rapid entry of corporates into vegetables and fruit sectors is helping farmers as many corporates are going for direct tie-ups with farmers eliminating the middle men. The current challenge is to adopt best practices in supply chain like collaborative forecasting, data integration, increased usage of IT, demand-based production, incorporating a pull system for fruit and vegetable production rather than a push system sharing risk and rewards by the supply chain partners, etc. In India, major partners still operate in silos which unnecessarily lead to information distortion and supply chain inefficiencies.

Another challenge is to keep abreast of globalization by constantly upgrading competencies which will ultimately lead to better supply chain practices in Indian food industry. When compared to China or Philippines, India lags far behind in terms of exporting food items. Similarly, many Asian countries like China have better storage capacities and well-coordinated supply chains in the food sector.

The main aim is to understand Supply Chain Management for perishable goods especially fruits and vegetables and explore the various challenges and opportunities evolving day by day. Though rapid entry of corporate into vegetables and fruit sectors is helping farmers as they are going for direct tie-ups with farmers eliminating the middle men still the challenge is to adopt best practices in supply chain like collaborative forecasting, data integration, increased usage of IT, demand-based production, incorporating a pull system for fruit and vegetable production rather than a push system sharing risk and rewards by the supply chain partners, etc. What should firms from established and mature economies are increasingly expanding into emerging markets. As Indian economy is still based on agrarian economy proper supply chain management of perishable goods like foods, vegetables, fish, milk will play a crucial role in developing the economy & help India to emerge as a global leader in Food Sector. Having a galore of opportunities & resources the hindrance/gap between rural & urban market of India should be

collaborated through proper vendor management, warehousing & logistics management.

Although various models are emerging in supply chain management of fruits and vegetables, but still there are gaps in decision areas, strategic factors etc. There is a requirement for a model that will bridge the gaps between rural & urban market will be able to create win-win situation for both.

Objective of Study

To analyze the current scenario of Indian Supply Chain & Logistics Models of fruits and vegetables

To analyze the effectiveness of different Supply Chain & Logistics Models of fruits and vegetables.

To analyze the Challenges & Opportunities in Supply Chain Management to bridge the gaps between Rural & Urban Market.

Major players in food and vegetable retailing in India

In India the supply chain industry in the sector of food & vegetable, milk, fish are developing through the following emerging models

Co-operative (HOPCOMS, Karnataka; Mother Dairy, Delhi)

Exports with EUREPGAP Certification (Namdhari Fresh, Bharti Airtel)

Farm to Fork -- Complete Chain (Godrej, Reliance, ITC)

Wholesaling – (Adani Fresh, Metro)

Front end – Convenience Stores (Food Bazaar, 3Cs)

Economy Stores (Subhiksha)

Vegetable retail models

Distinct and primary routes adopted in the retail vegetable marketing have been revealed by this exploratory study. The study found three business models of vegetable retailing. Traditional retailers follow “Traditional Retail Model” (TRM) and organized retailers implement two different business models—“Hub and Spoke Model” (HSM) and “Value Chain Model” (VCM). “Reliance Fresh” (Reliance Retail Ltd.) strategically deployed

value chain model and rest of the organized players in the industry go with Hub and Spoke model with minor modifications to fit in to their marketing and logistical strategies.

Traditional retail model

'Traditional Retail Model' is a complex route for the logistical flow of vegetables, which is predominantly followed currently in traditional retail marketing. The figure below outlines the logistical route of TRM of vegetable retail marketing. Players involved in this model are agents (commission agents), auctioneers, wholesalers, traditional retailer of all type of formats family run 'mom and pop' stores, roadside shops, pavement shops and cart vendors apart from farmers and customers. Agents, auctioneers, and wholesalers are traders in vegetable marketing.

Farmers are the cultivators of produce and source of vegetable supply. They are small by land holding and yield volume of crop and are highly fragmented across geographical areas. In this traditional retail model, farmers sell their products to customers and to agents intermediately.

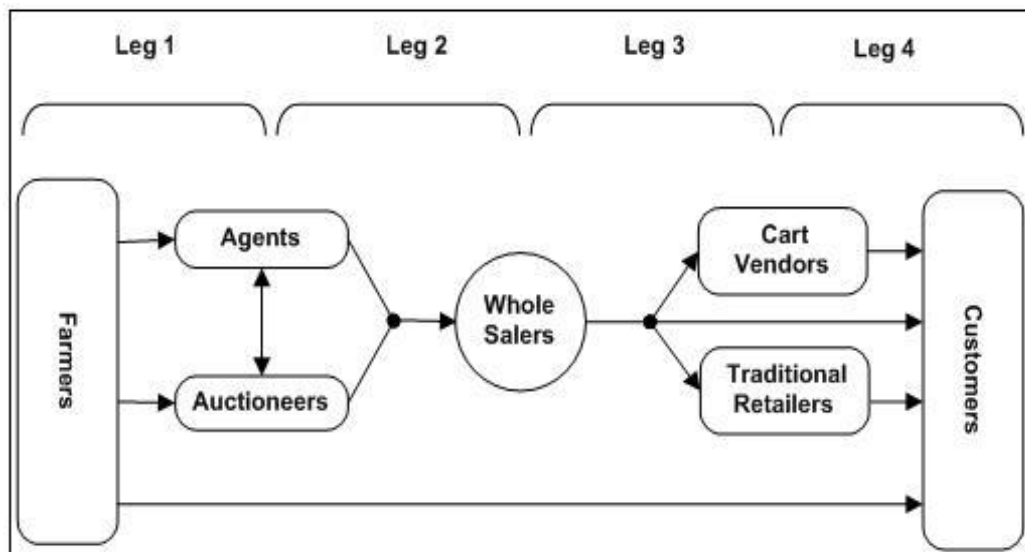
Agent and auctioneers are first level of middlemen in vegetable supply chain and transfer vegetable from producers to wholesalers. Numbers of transfers of ownership as well as transshipments of vegetable depend upon the number of agents present in between farmers and wholesalers. An agent operates from shops of small space, works for one or more wholesalers and normally deals with a particular range of vegetables. Most of the wholesalers at Vegetable Markets deal with specific vegetable(s) only and there are very few exceptions in the range of products. Normally wholesalers do not get involved in transportation of vegetables, both inward and outward transportation. The traditional retailers buy vegetables from wholesalers and sell directly to customers. The

families-run 'mom and pop' type stores sell staple products including vegetables. Customers constitute small domestic customers who buy vegetables for household consumption from traditional retailers. Hoteliers who buy for commercial consumption procure their vegetables form the wholesale market.

Vegetable logistics in TRM have four phases, producers (farmers) to (commission) agents, agents to wholesalers, wholesalers to traditional retailers and traditional retailers to customers. In the first phase, vegetables are transported from farmland to agents. Farmers are responsible to bring the vegetables to agent's premises. In case of contract, the auctioneers take care of the transportation of vegetables from farmland to his premises and transportation is seller's responsibility for the transaction of vegetable between the agents and auctioneers.

Agents arrange to pickup vegetables directly from farming locations to deliver at wholesaler's premises for huge volume of produce and cost of transport is on farmers account. The second phase of vegetable movement starts with outward transportation form agents to wholesalers.

Agents handle the transportation from agents to wholesalers. During the third phase, traditional retailers, cart vendors and commercial customers buy vegetables and make their own arrangement for transport from wholesale market to their destinations. The retailers jointly hire a truck to share the transportation cost. Customers and retailers are the player in the fourth phase. Domestic customers shop for their vegetables at traditional retailers stores that are conveniently located closer to their residence and walk down. Vegetables are delivered at door steps of the customers by cart vendors who sell vegetables in push carts, tricycles, and bullock carts.



Cane baskets and jute or gunny bags are used in handling vegetables. Loading and unloading are carried out manually. Vegetables are not cleaned and washed most of the time they are soiled.

Sorting, grading and packaging of any kind is being done. No temperature controlled storage or warehousing is used across the TRM route. Information technology and advanced management techniques are not deployed. Movement of vegetables in this Traditional Retail Business Model has four legs.

Leg 1: The first move in vegetable journey starts with the transportation of vegetables from farmland to agent. Farmers are responsible for bringing the vegetables to agent's premises. In case of contract, the auctioneers take care of the transportation of vegetables from farmland to his premises and transportation is seller's responsibility for the transaction of vegetable between the agents and auctioneers. Mode of transports are mini truck, farm tractor, bullock cart, bicycle, tricycle, motorcycle and head carrying.

Leg 2: Mode of transport is unconditioned trucks and for shorter distance farm tractors are used. Agents make arrangement to pickup vegetables

directly from farming locations to deliver at wholesaler's premises for huge volume of produce.

Leg 3: Buyers of wholesalers make their own arrangement for transport from wholesale market to their destinations. The regular modes of transport for them are mini truck, motorcycle, bicycle, tricycle, and push cart.

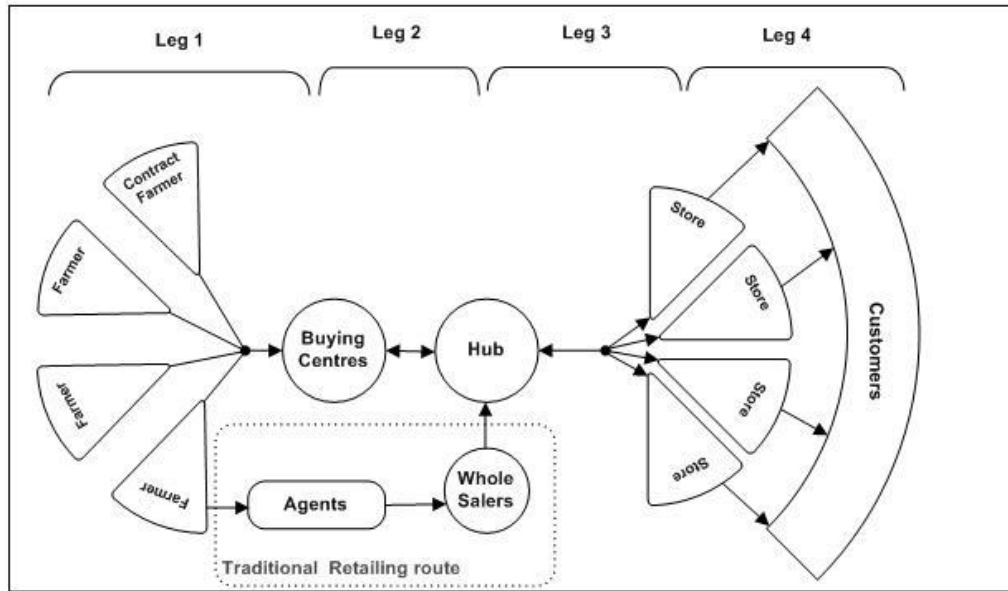
Leg 4: Domestic customers who reach the vegetable retail shop by walk.

Hub and spoke model

At present, organized retailers including prominent players like Spencer's Retail, More (Trinethra Super retail Ltd.) & Food Bazaar (Pantaloon Retail (India) Ltd) are adopting 'Hub and Spoke' Business Model of retail vegetables marketing. Figure below illustrates the Hub and Spoke Business Model of retail vegetable marketing. Fewer players are involved in this model compare to the traditional retailing model. Farmers, organized retailers, wholesalers and customers form this chain. Buying centres, hub and stores (retail outlets) are operational units of the organized retailers. Small farmers and contract farmers who executed a trade contract with the organized retailers are the primary source of supply of vegetables to the organized retailers. The buying centres make the vegetable

purchases directly from the farmers and transport to the hubs. A hub is served by one or more buying centre and a buying centre serves one or more hubs. Hub infrequently buys small volume of vegetables from the local wholesale market to balance demand

supply gap. Hub in turn distributes vegetables to stores attached to it. A store is served by only one hub. Store sells vegetable in retail quantity to the customers.



Vegetables travel in four phases, namely farmers to organized retailer's buying centers, buying centre to hubs, from hub to retail stores and retail outlet to customer. Farmers transport vegetables from farming location to the buying centers. The transport of vegetables in the second phase from buying centers to hub is arranged by buying centre. Mode of transport is unconditioned trucks. Fresh vegetables are transported in the third phase from hub to stores and shelf life-expiring vegetables are returned from stores to hub. The shelf life-expired vegetables are sold to cart vendor. Customers buy and pick up vegetables from the organized retail stores.

The stores offer home delivery for a shorter coverage area and high value of purchases. Vegetables are handled in stackable plastic crates and corrugated fiberboard boxes. The loading and unloading are carried out manually. Vegetables are cleaned and washed at the hub on arrival. The sorting and grading is done at the hub without

packaging. The space available for temperature-controlled storage is very less, but warehousing is used for it. Information technology and advanced management techniques are deployed partially. Connectivity between hub and corporate office is established.

Leg 1: Farmers transport vegetables from farming location to the buying centres. Modes of transport are mini truck, farm tractor, bullock cart, bicycle, tricycle, motor cycle and baskets. Buying centers arrange to pick up vegetables in a truck from the farm gates of the contract farmers.

Leg 2: The transport of vegetables from buying centers to hub is arranged by buying centre and mode of transport is unconditioned trucks.

Leg 3: Fresh vegetables are transported from hub to stores and shelf life-expiring vegetables are picked up from stores to hub. Mode of transport is unconditioned small trucks

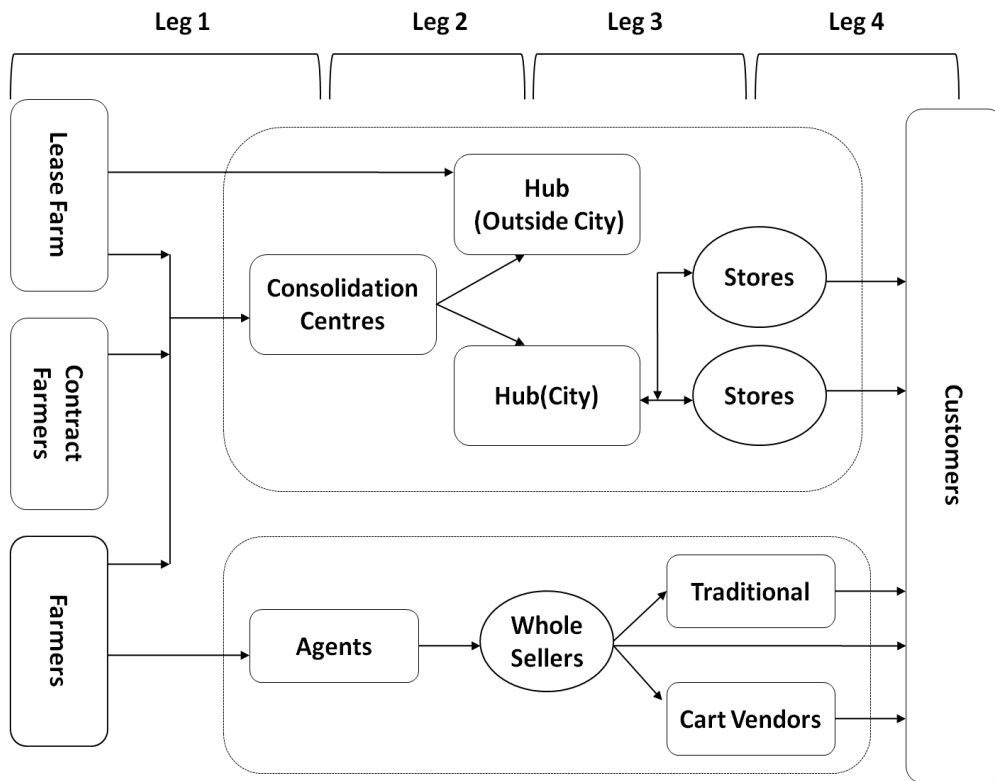
Leg 4: Customers buy and pick up vegetables from the organized retail stores. The modes of transport are motorcycle, car and public transport vehicles.

Value chain model

Currently, organized retailer Reliance Fresh (Reliance Retail Ltd) follows a Value Chain Business Model (VCM). Organized retailers who adopt VCM procure the produces directly from farmers and sell to customers by avoiding intermediaries. This model is based on its core growth strategy of backward integration and progressing towards building an entire value chain starting from the farmers to the end consumers. Very fewer players are involved in this model compared to the Traditional Retailing Model or organized retailer's Hub and Spoke Model.

Farmers, organized retailers, and customers are the players who form this value chain. In this practice, farmers, organized retailer's operational

units, consolidation centers, hub (distribution centers) and retail outlets stores, and customers are players. Small farmers, contract farmers and lease farmers are the primary source of supply of vegetables to the organized retailers. Contract farmers and lease farmers are farmers who execute a trade agreement with the organized retailers for sale of vegetables. Figure below illustrates the VCM business model of vegetable retailing. Vegetables move from farm locations to customers in four phases, farmers to consolidation centers, consolidation centers to hub, hub to retail outlets (stores) and stores to customers. Independent farmers supply their produces to the consolidation centers; contract farmers and lease farmer's produces are picked up by consolidation centers. One consolidation centre supplies vegetables to multiple hubs, depending upon the product. Hubs get direct delivery from the contract farming locations.



Stackable plastic crates, pallets and corrugated fiberboard boxes are used in handling vegetables. The loading and unloading are done with semi-automatic platform trolleys and hydraulic stackers. Vegetables are cleaned and washed at the hub on arrival. Preliminary sorting and grading are done at the consolidation center without packaging. The weight sorting and size sorting is done at the hub itself. Wrapping machine and film packing machines are used at the hubs. Every hub has warehouse and space is available for temperature-controlled storage. Implementation of information technology and advanced management techniques are in progress. Connectivity between stores (retail outlets), hub and back offices is established.

Leg 1: Farmers transport vegetables from farming location to the consolidation centres. The modes of transports are mini truck, farm tractor, bullock cart, bicycle, tricycle, and motorcycle. Consolidation centers arrange to pick up vegetables in a truck from the farm gates of the contract farmers and lease farmers. Consolidation centers also arrange to pick up vegetables from farmers if the volume is considerably high.

Leg 2: The transport of vegetables from consolidation centers to hub is arranged by consolidation centers and both temperature-conditioned and unconditioned trucks are used. The hubs get direct delivery form the contract farming locations.

Leg 3: Fresh vegetables are transported from hub to stores twice a day and collection stores return shelf life-expiring vegetables to hub for disposal once a day in unconditioned small trucks.

Leg 4: Customers buy and pick up vegetables from the organized retail stores. The stores for a shorter coverage area and high value of purchase provide home delivery.

Analysis of the models

Presently, different business models of fresh vegetable marketing are tested by the organized retailers and they are rapidly evolving. They are likely to adopt practices that have inherent strength

of local values and global practice advantages. Compared to traditional retailers, modern retailers are evidently cutting themselves off from the clutches of middlemen in different ways. This study finds that organized retailers offer significantly higher prices for the vegetables than their traditional counterparts to the farmers and payments is faster or payment is on delivery. This is one of the benefits of selling to organized retailers. Organized retailer's buying centers are closer to the farm locations. Farmers save on travel time to the mandi (traditional wholesale market) and on the hours spent waiting for auctions. They do not have to pay for transport and offloading, which is borne by the retailer. The electronic scales of organized retailers are more reliable than the local mandi's mechanical scales. The middlemen tend to round-off the weights, which organized retailers never do.

In the traditional business model, wholesalers are intermediaries and a predominant link in the retail vegetable logistical chain. In general, all the retailers are inevitably dependent on the local wholesales market. Currently, traditional retailers are protected from the competition from the global retail leaders either directly or indirectly by the government policy. The expanding retail markets require a parallel expansion of infrastructure and market related technologies at least to match their speed and economies of scale. The survey respondents, especially vegetable retailers presented their feedbacks on constraints, which are having adverse effect on the retail vegetable marketing. The major constraints are poor transport facilities, non-availability of large scale cold storage, no clear policy guidelines from the government, and fragmented and small farmers.

This study being an early work in the area of food mileage of vegetable in Indian context, there is no reference data available related to food mileage. The speed at which vegetable reaches its destination has not been studied as time taken between any two points was not observed. This is the limitation of this study and also scope for any further research. The research study does not find factors related to the food mileage. Measuring food miles is a complex task. The distance food travels has a huge impact on economical, environmental and social issues associated with transportation cost, pollution,

energy conservation and nutritional value of food products. Organized retail trade has resulted in more and more vegetables travelling ever-increasing distances from cultivation to ultimate consumption. There is a paradigm shift from local food system to the global food system. Less food mileage refers to more of local and greater mileage refers to more of global foods in our dietary habits. One of the many factors that have contributed to higher 'food miles' for organized retailer is the result of wider sourcing of supplies closer to the vegetable harvest which are located far away from retail hubs. Other reasons for increase in food miles are: greater product availability at the retail outlets, particularly for seasonal items which consumers now want to buy all year round and consumers are exposed to wider range and higher quality vegetables.

The strategy of organized retailers is to reduce overall cost than distance travelled. Food mileage is one of the factors along with value density (ratio of product value to weight), utilization of vehicle capacity, average payload weight to calculate the efficiency and profitability of the business. The present trend indicates 'food mileage' is traded off for better utilization of cheaper manpower available in the rural area where major cultivation of vegetables is located, continued business opportunity to marginal farm owners, persistent job availability to farm workers, indirect job creation for professions associated with transportation and agriculture.

Diverse agro-climatic regions, untapped huge rural resources, sharply rising food demand, wide market, growing modern market mechanisms, government's agricultural sector initiatives, expected investments in agribusiness and infrastructure are tilting factors of rural market integrating into global supply chain. A unified market and integration of rural and urban markets pave a way for free movement of goods across the boundaries. Free movement induces longer travel of goods without restrictions. Shorter food mile is an indicator of near sourcing or rural sourcing and longer food mile of vegetables is an indicator of agricultural outsourcing. It should be noted that the study concentrates on only one dimension, "Food

Mileage", which makes us conclude that more food mileage is an indication of agricultural outsourcing.

Agriculture was the backbone of the Indian economy as Nature had been very favourable to the country. Of the land within its boundaries, 52% was cultivable, as against the global average of 11%. All the major 15 climate types existed in India and sunshine hours and day length were ideally suited for good cultivation round the year. Also, India had great bio-diversity and accounted for 17% of animals, 12% of plants and 10% of fish genetic resources of the world. Undoubtedly, this comparative advantage was one of the reasons for the advent of a number of retail majors into food retailing in the past few years.

Many were leading players in FMCGs, tobacco business, and agribusiness. With their fragile life cycles, fresh foods create unique supply chain challenges. Foods such as fruits, vegetables, and meats need to be nurtured to ensure they remain intact and in good quality. This includes the time that this precious cargo spends moving through the links of the supply chain -- the most critical time for all fresh foods.

Yet many companies fail to put enough focus on their fresh food supply chains, resulting in inferior products and frustrated customers. Better understanding of today's challenges and implementing a supply chain transformation strategy is the solution.

Challenges in farm fresh business

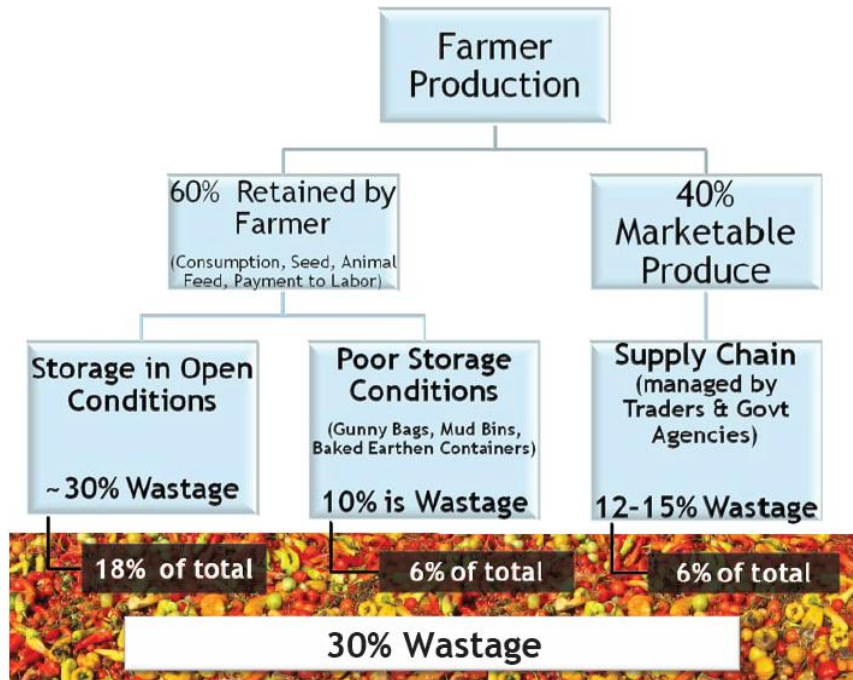
1. **Quality of Produce:** Due to untrained farmers, old agriculture techniques, tools and equipment, perception about their own way of cultivating crops, irrigation, applying pesticides depict a huge variation in quality of produce.
2. **Regulations on Directly Sourcing from Farmer:** Own set of traders are present in every mandi. It has been found that license requirement for buying & selling at mandis ensures entry barrier & limited competition. Uncontrolled profit-making among intermediaries create constraints for organized retailers. In addition to that APMC regulations, small land holdings

complicate the procedure of dealing with multiple farmers. Even contract farming not fully evolved on a large scale in India till date.

3. **Lack of Standardization:** India's fresh produces supply chain lacks standardization in Product, Packaging, Storage & Transport Infrastructure. Standardization is important for building scales in any operation as Supply chain becomes cost effective through scale. According to FCI due to Poor Storage and Transport Infrastructure 10 lakh tonnes of food grain rotted in Food Corporation of India (FCI) godowns over the past decade which could have fed over 1 crore people for a year. Decentralized procurement

& storage incurs high inventory cost. Improper Distribution of Cold Stores & planning has also enhanced challenges in collaborative agri supply chain approach. In India six states have 63% of all-India capacities & 82% of all-India capacity is used for a single commodity, i.e., potato whereas fruits & vegetables gets only 0.3% of total capacity & meat & fish get 0.9%.

4. **Logistics cost and Non-reliability of Delivery Time:** Comparatively high logistics cost & non reliability of delivery time, proper fleet management has created a massive challenge in this issue.



Opportunities in Farm fresh Business

In India, 52% of total land is cultivable as against 11% in the world. All 15 major climates of the world, snow bound Himalayas to hot humid southern peninsula; Thar Desert to heavy rain areas all exist in India. There are 20 agro-climatic regions and nearly 46 out of 60 soil types in the country. Sunshine hours and day length are ideally suited for round the year cultivation of crops. India is the

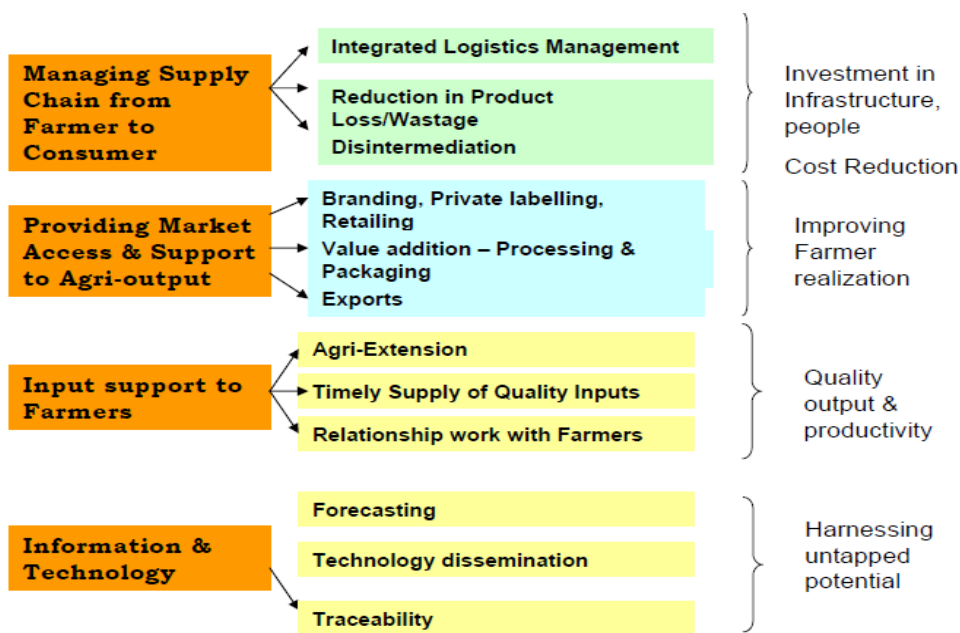
centre for biodiversity in plants, animals, insects, micro-organism and accounts for 17% animal, 12% plants and 10% fish genetic resources of the globe. In the live stock sector, India has 16% of cattle, 57% of buffalo, 17% of goats and 5 % of sheep population of the world. Agriculture contributes 24.2% to GDP, 15.2% of total exports and provides employment to 58.4% of country's work force. As mentioned in the FICCI report of October 2004 India is the Second highest fruit and vegetable

producer in the world (134.5 million tons) with cold storage facilities available only for 10% of the produce.

- Second highest producer of milk with a cold storage capacity of 70,000 tones.
- Fifth largest producer of eggs. Investments in cold chain required to store 20% of surplus of meat and poultry products during 10th plan requires Rs 500 Crores (US\$100M)
- Sixth largest producer of fish with harvesting volumes of 5.2 million tones.

Investment required is estimated to be Rs 350 Crore (US\$ 70M).

In spite of the vast natural resources and abundant agricultural produce India ranks below 10th in the export of food products. Conservative estimates put processing levels in the fruits and vegetables sector at 2%, meat and poultry at 2%, milk by way of modern dairies at 14%, fish at 4%, bulk meat deboning is to the tune of 21%. Currently, the food processing sector, though in the nascent stage, constitutes 14% of manufacturing GDP amounting to products value of Rs.2, 80,000 Crores. It employs 130 lakhs persons and is supposed to increase at an annual rate of 7%.



Opportunities for Development

Cold chain infrastructure

Investments in real estate and cold chain infrastructure are capital intensive and will yield slow returns. However, 100% foreign direct investment (FDI) is allowed in this sector. The Infrastructure consists of Coolers, Warehouses, Refrigerated Trucks, Carriers, Shopping malls, etc.

One needs to study of the potential risks and the ROI for this activity?

Third party logistics

The food supply chain is temperature sensitive and manual handling reduces the product quality and life. Logistics providers with air conditioned trucks, automatic handling equipment and trained

manpower will provide end to end support. They can also adapt state of the art techniques such as cross docking that will reduce the transit times and inventory.

Food processing industry

The Government of India allows 100% FDI in this sector. There are incentives for setting up processing plants either in Agri-Export Zones or outside of them. Sourcing of raw materials either fruits and vegetables or flowers or meat is easier with an AEZ since there are already participants with knowledge about the industry standards. There are opportunities to create in India

- a. Halal hub (Export to South-East Asia, Middle East)
- b. Vegetarian hub (20% of Indian population + overseas)
- c. Organic food hub (Europe and USA)
- d. Sea food hub

Retail

Retail, one of the largest sectors in the global economy (USD 7 Trillion), is going through a transition phase in India. One of the prime factors for non-competitiveness of the food processing industry is because of the cost and quality of marketing channels. Globally more than 72% of food sales occur through super stores. In India there are 12 million outlets selling food and related items including push carts, wet markets and neighborhood kirana stores. The kirana stores are generally located in small space and have no cold storage facilities. They also have restricted capital resulting in lack of shopping variety. The Indian retail sector is estimated to have a market size of about \$ 180 billion; but the organized sector represents only 2% share of this market. A strong retail front-end can also provide the necessary fillip to agriculture and food processing, and other industries. Currently 100% FDI is not allowed for foreign companies. India presents a huge opportunity and is all set for a big retail revolution. India is the least saturated of global markets with a small organized retail and also the least competitive of all global markets.

Emerging new supply chain

New agriculture supply chain is emerging in India removing non-value adding intermediaries

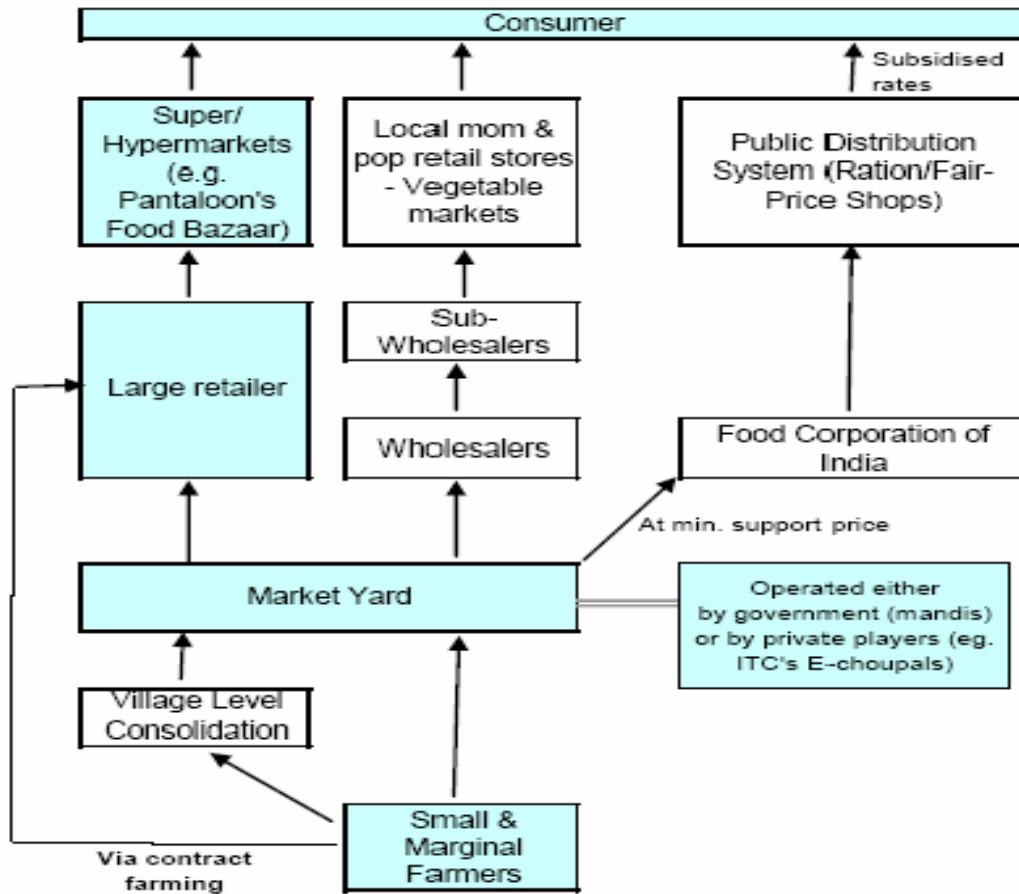
- Partnership with value adding intermediaries of the supply chain
- Technology transfer
- Streamline processes
- Maintain Quality
- To build warehouse in the grass root level as more than 1/3 of the food gets perished due to lack of storage system in the village which are to be sold in mandis and others.
- Identify & rectify the bottlenecks in supply chain by providing proper infrastructure & Collaborative Planning, Forecasting & Replenishment (CPFR).
- Remove intermediaries & apply contract farming in a larger scale with special reference to selling directly to Indian Government.
- Enable panchayats offices with ITES to get weather updates, prices, other farming techniques to increase awareness & knowledge base of the farmers.
- Panchayat offices should be enabled with VSAT & ITES so that farmers get to know about the specific need or demand of a market & can directly sell to that market to get better price.
- e.g.: Suppose there is a demand of any certain vegetable in the markets of eastern India, farmers from Uttar Pradesh & Maharashtra knowing this can end their surpluses to meet that certain demand.

Recommendations & Conclusion

Development of agriculture in India needs some critical management inputs particularly that of supply chain management- collaboration among various stake-holders along with efficient vertical and horizontal integration. The food and agriculture sector in particular has to prioritize development of research in the issues of genetics, biotechnology, integrated and sustainable production systems, post harvest handling, storage, marketing and consumer education. Government should create a policy environment that will ensure a mutually beneficial relationship between farmers and organized sector.

Along with investment in infrastructure, development of extension activities and linkages with farmers is also important areas where government can play influential roles. After the

successful trials of SAFAL Market in Bangalore, many state governments have expressed their desire to establish similar markets after they have amended their State APMC acts (NDDB, 2004-05).



Emerging F&V supply chain model

The two golden rules for successful development of this sector are to ensure consistency in supply; and provide recorded and demonstrated traceability of products. Thus, production and marketing strategies are the most crucial in strategy development. The development strategy should be based on innovation. Production innovations initially focused on efficiency and effectiveness in order to increase yields and lower costs.

Though India is a land of small and marginal farmers, studies have been advocating the fact that small farmers are going to feed India, thus it is important to mobilize them and help them to diversify to meet the increasing domestic demand of agri products. Small farmers are the key to initiate the green revolution and with technical change and increase in international competitiveness large scale operations and vertical integration takes place. Linking small farmers with high value urban and export markets would lead to development and growth of the rural sector. Diversification should be encouraged by interchanging the crops without creating any threat to the nation's food security and biodiversity. This will yield more food, more income, and better soil health. There is a strong need to strengthen research on multiple cropping driven modern technologies by using improved variety, pest management, etc. These technologies should be quickly disseminated through government institutions, NGOs and even private participants by encouraging farmers' participation and upgrading their technical capabilities.

The agricultural development requires a minimum set of basic production factors, and further requires an optimal crop management and developing a post-harvest infrastructure; entrepreneurial management and expertise; logistical infrastructure; and supporting financial infrastructure. Thus the production strategy should target not only meeting domestic and export demand of fresh products but also of the processed products. Improving post harvest operations related to handling, storage, and marketing of fresh and processed produce. Volumes saved in post harvest losses are actually the surpluses generated, without additional cost.

Agriculture sector needs to be developed as an organized industry and has to be run collectively by all the stake holders with farmers as the entrepreneurs. The marketing cost of fruits and vegetables is almost 50 per cent of the total cost of production, thus, there is a need to set up institutional agencies that can advance credit to farmer and motivate them to market the produce themselves.

Post harvest losses in crops range from 15-50 per cent. At micro level these losses increase the marketing cost of the product and at macro level they also reduce the per capita availability. Thus there is need to develop technologies, methods and mechanics to reduce these losses. There is need to remove the distortions in the present supply chain, create more integration between the different links of the supply chain and reduce these losses. This will result in net gain to producers, consumers and to the nation. Farmers usually procure inputs from the retail market and end up selling their produce in the wholesale market. Buying at retail price and selling at wholesale price is the most uneconomic way of business. Thus the involvement of an institutional structure in coordinating the demand of individual farmers of the village can reduce the total cost of inputs to them. The market needs to be demand driven rather than supply driven. The price of the produce should not be based on the prevailing whole sale price but on the basis of cost of cultivation of that produce. Farmers should be their own price setters rather than price followers. There is also an immediate need to integrate the production, marketing and processing processes of the produce to get maximum benefits from fruits and vegetables cultivation.

There are problem with price structure in the marketing, the price offered by them is not justifying the prevailing whole sale price or even the cost of production of the produce. Further successful implementing of the core marketing strategies will help in future expansion of the domestic and international markets. But the exporters face certain tariff and non-tariff barriers too. To enhance exports there is a need to develop air transport cargo system specialized for fresh fruits and vegetables, along with the airports, road and rail connectivity with the area of procurements.

Countries' capability to generate surpluses for exports depends on its ability to tap the potential of small farmers. For this assistance from APEDA and exporters association as well as training to the farmers is necessary. Quality control, longer shelf life is crucial for exports. Organic production of fresh fruits and vegetable is important to capture markets in Europe.

Several steps are required to improve the agricultural supply chain. Farmers should start dealing with large corporate, which in-turn would reduce large mark-up due to the large number of intermediaries coming into picture. Contract farming is likely to start by large retail players who will start dealing with the farmers, providing them with the right quantity and timely supply of inputs and ensuring the forward links upto the disposal front. As the private sector players increase due to competition, investment in logistics and infrastructure would also increase which would lead to an increase in the efficiency of complete agricultural chain.

One important measure would be to bring more markets under regulation and supervision of a well-represented market committee. Another measure would be the promotion and perhaps enforcement of open auctions in the markets. Yet another measure could be efforts to bring more buyers and sellers into the markets, bringing them closer to perfect markets. The direct participation of farmers should be increased. Market infrastructure should be improved through storage (go-down) facilities, cold storages, loading and weighing facilities. Improvement in the road network, and cold-chain facilities are also of substantial importance. Greater transparency of the operations through supervision and systems can also help substantially. The market integration and efficiency can also be improved by making up-to-date market information available to all participants through various means, including a good market information systems, internet and good telecommunications facilities at the markets. Thus, efforts are needed in the direction to capitalize on our strengths and remove constrains to meet the goal of moving towards systematic supply chain & logistics management which will lead to agricultural growth and development in India.

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