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Round Table

Challenges of Creating Sustainable Agri-Retail Supply Chains

Academic Background Note

By

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Abstract

There is growing pressure on businesses and governments to pay more attention to the environmental and resource consequences of the ever-increasing production, distribution and consumption of agro-based products. Major issues in the sustainable development agenda include how to ensure the involvement of producers, particularly small farmers and in these demanding sourcing networks as also the institutional initiatives that help them to meet the stringent food safety and quality regulations. Corporates, especially in retailing could play a critical role in creating sustainable agri-food chains.

Key Words

Agri-Food Supply Chains; Horticulture; Organised Retail; Sustainability; Social impact; Regulation

- **What is Agri-Food Supply Chain**

Agri-food supply chains and networks play an important role in providing producers access to markets; they affect economic, social and environmental sustainability of rural communities.

Agri-food supply chain covers the entire chain of activities from production on the farm, any processing, distribution and retailing to the consumer. Chen et al (2005) say that the terms "supply chain", "value chain", "commodity chain" and "agri-food system" are used interchangeably, with slight differences in meaning depending on the focus and context.

Agri-food supply chains, traditionally consisting of autonomous and independent actors, are becoming globally interconnected systems of complex relationships, affecting the ways in which food is produced, processed and delivered to the market [Burch and Lawrence (2008)]. These trends are posing challenges to the organisations engaged in agri-food supply chains.

There is growing pressure on businesses and governments to pay more attention to the environmental and resource consequences of the ever-increasing production, distribution and consumption of agro-based products. Serious concerns have been expressed about the sustainability of agri-food supply chains with the current population and consumption

trends (Global Footprint Network, 2012). Major issues in the sustainable development agenda include how to ensure the involvement of small farmers and other producers in these demanding sourcing networks as also the institutional initiatives that help them to meet the stringent food safety and quality regulations.

The two main types of agri-food supply chains are Agri-food chains for fresh agricultural products and Agri-food chains for processed food products [van der Vorst et al (2007)].

Large retail chain operators, caterers, hotel, restaurants and domestic customers in urban areas require a regular supply of fresh fruits, vegetables, meat and other perishable food products. The emergence of supermarkets has led to the changes in the retailing model of fresh produce and the management of the supply chain.

Fresh fruit and vegetables (FFV) supply chains are particularly of interest as they involve a large number of players and have significant impact on many employment and social issues [Best and Mamic (2008)].

- **Horticulture Sector in India**

India, endowed with diverse soil and climate regions, is home to a variety of horticulture crops which contribute to a significant part of the total agricultural produce in the country. The production of horticultural crops has been expanding since independence. According to the Planning Commission Working Group on Horticulture and Plantation Crops (2011), the area and production under horticultural crops have increased from 12.77 million ha and 96.56 million tonnes respectively in 1991-92 to 20.04 million ha and 221.20 million tonnes in 2009-10. Horticulture contributes about 30% of India's agricultural GDP from 13.08% of the cropped area and accounts for 37% of the total exports of agricultural commodities. Due to the increased investment and focused attention, there has been a spectacular change in the production and productivity of horticultural crops. Fruits and vegetables are largely consumed fresh in India with only a very small quantity going into the manufacture of various processed products such as pickles, ketchup, jams, chips and fruit drinks.

The Government of India is aware that the horticulture sector is connected with generating employment, improving the economic conditions of farmers and providing nutritional value to people. (Economic Survey 2004-2005). Steps have been taken to increase production, improve productivity of land, improve efficiency of agri-food supply chains and increase exports to enhance the economic strength of this sector. Various studies and policy documents have highlighted the inadequacies of various types of infrastructure. The Report of the Planning Commission Working Group on Agricultural Marketing Infrastructure and Policy Required for Internal and External Trade for the Xi Five Year Plan 2007-12 highlights the need to upgrade infrastructure in a whole range of areas such as marketing infrastructure; post-harvest processing, handling, packaging and transportation; marketing information and institutional infrastructure; etc. The horticulture sector is also faced with frequent and sharp price fluctuations; poor quality and consistency; issues in harvest / post-harvest handling leading to large amount of wastage and a lengthy food chain. Though India is the second largest producer of fruits and vegetables in the world after China, the export competitiveness among the Indian producers remains low. Supply constraints, yield gaps and logistics cost affect the country's competitive and comparative advantage.

There are opportunities to increase export to the developed markets, especially with a demand driven strategy. But this requires an insight into not only the market and consumer trends but also conformance with food-safety, and improved efficiency. Added value in terms of robustness, innovation, local processing, chain certification by adopting the latest developments in post-harvest technology, scenario analysis, protocols, quality certification and branding can make substantial difference. While technology is available, it is setting out a strategy, and investing and organising the essential partnerships in the chain that play a crucial role.

- **Horticulture Supply Chains**

Globally wholesale markets are the main centres of trade where buyers and sellers conduct business in fresh food produce as commodities. Commodities, by definition, are highly tradable products characterised by a lack of product differentiation; the only viable strategy is to be the lowest cost producer. Commodity systems, due to their production-push orientation are not reliable in supply in terms of quality, quantity or price and are also not very responsive to changing consumer needs [O’Keeffe (2007)].

An agri-food supply chain works towards making the evolution from a production push to a market pull orientation; in other words creating a system that is responsive to changing needs of the consumers. Roekl et al (2002) describe the key issues of building agri supply chains in developing countries as forming agri-industrial organisations that dynamically respond to the changes by gaining insight into changing consumer demands, maintaining safety and quality and increasing the velocity of products through the distribution channels by efficient logistics management.

Food distribution systems in Asia are changing, due to increasing urbanisation, changing consumer preferences and eating habits, increased infrastructure development as well as low margins and high competition. Integrated supply chains and networks, as distinct from loosely related firms in the channel, provide opportunities for creating added value. Further, branding can lead to high customer satisfaction and confidence in the purchase. Experience shows that these challenges can be met by multi-firm approach, by forming partnerships among suppliers, input providers, marketers and customers in the chain.

Pingali and Khwaja (2004) have identified two stage transformation of Indian diet featuring move away from inferior goods to superior goods followed by an increased consumption of proteins, sugars and fats. . In response to the increased demand of fruits and vegetables due to the diet changes of Indian population fruit and vegetable production has increased manifold in the last few decades

According to van der Vorst, et al (2007), market pressure is forcing improved coordination and continuous innovation in agrifood chains. Actors in the agri-food chains must satisfy the demands of diverse consumers; regulatory agencies; *local pressure groups such as* Non-Governmental Organizations (NGOs); and others. If products are produced using child labour, environmental pollution, etc., they will not be accepted. While maintaining price and quality Companies have to work continuously on innovations in products, processes and forms of cooperation.

The emergence of supermarkets has led to the changes in the retailing model of fresh produce and the management of the supply chain. Govindaswamy & Thornsbury (2014)

observe that the US fresh produce market has adapted to increased consumer demand and sophistication by streamlining the supply chains. There has been shift in marketing efforts by way of retailer consolidation, increased product offerings and year-round supply by increased imports.

Commenting on the wide divergence between the farm gate prices and retail prices of food items, Mr. Harun R. Khan, erstwhile Deputy Governor, Reserve Bank of India observed, "The usual reference to 1-2-3-4 in supply chain is quite well known, where what the producer sells for one rupee, by the time it reaches the final consumer fetches four rupees due to the presence of intermediaries. Therefore, increasing efficiency of supply chain could help in bringing food inflation down and increase the efficiency of our food markets and make our agriculture sector sustainable and viable.... managing food inflation from a medium-term perspective would include measures to increase production, improve productivity and enhance efficiency of supply chain management..."¹

There is a need to analyse the current structure of flow of agriculture products to retail in India and develop possible designs for structured sustainable supply chains which will bring in more efficiency, equity and minimise wastage.

- **Retail Revolution in developing countries**

Chen and da Silva (2005) note that supermarkets and hypermarkets in North American and Western European countries account for over two thirds of all food retailing. This trend is seen in other areas of the developing world such as Latin America and South Asia. The retail revolution has brought a new approach to food retail business, has created new barriers as well as opportunities for various participants in the agri-food system.

The large retail chain operators, caterers, hotel, restaurants and domestic customers in urban areas require a regular supply of fresh fruits, vegetables, meat and other perishable food products. The improving of living standards and greater awareness brought by globalisation has led to the changes in the way of consumption and buying habits.

In developing countries supply chain management is becoming increasingly important because the leading national and international supermarket companies are focusing on meeting and consumer desire for products conforming to global standards of food safety and health.

The produce industry relies on a careful orchestration of the supply chain - that includes planting the right varieties, harvesting at the peak of ripeness, packing in customized cartons, transporting over thousands of miles, merchandising, marketing and promotion at just the right moment - requiring detailed communication and coordination between growers, transporters and retailers.

- **Organised Retail in India**

¹ Food Inflation and Agricultural Supply Chain Management (Keynote address delivered by Shri Harun R. Khan, Deputy Governor, Reserve Bank of India, at the 16th Conference of Global India held in Mumbai on September 22, 2012) https://rbi.org.in/scripts/BS_SpeechesView.aspx?Id=736

The Government of India sponsored information portal India Brand Equity Foundation (IBEF) (www.ibef.org › *Industry*) says Indian retail industry accounts for over 10% of the country's GDP and around 8% of the employment. Modern organised retailing has emerged as one of the most dynamic and fast-paced industries attracting entry of several new players. According to IBEF (www.ibef.org › *Industry*) India's retail market is expected to nearly double to US\$ 1 trillion by 2020 from US\$ 600 billion in 2015, driven by income growth, urbanisation and attitudinal shifts. Modern retailing is expected to grow at 20% per annum as compared to the forecast growth of traditional retail at 10% per annum. India is the world's fifth-largest global destination in the retail space. (www.ibef.org › *Industry*). Recent policy changes allowing foreign firms to be part of India's retail sector is expected to directly impact the agri-food supply chains in the country.

NABARD Study on Organised Agri-Food Retailing in India (2011) found that food retailing forms about 61% of the total retail, estimated at about Rs.10,700 billion in 2008-09. Organised agri-food retailing is still urban centric, miniscule albeit growing at one and a half times as fast as food retailing. Food retailing while essential is not very profitable for organised retailers but it ensures regular footfalls into the store.

Linking primary producers with modern food supermarkets, is seen as a way to improve rural livelihoods, especially small producers. It is important to ensure the process of establishing linkages between corporates and primary producers is not 'exclusionary in nature and becomes a win-win' situation for the participants in the supply/value chain. [[Singh & Singla](#) (2011)]

The recurring themes in various debates on the role of organised retail sector have been the strong emphasis on the expected beneficial effects of improving the current state of agri-food supply chains and improved prices to farmers. However, the NABARD Study found that the struggling Indian organised retail sector has not been able to make the investments in the supply chain to reduce the costs.

- **How retail chains create value**

Dolan & Humphrey (2000) observe that the differentiation strategies of supermarkets have emphasised fresh, healthy food, ease of preparation, quality, consistency, variety, processing, reliability of supply and price to attract high-spending, middle-class consumers. They give an example of carrots to show how differentiation and processing adds significantly to value creation:

O'Keeffe (2007) describes how three supermarkets in the UK viz. Tesco, ASDA and Waitrose are pursuing different marketing strategies that reflect their positions in the market. Tesco's 3-tiered brand strategy caters to premium, mainstream and discount market segments and develops specific products for each range by working closely with its fresh food suppliers. ASDA pursues 'every day low pricing' (EDLP) strategy and works together with its suppliers to reduce costs. Waitrose caters to the premium segment with an emphasis on flavour and taste and works with dedicated suppliers and growers to offer superior flavour and freshness to quality conscious customers.

These successful fresh food firms understand the drivers of consumer value for their chosen target market and execute an integrated suite of strategies that create and deliver value to

the consumers. Their organised fresh food value chains replace market mechanism with management to coordinate between volatile demand and supply.

Developing a fresh food supply chain requires a lot of efforts and competencies [Roekl et al (2002)]. The perishable nature of the products places a number of constraints in dealing with sub-optimal demand and supply information. In fresh foods both demand and supply – quantity and quality - are volatile, inventory cannot be used as the buffer. Suppliers who have the product knowledge, including the end use by the consumers and also are sensitive to the market demand will be able to respond more quickly to changing consumer preferences and retain a marketing advantage. [Tropp et al (2008)]

A detailed study of the existing trade system and the trade environment is necessary to understand the product flow, exchange levels, forces affecting the operation of the supply chain such as governmental policies, etc. Such a study helps to identify the potential supply chain partners of an agri-supply chain and delineate their functions, roles and relationships. Cooperation among supply chain partners is necessary to establish traceability which can improve verification of quality and reduce the costs in case of food safety problems. Introducing IT Tools, such as chain-wide reporting, improves transparency, decision making and control of supply chains and is also useful in reducing administrative costs.

In their study of malting barley to beer agri-food supply chain, Leat and Reoldo-Giha (2008), have identified five factors affecting the relationships in the supply chain viz. communication; compatibility of aims; contractual relationships based on professional regard and personal relationships; high levels of trust and a willingness to resolve any problems; and commercial benefit.

In their study of fresh food exports from Africa, Dolan and Humphrey (2000) note that UK supermarkets have established control over the fresh vegetables trade and play a decisive role in determining the production and processing structure of fresh vegetables exported from Africa.

- **Social impacts of Retail led Agri-Food Supply Chains**

Ministry of Commerce and Industry, Government of India commissioned a study by ICRIER (2008) to analyze the impact of organized retailing on unorganized retail, farmers and intermediaries. The study concluded that both unorganized and organized retail would coexist and organised retail would contribute by setting up of modern supply chains and raising productivity in both agriculture and industry.

Ruben et al (2006) note that poor farmers in developing countries, are likely be excluded from trade as they are unable to adopt technological innovations due to limited resources and little access to markets and information. Large scale commercially oriented farm enterprises are better equipped to meet the demands for regular and reliable deliveries of homogeneous quality products and in the process are able to realise economies of scale in processing, transport and distribution. However, small farmers could offer cost advantages in case of labour-intensive products and can be involved into global agri-food chains ensuring a more equitable configuration. New institutional and organisational initiatives are needed to enable producers in developing countries to meet global business requirements and trade standards. They conclude that a fundamental reorganisation of information streams and agency relationships based on SCM principles is required for providing

opportunities to smallholders to match their supply to consumers' demands and to become part of preferred suppliers for global sourcing.

To meet the increasing consumer demand in Western countries for year round supply of exotic products Western retailers and food industries are increasingly sourcing from developing countries and these countries are thus becoming more and more integrated in the global food market. A typical supermarket in Europe merchandises many imported foods from a diverse number of developing countries such as beef from Argentina, rice from Thailand, special coffees from Tanzania, papayas from Brazil, mangoes from India, and so on. This means that suppliers from developing countries must adapt to the stringent quality and safety standards and regulations in European markets. They must not only guarantee traceability of their agricultural products but also be competitive in the global market. One important barrier for producers in developing countries is the lack of an enabling ecosystem consisting of institutions, support services, infrastructure facilities, skilled people and laboratory facilities.

To cope with these developments and requirements, companies involved in the agri-food supply chains must reexamine their roles, activities and strategies. Market demands for responsive, low cost and high quality deliveries can be met only with close and effective cooperation among the parties involved in the Supply Chain.

In most of the current discussions on agri-food supply chains one seldom hears about production to meet the consumer demand. Farm production is essentially a "push" system where there is often an imbalance between supply and demand. These imbalances are moderated by the spot market. In times of surplus farmers receive lower prices, whilst in times of shortage retailers lose quality assurance by having to buy in the spot market. Taylor (2006) reports that there is no evidence of a systematic attempt to closely link agricultural production to expected demand at the harvest time. He observes that the disconnect between agricultural production and consumer demand occurs because of both operational and structural reasons. Agricultural production has long lead times; many crops have a six to nine month planting to harvest cycle while beef and pork animals have two and one year production lead times respectively. Farmers, in the absence of a reliable long term demand forecasts, made their own judgments about how much to produce, often taking inputs from their immediate downstream customers. The development of a joint long term forecast by farmers, processors and retailers could be an important step in helping to link farm production to consumer demand.

According to Gulati et al (2005), the growth of high-value agricultural commodities such as fruits, vegetables, eggs, dairy, meat, and fish not only creates more opportunities for small farmers but also places a greater need for close linkages between farmers, processors, traders, and retailers to coordinate supply and demand. Institutional mechanisms such as grades and standards, inspection and certification services, contract farming, farmer cooperatives, price information services, professional associations, and vertical integration facilitate coordination in agricultural supply chains. One key issue is that of the distribution of benefits of supply chain management, and the extent to which these benefits are shared by rural communities, smallholder farmers and traders.

Case studies have shown considerable sectoral differences in the position that smallholders occupy as well as the value chain structure; agri-food chains have evolved away from small farmers and traditional markets. High-volume crops such as coffee, cocoa, and processed

tomatoes, are controlled by large processors. The rise of buyer-driven FFV export chains as also the efforts of big retailers to regain control over the markets would inevitably force smallholders into even more tightly constrained situations.

Lee et al (2012), found different leverage points and key change agents for improving the balance between economic, social, and environmental well-being of farmers and consumers who are at either end of the farm-to-fork chain. Using a global value chain approach, they suggest that collective efforts are to be initiated to regulate agri-food trade at the global level to protect smallholders from market vagaries and to strengthen private governance schemes.

- **Building Sustainability in Agri-Food Supply Chains**

There is a growing concern about social and environmental sustainability of the food industry (Dong Li et al, 2014). The increasingly resource intensive consumption patterns is determining the unsuitable trajectory of our global food production system. According to a UN Discussion Paper (2012), if the current population and consumption trends continue, 'humanity will need the equivalent of two Earths to support it by 2030'.

The world will need to produce significantly more food to provide the basic and adequate nourishment to everyone. The amount of food required will be even greater if current trends in diets and food systems continue. For example, in India, urbanisation has led to a transformation of Indian diet featuring move away from inferior goods to superior goods followed by an increased consumption of proteins, sugars and fats. These consumption trends are detrimentally affecting health, negatively affecting agro-ecological resource base and its ability to sustainably provide and adversely affecting food security. Concrete action is needed to redirect the current consumption patterns to diets based on less resource-intensive foods.

The Indian government's policies in the past emphasized food grain self-sufficiency, which did not necessarily include agricultural sustainability. However, India's National Agricultural Policy (NAP) (2000) emphasised the importance of management and conservation of resources. The NAP stated that improving the quality of land and soil, rational utilisation and conservation of water, and sensitising the farming community to environmental concerns would receive high priority. Several initiatives have been started by Central and State governments to promote sustainable agricultural development. The key to sustainable agriculture in India is the management of the small farm to achieve improved productivity, profitability and sustainability.

Basic questions today are whether food can be produced, distributed and consumed in a more sustainable way without compromising costs. A sustainable food supply chain involving environmental, technology, market, regulatory and socio-economic considerations can be developed only when the stakeholders in the food industry come together and work beyond their organisational boundaries. Tackling food loss and food waste is a good starting point for effective collaborative action.

A sustainable food system can emerge from substantially increased and collective global efforts to establish climate-resilient agricultural production systems which that make efficient use of resources, reduce greenhouse gas emissions, develop low-waste supply

chains, ensure adequate nutrition and encourage healthy eating choices, take special care of the needs of the poorest and most vulnerable.

Corporates, particularly retailers play a critical role in agri-food chains. Organised supply chains provide opportunities for adoption and testing of new approaches such as social accountability, good agricultural practice (GAP), total quality management, and HACCP (hazard analysis at critical control points) that ensures the quality and safety of products and acceptable social performance of corporate social responsibility. Several voluntary initiatives such as fair trade, ethical trade (codes of conduct) and collective agreements—have provided some benefits, but more challenges remain.

The Report of the Commission on Sustainable Agriculture and Climate Change (2011) says ‘the multiple emergent challenges – food insecurity and undernutrition, climate change, increasing competition for energy and water, degradation of land and biodiversity – are connected in complex ways and demand an integrated management approach. Adaptive management and governance to improve nutritional security, economic prosperity and environmental outcomes will require a much better global system for integrating spatially explicit information about agriculture, ecosystem services, markets and human populations in real time’.

FAO Report (2011) “The state of the world’s land and water resources for food and agriculture (SOLAW) – Managing systems at risk” observes that the world community has to meet the projected demands for food and agriculture production, address malnutrition and rural poverty, and reconcile the competing demands for land and water with the need to check rapid degradation of natural systems. The Report calls for “improved governance of land and water resources and a closer integration of policies, combined with increased and more strategic investment targeting food security and poverty alleviation”.

- **Regulating Agri-Food Supply Chains**

The Government of India recognizes the need to integrate farm production with national and international markets to enable farmers to undertake market driven production. The state is trying to facilitate private investment in owning, establishing and operating.

Report of Task Force on Agricultural Marketing Reforms (2002) recommended that the State Agricultural Produce Marketing Regulations Act (APMC Act) and the Essential Commodities Act be amended to remove restrictive provisions coming in the way of an efficient and competitive marketing system. The Department of Agriculture and Cooperation has formulated a Model Act “The State Agricultural Produce Marketing (Development and Regulation) Act 2003 in September 2003 and circulated to all State Government/UTs for adoption. A majority of the states have adopted key reforms as suggested in the model act. However, except in a few states, the various reforms have been considerably diluted or only partly implemented.

Food safety concerns have led to the development of ‘integral chain-care’ tools [Roekel, et al (2002)] such as social accountability, good agricultural practice (GAP), total quality management, and HACCP (hazard analysis at critical control points) to ensure the quality and safety of products and also an acceptable level of social performance in supply chains. Some examples are Supermarkets in Brazil and Thailand, who have adopted total quality management programs and HACCP rules for perishables like fresh fish and meat. Leading

European Retailers have established their own quality standards (e.g., EUREP-GAP and BRC2) that include tracking and tracing systems which suppliers must meet. These are used to ensure the quality of products and transparency throughout the supply chain.

There is a growing concern that modern agri-food systems are moving towards a highly concentrated structure, in which retailers hold most power, pass on the benefits to customers and shareholders and not to the producers [Vorley & Fox (2004)]. Public and voluntary agencies make important contributions for reinforcing the supply-chain environment. Public policy has an important role in creating strategic actions to promote supply chain formation and to help equip poor farmers to compete and to regulate the market (Chen 2002). Humphrey and Schmitz (2000) opine that by upgrading the knowledge, processes and products, Agricultural producers could evolve from the buyer controlled value chains into more equitable network relationships. Ruben et al (2006) state that smallholder participation in global supply chains is determined by market access and network governance. Pimbert, et al (2003) advocate a combined food system approach which could result in new livelihood options, resource access and market opportunities for smallholders and family farmers.

The Round Table is invited to bring in practitioner insights on improving agri-food supply chains and debate the following issues:

Question 1

- Agri Value Chain in India seems to be stuck in the cycle of low returns and low investment.
- Why is Organised Retail not able to move beyond the present situation of commodity trade?

Question 2

- Experience shows economic considerations restrict Retail Supply Chains to reach out to large producers/markets within 50-60 km range whereas the traditional supply chains link even small producers up to 200 kms with demand centres.

How and when, do you think, Retailers would be able to extend supply chains to cover small farmers and in distant areas, say, over 200kms?

Question 3

- What factors have hindered the adoption of best practices in Indian Agro-Retail supply chains?
- How has adoption of Information Technology helped in improving efficiencies and coordination in Agro-Retail Supply Chains?

Question 4

- What were the specific difficulties faced due to policy and infrastructure issues? What steps were required to overcome these difficulties? What policy initiatives and infrastructures you feel would be required to improve the environment for operating Agro-Retail supply chains?

Question 5

- What would be your vision of a sustainable agri value chain for India?

ROUND TABLE

Challenges of Creating Sustainable Agricultural and Retail Supply Chain: Discussion²

Anchor

Gopal Naik, IIM Bangalore

Panelists

- K M Parashivamurthy, Addl. Director (Fruits), Govt. of Karnataka
- Sunil G. Awari, General Manager, Namdhari's Fresh
- Praveen Dwivedi, President, Future Consumer Enterprise India Limited

Gopal Naik: Introduction

The Indian agricultural and retail (agri-retail) supply chain is one of the largest supply chains and is considered difficult to sustain. All of us are involved in the agri-retail supply chain as consumers. A large part of the Indian population is involved in this supply chain as producers, and in performing activities such as processing, transporting, storing, and trading of agricultural commodities. This supply chain generates livelihoods for a large number of people, and improves the economic conditions of the country. Research results show that the poverty can be reduced if we are able to have healthy agricultural development. We need an efficient supply chain for that.

The agriculture supply chain, however, is faced with many issues. The uncertain quality of health foods, and health and safety aspects, form one such issue. For instance, if you go to the market and buy greens, how can you tell whether it is actually healthy, free from pesticides, and so on?

The Indian agriculture supply chain is not very competitive in the world market. A number of studies report that at the farm gate level, the sector is competitive. But when the produce

² The panel discussion was part of the The Fourth Biennial Supply Chain Management Conference held in December 2014 at the Indian Institute of Management Bangalore. This part of the article carries edited excerpts of the presentations made at the panel discussion. The views expressed by the panelists are personal and academic in nature and not necessarily the views of their organisations. The presentations of the panelists were made in an academic context in an academic institution.

reaches the market, we are not competitive. That means the major problem lies in the agriculture supply chain. Effectively, our share is not growing in the world market. Indian agriculture products generally receive about ten percent less price in the international market, and are often rejected because of the quality uncertainties.

Unlike other supply chains, the agriculture supply chain has not improved in the last few decades. There are very few examples of a successful agriculture supply chain which has transformed itself. One example is in the grape sector in Pune area. Over a period of about twenty years, the Maharashtra State Grape Growers Association in Pune, with the help of the government of Maharashtra, put in great efforts to ensure that our grape is able to compete in the international markets. They have developed a food chain which is as good as anywhere else in the world. But this example has not been replicated on a large scale. We don't see large scale changes in the supply chain at the all India level which would help us in moving our supply chain to the next generation where the efficiency is high, which is sustainable, wastage is low, time taken is short and which serves the interest of the producers and consumers.

Producers would like more stable prices, less uncertainty in the market place, and more information about the markets. Consumers would like to know the quality of the produce, and whether the supply chain provides information to the producers in time so that they can produce the output which can meet consumer requirements. Another question is whether the supply chain is able to provide the consumers easy access to the required quality produce, at an affordable price. Society in general would be concerned whether the supply chain is ecologically sustainable, and does not misuse or abuse resources and the land. For example, too much of irrigation, or excessive usage of pesticides and fertilizers create waste lands. The land use pattern should be sustainable and productive in the long run. Another key issue is managing the large amount of wastage created in the agriculture supply chain.

To address some of these key issues today, we have three experts from three major areas. Mr Dwivedi will talk about the private sector's role in developing the agri-retail supply chain, the culture of the supply chain in India, the problems they are facing, and also recommend some changes that we need to incorporate in the agriculture supply chain.

Mr Parashivamurthy, will bring in his experience with the horticulture sector and talk about the role of government policies, and the kind of policy changes that are required to make our supply chain more efficient and sustainable.

Mr Sunil Awari will present the challenges Namdhari's Fresh is facing in terms of making sustainable the supply chain in agriculture.

We would also like our experts to focus on some key questions such as why the quality of the produce does not meet the requirements of the consumers. A second point of discussion is the role of the private sector, which has been mainly restricted to contract farming. The reach also has been limited to areas surrounding bigger cities, and has not

included the rural areas. The third question is that of best practices. We are still struggling with appropriate packaging and transportation of agricultural produce, resulting in high wastage and poor quality at the consumer end. Why have we not been able to bring in best practices from around the world to our agricultural supply chain so that it would meet the requirements of the consumers? The fourth question is, what are the major policy barriers? How can policy be facilitated to bring in changes in the agriculture supply chain? We would also like them to share their vision about the future of the agriculture supply chain in India.

I invite Mr Parashivamurthy to make his presentation.

K M Parashivamurthy: Meeting the Challenges of the Agri-Retail Supply Chain

I am from the Karnataka government horticulture department. Having worked with both the Horticultural Producers' Co-operative Marketing and Processing Society Ltd (HOPCOMS) and the Karnataka Horticulture Federation (KHF), I realised that unlike the milk federation which handles only one product, in India, the fruits and vegetables sector is not as successful because the agriculture and horticulture sector handles numerous perishable products.

Let us consider the standard of living of the farmer. The price of fruits and vegetables fluctuates every day whereas the price of non-perishable commodities has steadily increased over the years. The price of tomatoes, for instance, has been known to fluctuate between two rupees and eighty rupees a kilo! This is the scenario of our marketing sector. The government alone cannot change the scenario.

Private organisations must play a major role through public private partnership (PPP) models.

The concept today is that the government will provide the infrastructure to the farmers for all the packing, grading, and other post harvest activities and the farmer should sell his product under his own brand name. Unfortunately in India, most farmers have small holdings and hence are unable to establish their own brand. The Indian government established the Small Farmers' Agribusiness Consortium (SFAC), which is now playing a major role in promoting farmer producer organisations (FPOs). From each village 20 to 20 people with a common interest form a group. Similarly 50 or more groups together form an FPO. Farmer producer organisations may be formed at the hobli or taluka level. The FPOs provide technology to the farmers in back ended linkages, to help them produce good quality products and provide marketing facility in forward linkage.

As Prof. Gopal Naik mentioned, the quality of production is an important aspect of the marketing system. While the Green Revolution in India made us self-sustainable in agriculture and in food production, under its the influence we started using fertilizers and pesticides. Although farmers were not asked to use fertilizers and pesticides continuously, they stopped the use of farmyard manures. As a result, the soil health has deteriorated. Later it became a major constraint for production of quality produce.

We are in the process of instituting several measures to improve processes. We are now doing precision farming, which means, growing the crop that is in demand by using precise quantity of manures, pesticides and water as per the requirement. Water is harvested to mitigate water scarcity and utilise for crop production. The advantage of water harvesting is that the pH level can be controlled at seven, which is neither acidic nor alkaline (pH is the numeric scale used to specify the acidity or alkalinity of an aqueous solution), and which is used for almost all crops. We are also going to mitigate the pesticidal residue using protected cultivation in green houses. Protective cultivation in green houses enables us to use water very precisely, harness solar energy, avoid loss of water, and get maximum protection from pests and diseases.

The next challenge is crop planning. Farmers are unable to coordinate among themselves and decide on what seasonal vegetables to grow and how much. This results either in excess production or scarcity (as was the case with tomatoes). If excess produce is stored for a few weeks in cold storage, it will allow for enough time for the price to recover. However, the cold storage capacity in the state is limited and very few commodities are stored in the available cold storages. The National Centre for Cold-chain Development (NCCD) has been established to promote and develop integrated cold chain in India for perishable agriculture and horticulture produce. This centre is helping private and public entrepreneurs set up cold storages. Public and private entrepreneurs can seek assistance from the Agricultural and Processed Food Products Export Development Authority (APEDA) for export purposes and for establishment of cold chains.

The production scenario in Karnataka is quite promising. We have a high average Indian productivity of fruits and vegetables. Altogether the value is about Rs 18 billion. Export value of fresh fruits through APEDA is about Rs 87,600 million, and vegetables is about Rs 64,830 million. Exports of fruits and vegetables are increasing year on year, which shows that we have taken care of quality of production, but exports are not up to the mark. However, we are picking up and are working to fulfil the requirements of the exporters.

Our department is tackling the concerned challenges through three mitigating approaches -- production related initiatives, post-harvest management and market related initiatives. Coming to production related initiatives, in Karnataka, we have many vegetable growers or seed producers, private seed producers, producing very good varieties. They compete with each other in coming out with new varieties every year which are high yielding and high quality. To aid production, we are providing high tech nurseries for farmers. After the National Horticulture Mission came into existence in 2008, high tech nurseries have been set up in villages, tissue culture labs are being established in district headquarters and we are helping to restore the old tissue culture labs, and to establish gardens for growing new fruits and vegetables. With the help of the Indian Institute of Horticulture Research and the University of Agricultural and Horticultural Sciences, and institutions such as Namdhari's Fresh, we are setting up cold

storages, and forming and practising standards for protected cultivation. We are adopting the technology and ideology of organisations such as Namdhari's Fresh and other leading private organisations. We are providing green houses, shade nets, and plastic tunnels to the farmers. The cost of protected cultivation or the green house is about Rs 3.8 million per acre. This enables protected cultivation which has yield advantages through storage of water and savings on water consumption, protection from attacks of pests and diseases, improved quality of produce and improved productivity to the extent of 200 to 400% when compared to open cultivation. However, the farmers prefer investing in purchase of additional land than invest in green houses,

Post harvest, about 40% of the total horticultural produce of fruits and vegetables is being wasted due to poor management. So we are promoting pack houses for farmers. The moment the produce is harvested, it should be brought into the shade, to bring the temperature of the produce to room temperature to retain its freshness. The farmer is advised to have a small pack house in his farm and to bring the produce there immediately after harvesting, and clean, wash, dry, pack, and sell it. The processes are integrated. Here he can grade his produce with the help of machines, and also pack and store it. A cold room can also be maintained at 16° C with the help of solar plates. The National Horticultural Mission is providing assistance to help farmers procure refrigerator vans in which to transport the produce from the pack house to the cold storage. We are helping farmers in setting up ripening chambers and processing plants to change the form of the product after harvesting, to enable longer storage. For example, tomato sauce can be made out of tomatoes, sealed and stored for six months to a year. But as fresh produce, the tomato does not last for more than a week.

Under the Rashtriya Krishi Vikas Yojana, we help in forming agro industries and processing units where the entrepreneur collects the produce from the local area and processes it locally. We are providing assistance up to Rs 5 million subsidy for such ventures. We are supporting secondary units for packing, sales, and export of packed foods. The Karnataka Mango Development and Marketing Corporation, is successful in mango export with the help of APEDA.

Many individuals are also helping the farmers to maintain documents. Traceability or labelling the products is of utmost importance in export. With the help of APEDA we have registered about 2000 farmers for the export of mangoes. With the help of designated officers, farmers maintain a diary and follow the book for good agricultural practices (GAP) in the production of export quality mangoes. With that documentation the APEDA will help farmers to export mangoes.

Coming to the markets scenario, the terminal market (a central assembly site for assembling and trading of produce) is a public private partnership but has not been successful due to some policy issues. The wholesale market is under the Agricultural Produce Market Committee (APMC); the rural markets or apna mandis have not been successful since the farmers have been reluctant to sell to consumers directly. The share they are getting is

about 32 to 42 paise per rupee. All things in the markets scenario considered, a bridge between the farmers and consumers was perceived as a requirement and the HOPCOMS came into existence in 1969. Initially set up in the name of grape growers association in Bangalore, it was later extended to other produce and established throughout Bangalore. These HOPCOM outlets can be further improved.

Among the issues of quality control, is that of improving the shelf life of fruits and vegetables. There are several dedicated boards such as the Mango Board, the Spice Board which concentrate on particular foods. Consumer preference is playing a great role in processing the products. Earlier we used to grow large size produce. Now we have to cater to nuclear urban families. So now the fruits and vegetables are much smaller in size. There is also a great demand for ready to cook and ready to eat products.

Coming to strategies in post-harvest management, there are several interventions that are required and that we are working on. We are planning to organise training for farmers groups on cooperative models, and National Dairy Development Board (NDDB) models on crop planning and growing of vegetables and fruits which are in demand. We must work on improving the market and reduce the gap between farmers' share and the final price. We must improve the lifestyle of the farmers, and provide infrastructure to the local markets. Processing capacity and distribution network has to be strengthened. Primary processing facilities must be set up in production clusters. Technology upgradation or research must be promoted. Electronically traded spot exchanges must be developed. Warehousing, testing labs, and other eco-system linkages must be established to strengthen efficient price discovery mechanism.

Cooperative models already exist. We must explore emerging models such as EurepGAP³ and Farm to Fork, avail of training programmes organised by the National Council for Cooperative Training, and so on. We are working towards better packaging, including assistance to farmers for the crates used for packaging. The cooperative model should be extended with the help of the government, for improvement in packaging. We must promote the food processing industry, keeping an eye on the export potential. We have to extend help to private entrepreneurs for export purposes.

There are also constraints that the food processing sector faces, which have to be addressed. These include lack of suitable infrastructure, lack of adequate quality control and testing infrastructure, inefficient supply chain and involvement of middlemen, lack of processable varieties of farm produce, seasonality of raw material, high inventory carrying cost, high taxation and high packaging cost, affordability, and cultural preference for fresh food.

To conclude on a promising note, in response to consumer preferences, HOPCOMS outlets are being upgraded, and the brand name is doing well in Bangalore.

³ EurepGAP is a common standard for farm management practice created in the late 1990s by several European supermarket chains and their major suppliers

Audience: Fresh vegetable outlets are located in urban areas like Bangalore. But if they shift to rural areas, it may bring down the price, and benefit consumers.

Parashivamurthy: We cater to urban areas to increase profitability. Also, in villages, people tend to grow their own produce and the need for HOPCOMS is not so strong. But in hobli and taluka level, efforts are being made by HOPCOMS to open their outlets.

Audience: You said that the agriculturists are getting about 42% of the total revenue. Why are they not increasing their revenue by selling directly to the market?

Parashivamurthy: We observed a few challenges in our attempt to establish Apna Mandi, that is, an open market for villages. The concept is new for the farmer, who is more interested in farming and production. He does not have the marketing ability to sell his product to the consumers. Further, the Apna Mandi tends to be occupied by middle men. The farmer struggles to get a premium spot to sell his produce.

Sunil G. Awari: Challenges of Creating Sustainable Agri-Retail Supply Chains and some Solutions

Namdhari's Fresh is a Bangalore based company engaged in the production, retailing, and export of fresh fruits and vegetables. We are also engaged in the production and worldwide marketing of hybrid vegetable and flower seeds. We operate through three arms -- exports, retail, and now we have a sizeable presence in institutional supplies. We have locations all over India and we are now expanding into various parts of world.

I will first share my thoughts on the challenges of creating sustainable agricultural and retail supply chains (Table 1).

The most basic problem with our supply chain sustainability system is that we are leaving out the most important stakeholder, the farmer. And the backbone of this issue is a problem with our fragmented land holdings. Unless we have a sizeable plot of land, we cannot grow anything in large quantities. But at Namdhari's, we have been successful in motivating farmers to form a group and grow a common crop. That is where our success lies and we are one of a handful of companies that are making sizeable profits in the agricultural business.

Second important issue is restricted corporate farming. This point is linked to the first point of fragmented land holdings. Government must allow the corporates to purchase or lease sizeable acreage of land. It may not be on ownership, but through government mediated solution, on long term lease. Some states are easing out the restriction for large land acquirement, which will help.

The next issue is a lack of extension activities. We now have very good institutes -- agricultural institutes, management institutes, and research institutes -- but our knowledge is not percolating down to the actual user. There is a gap. So the extension activities need to be made practical rather than theoretical or limited to conferences.

There is no legal protection for serious contract farming organisations. The solution to the small holding, which is a constitutional weakness of our agricultural system, is contract farming. It would be a good solution without hampering the interests of farmers. But on days when the price of the produce rises sharply, the sourcing farmers sell their produce in the mandi instead of their contract farming agency. In this scenario we are helpless. So we need a democratic solution for protecting the interests of the contract farming agency. The private companies try to sort out their problem themselves, but the government must play a greater role.

Retail giants must make systematic efforts to develop the backend. We have several retail giants entering India. But other than buying the farmer's produce, they are not investing in farmer development, or in farmer training programmes. Culturally, we look to recognise problems but we do not seek solutions. We have several agricultural research institutes in India. But their practical contribution to the agricultural community does not seem to be up to the mark. For example, for the past five years, our pomegranates have been out of the international market due to some bacterial disease. We would benefit considerably if our scientists would find alternate, practical solutions to this problem.

Next I would like to take you through the probable solutions for the problems mentioned earlier (Table 2).

We must develop crop zones based on the strengths and weaknesses, and have defined production targets. Even for infrastructure development, we need to have a specific crop zone. Different vegetable crops need different temperature zones. If we ensure that a particular district grows a particular crop, then cold storages can be set up to cater to that crop. It is important to define products and targets. If we plan that this state is going to produce 10,000 tonnes of tomato, 15,000 tonnes of onions, and so on, and give these programmes to the farmers, we can address the sustainability issue. Although this is a difficult task, it is not impossible.

We must develop post-harvest infrastructure, focusing on logistical aspects. I believe that the basic constraint for development of quality agricultural produce in India is not its wastage; it is the utilisation of waste material. We have a market for everything; even blemished vegetables are placed on the shelves and we try to sell those. If I produce ten tonnes of tomato, and two tonnes have problems of bruises or softening, I know I can send it to the wholesale market and there will be customers for it. That is where the problem is. Unless this stops we will not be out of our comfort zone. We must stop this by imposing

practical, simple specifications to bring in produce in the market. That might take some time, but that is how Western countries are working.

We need to encourage corporate farming and group farming. Mr. Parashivamurthy has already spoken about protected cultivation in the agricultural field. Prof. Gopal Naik briefly touched on this subject and gave the example of the grapes producers in Maharashtra. The fact is that our grape farmer in Nasik is on par with the Chilean or South African farmer today. They work in groups. Let us start by encouraging farmers to form groups. The government of Karnataka is already doing that.

Investment in farmers' training is important. Farmers in every village must go through a programme and be educated on all aspects of farming including fertilizer usage, chemical residue, precautionary measures, impact of fertilizers on farmers' and consumers' health, and so on. These programmes must be audited for effectiveness.

We need to quantify the contribution of research organisations. Let us have audits of the research institutes dedicated to agricultural development to cover aspects such as -- what varieties they have brought in, how practical are they, what are the problems in the field, have they conducted any surveys for diseases, and so on. Let us take the example of apples. Currently there is a 52% duty on imported apples, to promote locally grown apples. Instead of imposing duty, we must grow the varieties that are grown worldwide. There must be a competition in quality. This is where the contribution of the research institutes is going to be important.

Last but not the least, we need to have vegetable special vehicles connecting to cities. Our national highways are in very good condition. Now we need a network of vegetable special vehicles, systematic vehicle arrangement which would go in the morning to the villages, collect vegetables from there and bring them to a main place. Whenever I attend government forums, I request that all the major trains have one refrigerated bogie to carry vegetables.

Praveen Dwivedi: Agri-Retail supply chain: Challenging the clichés

As a late entrant to the agriculture industry, I have looked at it from the perspective of how things can be changed, and I would like to challenge many of the clichés about this industry.

When we look at the agri-retail supply chain, we get caught up with the word "supply". In this supply chain, we must focus on the consumer rather than the producer. We tend to forget the consumer and his demands.

If it was a freewheeling economy, the produce would be priced at the price at which it is supposed to be sold. The demand and supply of the equation, which determines the economic reality of any business, shows that there is relevance of why a particular commodity is being sold at a particular price at a particular point in time. If the produce is non seasonal and there is a demand for it, then it will obviously fetch the price demanded

because the demand is much greater than the supply. This happens across all commodities, including foreign exchange. However, to echo a former agriculture minister, we want to play the global game in a very restrictive manner. The government's concern about prices is exhibited in knee jerk reactions. That is why global practices, global market development, has not advanced in the agriculture industry.

The Indian consumer is not willing to pay a consistent price, but wants opportunistic pricing; always looking for the least price, and not concerned about the fluctuations in the price. Sunil's first point on the remedial measures talks about creating crop zones. But in my experience, the Tobacco Board of the Government of India that governs the most regulated crop, tobacco, has not been able to regulate it in the last five decades. There are different realities for different industries, different technologies, different practices, and the different wants of the farmers. There are also socio-cultural issues involved. For instance, the price of tobacco, which is an agricultural produce in its own way, fluctuates a lot. But we don't talk about it, because the consumer has an elastic paying ability for cigarettes. Cigarette prices have risen from two rupees to twenty rupees. And I don't think anybody talks about it in the same dimension as we talk about staples such as wheat, rice, potato, onion, tomato, greens and so on.

Some of these issues are very difficult to address and I think we need to have a new lens to examine them. We need to figure out the consumers' wants, how the world economy is moving, and India's role in it. In 2015, the world population is estimated at nine billion. We have a projected growth of 33% in the next thirty years to the global population. The same land will compete for housing, agriculture and everything else. I am told that there are countries which are growing grains today looking at Indian consumption. They understand that India is not going to remain self-reliant in the years to come. These are the issues we must tackle -- wastages, farmer training and so on seem minor in comparison.

I think we need to make the economy completely free. The government should exit from the agriculture field. The subsidies offered by the government are only going to breed more inefficiency in the system. Everything must be stand-alone on a business case right from the farmer, to the seller, to the consumer. And whatever is the right price, the consumer has to pay for that commodity. The most regulated industries in this country, to my knowledge, are aviation and insurance which are both suffering. Organisations in those industries are dying.

Today, imported produce like apples are levied about 50% import tariff and must be approved by the Food Safety and Standards Authority of India (FSSAI). And yet, containers full of imported food are lying at Chennai port and Mumbai port, not getting cleared, because of the lack of clarity on food. Some multinational companies, such as Mars and Lindt, are closing the food operations in this country. So I think we need to make the market into a free market for manufacturers and operators. I am not going to talk about how agriculture has to change. How market has to change is the bigger picture. And if we can address how the market has to change, we will be there in the long haul and we can sustain it.

Some of the clichés like go direct to the farm, eliminate middle men, promote contract farming and corporate farming, have been discussed in the past but have not brought any real changes. When we speak of farm gate prices being forty two paisa per rupee, we do not seem to analyse the value that the agency taking sixty paisa is adding. The price of any fresh produce is determined by the demand and supply equation. It can be sold at a better rate if it can be branded. For example, Bangalore has a gourmet food store where imported tomatoes are sold at two thousand five hundred rupees a kilo. And there are consumers who are buying it. That is not the farm gate price in Holland, but includes the costs of air freight, the middlemen, the importers, the table costs, and so on. So that is the price a consumer is willing to pay because he/she wants the quality, or round the clock availability. And for that, a set of people are working out a price which is consistent through the year so that retail houses can maintain the prices through the year and the consumer, over a period, gets used to it.

We have become a kind of a society where we look at things external to our existence and say the government has to do everything. There is a limit to what the government can do. The only issue is the extent to which the government should do things and the stage at which the government should draw the line.

Waste reduction is a key to capture loss. I think Sunil touched upon it. According to me, there is nothing called waste; there is only value erosion. There is a set of consumers in this country who are willing to purchase the same product at every single price point. The issue is how to capture the price point, and at which level. So there is a customer who will pay two thousand five hundred rupees for a product, to whom you give it at that price, and there is a twenty five rupee customer to whom you give the product at twenty five rupees. That segregation is what is required and not a mass average rate at which you can sell the produce. Direct sourcing from farmers may not result in a price advantage and secure supply, since the farmer is not loyal.

Disintermediation is expected to provide value capture. But we have hugely misunderstood this dimension. Given the organised retail trade's ability to manage costs, their costs are much higher than the cost at which the middlemen are bringing the produce to the consumer. Further, the produce sold in the mandi is fresher than that being sold at the modern retail store or HOPCOMS. So there is a methodology which needs to be deployed on what produce will move through cold chain, what will move through a short term supply chain, what will move through a long term supply chain and in what manner. The concept was misunderstood and everything was stored in cold storage. The consumer was expected to pay a premium for added cost of technology. But the consumer only looks at the least price. The industry has to evolve. We need to figure out what is it that we need to do, and what is it we do not.

There are several cold storage facilities in the country which do not have enough business, and which are not making money in a scenario where we are talking about the shortage of cold storage. We need to figure out what is happening to independent cold storages. I am

told the total number of cold storages in the state is lower than the number of cold storages in the city of Agra. The cold storages in Agra are playing the role of a financier, trader, infrastructure provider, and are working with the farmers. So it is a completely integrated trade, which is what is required to be done by players who want to play the game as it is meant to be played. And they make a lot of money. We have to design systems appropriately rather than just saying let us create the infrastructure and the consumers will start paying.

We have to see what it is that is misaligned. We have depleting farm resources, we are worried about multi storied buildings coming up on agricultural land. Governments want to control agricultural lands while the farmer is more than happy to sell them. That's the reality.

In the case of the fresh supply chain, the distances between the urban centres and the rural growing areas are increasing. So for the people who grow the fresh produce, it is a challenge on how to reach it to the consumption point. And there are costs associated with it.

There is a lack of focus on return on investment for the farmer and the industry. Everybody is trying to be opportunistic. The farmer has to understand that he has to assess his farm by determining his cost of production and set up his price irrespective of the market prices. The moment that happens, which is what the Maharashtra Development Cooperative does, then the industry will view it very differently. And all the opportunistic players will disappear over a period of time.

There has been no improvement in supply chain design – the tendency is to evacuate and not to build the market. Since the produce is “perishable” people tend to dump the product quickly. Modern retail is challenging the wrong end of the market dynamics by centralising the demand and supply locations. Modern retail is struggling. It is constrained for locations, and for consumer's willingness. ITC set up choupals or networks, as well as a hypermarket called Choupal Sagar. It was completely rural. But the farmer is not willing to buy there; the farmer still wants to shop in urban India. The rural Indian today, wants to use the same television, same mobile, same two wheeler, as an urban Indian. We have to understand that aspiration and build infrastructure accordingly.

Domestic markets are seen as less remunerative. One of the problems of the fresh produce industry is that we have decided that a good product must be sold in the international market and that the Indian consumer will not pay for quality, without even checking with the consumer. There is a huge consumption market in this country, and yet we are exporting the best quality produce. We should change that mindset. We need to figure out the model that is cost effective.

Two percent of the fruit and vegetable produced in India is processed – the comparative rate for a country like Thailand is around 38% because they produce separately for the processing industry, and separately for the table variety. This is not the case in India. There have been cases where the low price of tomatoes and the high price of tomato ketchup in

India have been compared. But the cost of supply chain, of branding, and of promotion for the table, has to be taken into account. The ketchup manufacturer is not making a huge profit. Because the Indian consumer is not willing to pay the required price. In India, the tomato content in tomato ketchup is down from about 30% to 21%. That is because the price point has to be maintained; the only alternative the FMCG industry in this country is left with is to reduce the content or reduce the weight. The consumer is aware of this, and is buying it. The regulatory body is also imposing certain restrictions.

We need to build models that transform farmers into entrepreneurs. Agriculture has gone out of fashion. But in cities like Bangalore some people are leaving the IT industry and getting into farming. The irony is that states like Karnataka and Maharashtra, discourage it. These pose restrictions on non-agriculturists acquiring agricultural land. At one level, we want farming and farm produce to grow, the prices to come down, supply to improve, quality to improve, but we are not allowing somebody who understands what is involved and is willing to take the risk as an entrepreneur to enter the field. Instead, we want the person who has no ability to take risks, to continue to be there. We need to allow the farmer to become an entrepreneur and an entrepreneur to become a farmer. It should be a two-way traffic. Good agricultural practices must be taught to the educated masses.

We must use the integrated approach for building the market. The farmer has to be an integral part of the system to create the value chain. He cannot remain as a supplier. Today he is only a supplier and is opportunistic. He must understand why he exists, and what role he can play.

Interplay of resources to distributed model -- the law cannot change the people's affinity towards land ownership. In India, everybody holds on to land. There is so much of unutilised barren land in this country. But, given the prevailing sentiments, the land cannot be easily allotted for other purposes. The paper industry, for instance, tried unsuccessfully to obtain this land to grow bamboo.

It is very important to bring in the rural produce through the hub and spokes model. From the fragmented farm we need to integrate large players and take forward concepts such as food parks. Thirty one food parks are coming across the country and hopefully they will change things. There will be collection centres, they will bring produce to one central location; from there produce can be sorted as fresh produce, or to be processed, and so on, as required.

We should create an appropriate railway supply cold chain structure. Appropriateness of infrastructure or knowing what has to be dealt with in what manner is important.

Multiple channels focus needs to be supported, through measures such as category management. You approach category management organisations as a supplier or as a producer. And they integrate the retail and the producer. That's something I personally believe is required in this country. Let farmers sell to them. They will do the value addition, rating, sorting, packing, and reach the product to the retail shelf for it to have a value. We

need end to end value creation so that the dynamics moves away from opportunistic play into a sharing model, a collaborative model.

We have to approach the supply chain as an end to end journey. We need to take an integrated approach. To begin with you look at what value you are adding at the farm gate. Then, take it to a responsive logistic supply chain and figure out what you can do. We must create and communicate value to farmers and consumers before attempting to capture it – at present we are chasing, capturing and setting value before we even create it. We must leverage evolving 3PL models for integrated logistics. We must build an all-encompassing food eco system and not just a fresh eco system. There has to be full value chain development. Our approach should be fresh-store- and then process, rather than just store and sell. We must build the Made in India brand into a hallmark of quality and keep the price equations lower than the rate of inflation.

Gopal Naik: Thank you all very much for contributing your insights to this discussion.

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Table 1: **Challenges of Creating Sustainable Agricultural and Retail Supply Chains**

• Small land holdings: fragmented agricultural activities
• Restricted corporate farming: land holding
• Lack of extension activities: farmers education & training
• No legal protection to serious contract farming organisations
• No systematic efforts by retail giants to develop back end
• Weak role of agricultural research institutes in the development process

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