

Training programme
on
Supply Chain Management in Agriculture

Reading Material



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CHAPTER - 1

Integrated Agri-supply chain management

Supply chains are principally concerned with the flow of products and information between supply chain member organizations—procurement of materials, transformation of materials into finished products, and distribution of those products to end customers. Today's information-driven, integrated supply chains are enabling organizations to reduce inventory and costs, add product value, extend resources, accelerate time to market, and retain customers.

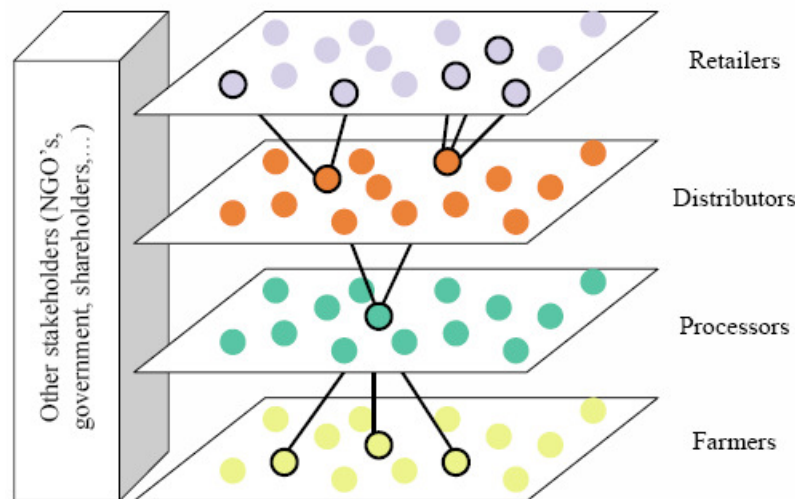
The real measure of supply chain success is how well activities coordinate across the supply chain to create value for consumers, while increasing the profitability of every link in the supply chain. In other words, supply chain management is the integrated process of producing value for the end user or ultimate consumer.

The supply chains of different agricultural commodities in India, however, are fraught with challenges stemming from the inherent problems of the agriculture sector. The agri-supply chain system of the country is determined by different sartorial issues like dominance of small/ marginal farmers, fragmented supply chains, absence of scale economies, low level of processing/value addition, inadequacy of marketing infrastructure etc.

Early processing-based supply chain management success included improved relationships between warehousing and transportation within companies as a result of reduced inventory and better response time to customer requests for products and services. Supply chain management then entered a logistics stage where other functional areas within companies joined forces to incorporate manufacturing, procurement, transportation, distribution, and marketing to effectively compete in the marketplace. This stage was aided by the use of telecommunications, electronic data interface, and other technological advances that made the transfer of information more transparent across the functional areas between companies.

1.1 Food supply chain Networks

A processing-based and organised agri-supply chain functions as a part of a very complex network. Figure 1 depicts a generic supply chain at the organization level within the context of a complete supply-chain network. Each firm is positioned in a network layer and belongs to at least one supply chain, i.e. it usually has multiple (varying) suppliers and customers at the same time and over time.



Schematic diagram of a supply chain from the perspective of the processor (bold flows) within the total FSCN (based on Lazzarini et al. 2001)

Fig- 1: Schematic Diagram of Supply Chain

1.2 The advantages for supply chain members

Individual suppliers, producers and marketers who are associated through a supply chain coordinate their value creating activities with one another and, in the process, create greater value than they can, when they operate independently. Supply chains create synergies in one of three ways:

- i) They expand traditional markets beyond their original boundaries and thus increase sales volume for members;
- ii) They reduce the delivered cost of products below the cost of competing chains and thus increase the gross margin for the working capital committed by members of the chain ;
and
- iii) They target specific market segments with specific products and they differentiate the service, product quality or brand reputation of the products they deliver to these market

segments and thus increase consumer perception of delivered value. In this way, they allow chain members to charge higher prices.

Generally, supply chains increase market contestability both at the producer end and at the consumer ends of the chain. At the consumer end, chains compete primarily through price, differentiated products and services and differentiated terms of sale. At the producer end of the chain, supply chains compete with one another primarily for "producer affiliation" and core vendor commitments.

1.3 Components of an Agri supply chain

Agribusiness, supply chain management (SCM) implies managing the relationships between the businesses responsible for the efficient production and supply of products from the farm level to the consumers to meet consumers' requirements reliably in terms of quantity, quality and price. In practice, this often includes the management of both horizontal and vertical alliances and the relationships and processes between firms .

Agri-supply chains are economic systems which distribute benefits and apportion risks among participants. Thus, supply chains enforce internal mechanisms and develop chain wide incentives for assuring the timely performance of production and delivery commitments. They are linked and interconnected by virtue of shared information and reciprocal scheduling, product quality assurances and transaction volume commitments. Process linkages add value to agricultural products and require individual participants to co-ordinate their activities as a continuous improvement process. Costs incurred in one link in the chain are determined in significant measure by actions taken or not taken at other links in the chain. Extensive pre-planning and co-ordination are required up and down the entire chain to affect key control processes such as forecasting, purchase scheduling, production and processing programming, sales promotion, and new market and product launches etc. Following are the components of an organised agri- supply chain:

1. Procurement or sourcing
2. Logistic management
 - a. Transportation
 - b. Material management
 - c. On the premise of supplying mostly from production not stock

- d. Warehousing
- e. Logistics Network modeling
- 3. Organizational management
 - a. Contracting
 - b. Strategic alliances and partnerships
 - c. Vertical integration
 - i. Long term storage
 - ii. Packaging technology
 - iii. Cold chain management
 - iv. Energy efficient transport
 - v. Quality and safety
- 4. Application of Efficient Consumer Response (ECR) System
 - a. Electronic scanning of price and product at the point of sale
 - b. Streamline the entire distribution chain

1.4 Agri marketing and emergence of coordinated supply chains in India

The agri supply chains in India and their management are now evolving to respond to the new marketing realities thrown by the wave of globalisation and other internal changes like rise in the level of disposable income of consumers, change in the food basket of the consumers towards high value products like fruits, vegetables and animal protein. The new challenges of the agricultural economy of the country have now spurred the government agencies to go in for different legal reforms for enabling and inviting private investment in agricultural marketing infrastructure, removing different entry barriers to promote coordinated supply chain and traceability.

The amended APMR Act, the major agricultural Marketing Act of the country, being implemented by the different states of India, now contains enabling provisions to promote contract farming, direct marketing and setting up of private markets (hitherto banned). These measures will go a long way towards providing economies of scale to the small firms in establishing direct linkage between farmers, and processors/ exporters/ retailers, etc. Thus, the measure will provide both backward and forward linkages to evolve integrated supply chains for different agri produce in the country.

1.5 Marketing channels:

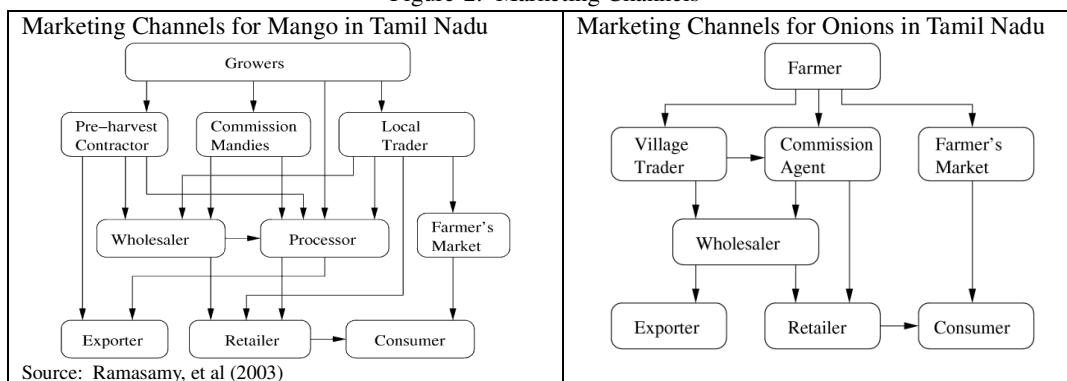
While studying the supply chain-management issues of the agriculture sector, it is worthwhile to analyse the prevalent market channels of some commodities to bring the discussion to perspective.

Marketing channels for fruits and vegetables in India vary considerably by commodity and state, but they are generally very long and fragmented. Figure 4 presents typical marketing channels for mangoes and onions in Tamil Nadu. The majority of domestic fruit and vegetable production is transacted through wholesale markets although depending on the state and commodity; farmers may sell to traders directly at the farm gate, to traders at village markets, or directly to processors, co-ops and others. Some of the the common problems in agri supply chains in India are presented in Table-1 and Figure-2 describes marketing channels of mango and onion, prevalent in Tamil Nadu..

Table-1: Broken Links in Agri Supply Chain in India

Production	Supply Chain	Processing	Marketing
<ul style="list-style-type: none"> • Poor extension • Quality inputs • Low productivity • Deficient and inefficient production management • Non demand linked production • Improper post harvest management resulting in poor quality 	<ul style="list-style-type: none"> • Lack of storage • Poor transportation • High wastages • Multiple intermediaries • Fresh produce transported to mandis in open baskets or gunny bags stacked one on top of the other • Cold chain absent or broken, produce deteriorates rapidly • Food safety is major concern: Hygiene and pesticide MRL not monitored 	<ul style="list-style-type: none"> • Low processing • Lack of quality • Poor returns • Low capacity utilization 	<ul style="list-style-type: none"> • Poor infrastructure • Lack of grading • No linkages • Non-transparency in prices • Long delays from producer to retailer
Each segment working in an isolated manner resulting in multiple losses across the value chain			

Figure-2: Marketing Channels



1.6 Coordinated supply chains

In the last few years there has been an emergence of more coordinated supply chains for fruits and vegetables in India catering to the export market and to the high end domestic market. On the domestic front this trend has primarily been led by the growth of large hypermarkets, supermarkets and other organized retailers in metropolitan centers. For exports, the emergence of dedicated export chains has been prompted by stricter quality and safety standards in certain export markets.

Coordinated supply chains involve structured relationships among producers, traders, processors, and buyers whereby detailed specifications are provided as to what and how much to produce, the time of delivery, quality and safety conditions, and price. These relationships often involve exchanges of information and sometimes assistance with technology and finance. Coordinated supply chains fit well with the logistical requirements of modern food markets, especially those for fresh and processed perishable foods. These chains can be used for process control of safety and quality and are more effective and efficient than control only at the end of the supply chain.

Several companies in India are beginning to invest in integrated supply chain management systems and infrastructure with emphasis on quality and, to a lesser extent, on safety. Different models are emerging including fruit and vegetable retail outlets that directly procure produce from farmers or grower associations through various formal/informal contractual arrangements. Collection-cum-grading centers have been established in rural areas with all produce moving through a central distribution facility having modern infrastructure including cold storage, ripening rooms and controlled atmosphere chambers. Growers are required to follow certain specifications and are often provided with some inputs and technical advice about agronomic and post-harvest practices.

Contract farming for fruits and vegetables is already being practiced in several states and is likely to expand considerably due to legal reforms initiated in India, i.e., implementation of Model APMC Act. Until recently, contract farming was not legally recognized in most states and a legal framework for governing contracting arrangements was missing. Under the APMC Model Act a new chapter on 'contract farming' was added which provides for the registration of contract buyers, the recording of contract farming agreements,

and time-bound dispute resolution mechanisms. It also provides an exemption from the levy of market fees for produce covered by contract farming agreements and provides indemnity to farmers' land to safeguard against the loss of land in the event of a dispute. Contract buyers will now be able to legally purchase commodities through individual purchase contracts or from farmers markets. Provision has also been made in the legislation for direct sale of farm produce to contract buyers from farmers' fields without it being routed through notified markets.

A terminal market for fruits and vegetables has been set up in Bangalore. The market (known as SAFAL) can physically handle up to 1600 metric tons of produce a day. It is linked to some 250 Farmers Associations and 40 Collection Centers that have been established in selected producing areas. The market receives sorted, graded and packaged produce from these associations and centers and this is then auctioned at the market. SAFAL also has forward linkages to a number of retail outlets (Cash and Carry Stores). The market has modern infrastructure, including temperature and humidity controlled storage facilities, and ripening chambers. This calls for the collective action in supply chains.

Initiatives are taken to establish more terminal markets based on modern infrastructure. MTMs would endeavour to integrate farm production with buyers by offering multiple choices to farmers for sale of produce such as electronic auctioning and facility for direct sale to exporter, processor and retail chain network under a single roof. In addition, the market would provide storage infrastructure thus offering the choice to trade at a future date to the participants. It is envisaged to offer a one-stop-solution that provides Logistics support including transport services & cool chain support and facility for storage (including warehouse, cold storage, ripening chamber, storage shed), facility for cleaning, grading, sorting, packaging and palletisation of produce and extension support and advisory to farmers.

The model presents integration of agri supply chains for perishables through MTMs. Presently in the regime of fragmented and inefficient agri supply chains there is no control and command of chain partners on the other following that they are not able to maintain quality of produce in their chain. In order to bring integrated command, source quality

produce by way of organizing farmers in groups and providing them the right technical advice and link farmers to the market, modern terminal market complexes will prove a dent.

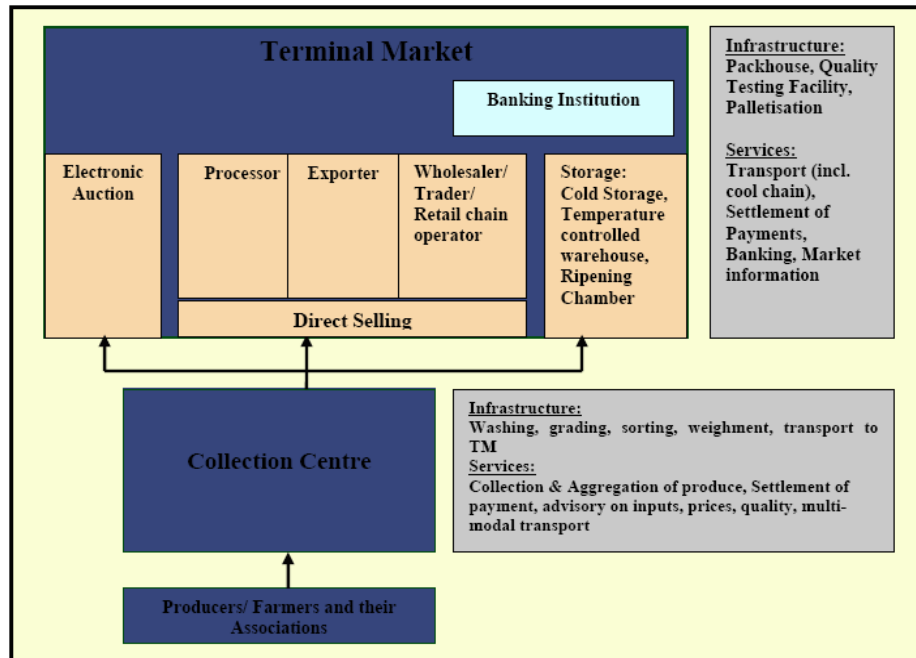


Fig-3: Schematic Diagram of Terminal Market Concept

The role of Collective Action (CA) in agri supply chain arises wherever there are economies of scale in production or in marketing. This includes the role of farmer groups in being better able to ensure traceability. In these chains, the costs for the establishment of traceability are lower for firms and farms with collective action than without it. Similarly, collective action has a rationale if agents in the supply chain have different comparative advantages. Thus, a producer group (with comparative advantage in production) could benefit from collaboration with agents that have expertise in marketing.

With increasing private investment in the food retail sector and impending changes in contract and marketing laws, shorter and more direct supply chains with traceability are expected to become more common. The incidence and spread of coordinated supply chains will be closely connected with the pace and direction of food retail sector modernization within India. Thus far, changes in food retail have been gradual, and considerably slower than observed in many other developing countries.

Supermarket procurement regimes for sourcing of fruits, vegetables, dairy and meat strongly influence the organization of the supply chains. The rising scale of organized retail

in the Asian countries (like Metro Cash & Carry, Tata Chemicals and Field Fresh Foods, Bharti Enterprises, Reliance Fresh in India) is now playing a vital role in organizing farmer production bases and integrating these into the retailers' fresh produce supply chain, thus procurement systems in this segment is changing fast responding to the consumer demand and competition.

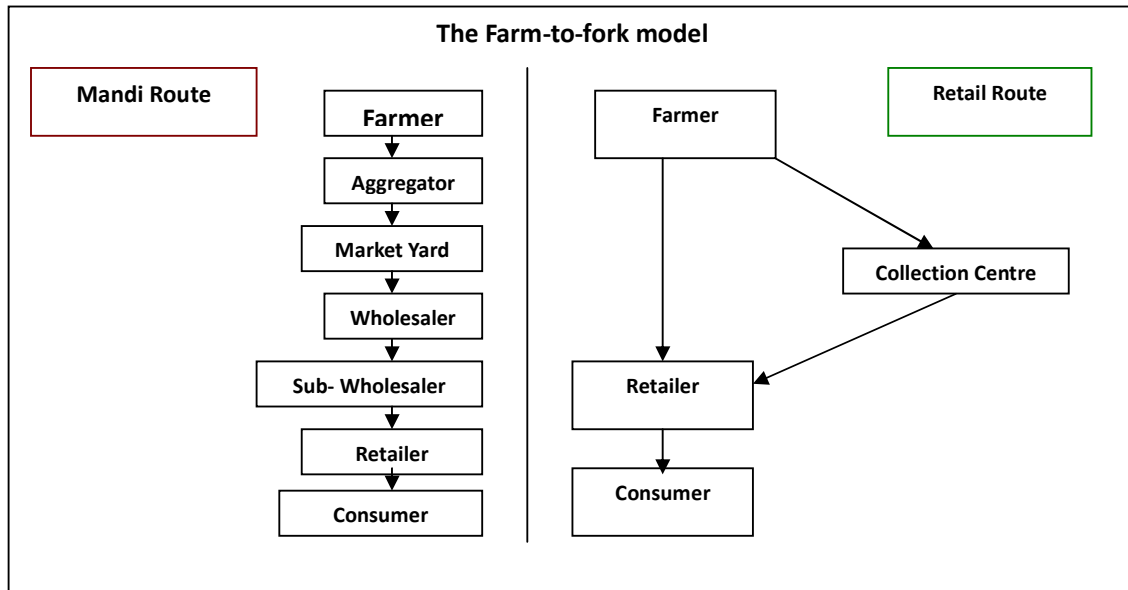


Fig-4: Changing Supply Chain with Entry of Organized Retailing

Besides the presence of retailers in the countryside for farm produce sourcing, now there are also some players; who are helping various retail chains for their sourcing requirements. For instance, **DCM Shriram Consolidated Ltd (DSCL)** is in the process of tying up with them to source fruits and vegetables from farmers and supply to the retail chains. DSCL is already doing this for Future Group's Food Bazaar, south based Subhiksha and RPG's Spencer. The new tie-ups would help the company to operate on economies of scale, and to operate all over the country.

1.7 Case studies of integrated supply chain management

Different models of agri supply chain management have come up across the Asian countries. The integration in the traditional disjointed supply chain has been made possible through different revenue models developed by the organized retailers, exporters, processors through contract farming, etc. The chapter contains some case studies on integrated supply chain in India and other Asian countries.

Case Study-1: Mahagrapes: One of the largest exporters of fresh Grapes (mainly seedless grapes) from India.

Mahagrapes is a partnership firm of sixteen grape growers cooperatives. In keeping with the international trend of fruit growers becoming exporters, the vineyard owners of Maharashtra entered the International market with their own brand, Mahagrapes. It acts as facilitator, quality controller, input supplier as well as service provider to its member societies. The hard working grape growers in areas of Sangli, Solapur, Pune & Nasik regions of Maharashtra have formed 16 co-operative societies with a membership of almost 2500 farmers.

Mahagrapes was born on 19th Jan 1991 with the valuable support of:

- 1) National Co-operative. Development Corporation (NCDC), New Delhi.
- 2) Government of Maharashtra
 - a. Department of Co-operation
 - b. Maharashtra State Agriculture Marketing Board, Pune.
- 3) Agricultural & Processed Food Products Export Development Authority (APEDA), New Delhi.
- 4) National Horticulture Board (NHB), New Delhi.

Objectives of Mahagrapes:

1. Upliftment of farmers' community.
2. Growth of Co-operative Movement.
3. Encourage and develop agricultural export.
4. Maximize Foreign Exchange earnings.
5. Update the farmers on the latest technology in farming
6. Acceptance of global challenge with a commitment to quality

Functions:

1. To source and develop worldwide markets.
2. To provide Quality control in post harvest activities.
3. Provide extension services to members of co-ops for production of export quality grapes.
4. Supply and supervise branded packaging.
5. Provide logistical support

6. Provide advance payment to farmers for their produce.
7. Obtain best price for produce.
8. Pass on the benefits to the Co-ops.

To reach individual farmers was a difficult task to which formation of co-operative societies has provided the answer. Each co-operative society is equipped with a pre-cooling & cold store facility; the technology imported from California, which has proved to be an essential export tool. We provide societies with day-to-day international market price and supply them with all the packaging materials required for exports.

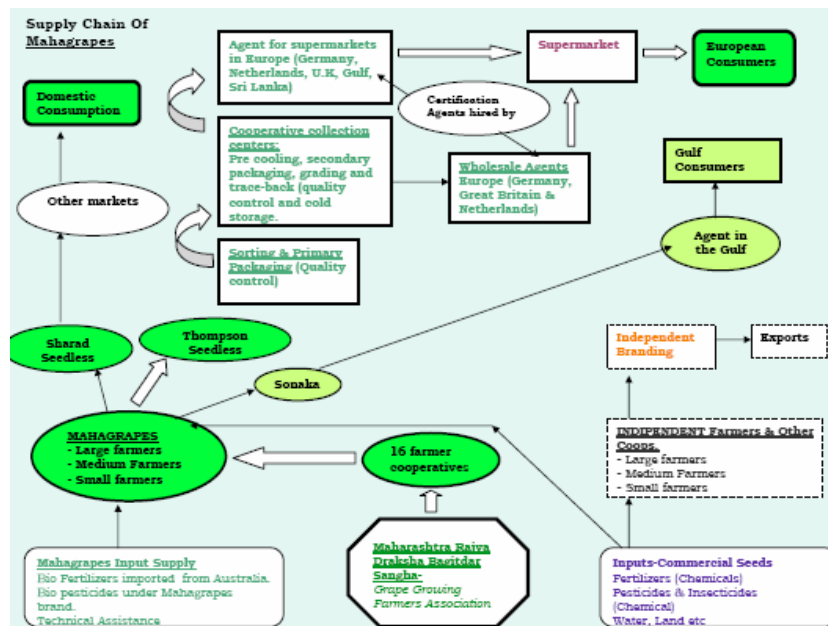


Fig-4 Mahagrapes Supply Chain

Why it is a success story?

- Exporting to European markets with almost nil rejection for past sixteen years. It is a successful business entity. It has shown acumen as well as agility.
- Mahagrapes has linked grape growers to international markets and has compressed the supply chain. In doing so it has assumed barometric role.
- It is pioneer in bringing pre-cooling technology and array of post harvest operations. All these operations have pulled the farmers upwards in supply chain.
- It is a story of successful public private partnership. The government helped but only as a facilitator. Most importantly it was a time bound help.
- It is a success because once the Mahagrapes showed the way, the export scenario changed. Today it is crowded with many players including corporate houses. There is

extensive network of financial institutes as well as infrastructure facilities such as labs, cold storage facilities. The complexion of Indian horticulture export has become more professional.

Case Study-4: Integration of Supply Chain in Karbi Anglong district of Assam: A case study of linking tribal farmers with the market

Karbi Anglong is a remote district of Assam, which is a leading producer of high quality Ginger. It is a hill district and inhabited by tribes due to which access to market, infrastructure and finance have been a major obstacle for farmers for market access. There was high incidence of post harvest losses of ginger due to lack of transportation and storage facilities. The small and marginal farmers did not have economies of scale to opt for proper grading, sorting, packaging and transportation etc. The producers had to often resort to distress sale due to lack of market channel, market support and market information. In spite of high quality of the produce and high demand for the product in industry the price that the farmer was getting was not commensurate with the quality. The share of farmer was a negligible fraction of consumer rupee.

Innovation in marketing by district administration:

The district collector of Karbi Anglong brought innovating marketing in 2007 by organizing the growers as federation and facilitating the producers to gain better advantage. *Ginger growers of the co-operative Marketing Federation limited (GINFED)*, a pilot initiative under district administration of Karbi Anglong district of Assam exemplifies the efforts of linking farmers to the market by providing logistic and market support to strengthen supply chain. The integration of supply chain is being achieved by providing following support.

Organizing co-operative federation

Karbi Anglong produces 12,000 metric tones of ginger per annum, which is valued at about Rs 10 crores. GINFED started in 2007 under Rashtriya Sama Vikash Yojana (RSVY) has association of 3,500 small and marginal tribal ginger growers. It aims to bring all the ginger growers under one umbrella and give better returns to the producers.

Logistic support and agreement with NF Railway

Transportation of Ginger is a major bottleneck due to hilly and remote location. It used to transport by road from Diphu to Guwahati and from Guwahati to Delhi, which escalated transportation cost. The transportation cost of Ginger by road from Diphu to Azadpur mandi in Delhi is between Rs 3 to Rs 5 per Kg.

GINFED has now an agreement between North East frontier railways and Karbi Anglong district administration. The Lumding railway division of NF Railway will attach a wagon to an express train to transport ginger from different location. The transport cost will be between 20 to 30 paisa per kg, when sent by train. With this agreement the transport cost of supplying Ginger to Delhi gets reduced by 90%.

Storage and post harvest handling

Apart from transportation GINFED will also provide post harvest handling facilities with storehouse, packaging, cleaning and grading. With Storage facilities in place, the producers will be able to store the produce and taking marketing decisions. The post harvest facilities such as cleaning, grading and packaging will help producers in supplying ginger to international market. The GINFED is also registered with SGS Sweden for getting organic certification with the help of NABARD.

Besides this the Federation has also fixed a uniform price of Rs 8 per kg for procuring Ginger. This has brought relief to producer who initially suffered from lack of marketing avenues, realization of proper price and distress sale. Before the GINFED intervention the price at which farmer used to sell was between Rs 4-5 per kg. The assured price support and assured by Ginfed has lead to price discovery

Financial support

Ginger farmers are provided with a special credit –cum- debit card to avail bank loans. The Ginger card (G-card) holder can obtain loan of Rs 10,000 for crop production from State bank of India. The system is being seen as a major boost to the marginal tribal farmers of the hill district.

Forward linkages

The solution to logistic bottleneck and access to value added services will now help to supply good quality ginger to ITC Ltd, Rayfam, New Delhi, Sresta Bio products, Hyderabad, NERAMAC and NAFED. These buying agencies will now make efforts for further integration of the supply chain and cost reduction in the procurement process in bringing about both market and pricing efficiencies in the market channel. The integration of logistic and business services will help in delivering benefits to all the players of supply chain.

Conclusion:

As the Supply Chain involves a number of players, the extent of integration of services depends on the degree of trust and information sharing amongst the players. It is often observed that the big players in their efforts to make vertical/horizontal integration of different activities end up gobbling up the weak ones. What in fact is called for is strengthening of the system and process, so that requisite synergies evolve to give benefits to all the partners.

In order to shore up the emergence of professionally managed agri-supply management of different agricultural produce, the Government should play its facilitating role to its hilt. Some of the major issues that need to be focused in the public domain are:

1. Focus should be laid on free play of demand and supply forces in the market. This has to be enabled by removing different entry barriers, having a proper market information system, promoting grading and standardization, taking care of quality and safety issues, putting up a strong system of risk management and price formation mechanism.
2. Different legal restrictions inhibiting growth of competitive environment should be dismantled and replaced by a facilitating legal environment.
3. Infrastructure constraint is Achilles heel of marketing system in India. Since it is difficult to arrange sufficient funds from the public exchequer for the development of infrastructure facilities, the need of the hour is to explore different Public Private Partnership models.
4. The extension mechanism of the country is production oriented relegating the marketing aspects to the backburners. It is time a proper marketing system is in place for

disseminating information on what to produce, when to sale and where to sell etc and on packaging, transportation, grading, standardization .

Within broad framework of a conducive environment provided by Government side, the private sector should come up in a pro-active manner to invest in agriculture sector. In no way, they should be discouraged by the teething troubles as entrepreneurs in this virgin sector in India. The managerial efficiencies brought about by the private sector to the agricultural economy of the country will go along way towards ensuring optimum utilisation of resources, thereby ensuring sustainable growth for the sector.

Chapter -2

Agricultural marketing scenario in India

Any discussion on agri-supply chain management is not complete without covering the agricultural marketing scenario of the country. The chapter presents a broad scenario of the agricultural marketing system of the country, having a bearing on supply chain management issues.

It goes without saying that marketing and production of agricultural produce are inextricably intertwined with each other. In the post WTO regime, an effective agricultural marketing system through cost effective supply chain management, is the key driver of the agricultural economy of a country. An effective marketing system aims at ensuring remunerative prices to the producers at cost effective marketing costs and smooth supply of commodities to consumers at reasonable prices. In order to protect the interests of the various stakeholders in the supply chains of agricultural commodities within the agricultural marketing system of the country, a number of governmental interventions have been introduced from time to time. However, the present agricultural marketing system of the country leaves much to be desired. There are many imperfections in the marketing system for agricultural commodities. Some reform measures by the government have already been initiated to address these issues and some are in the pipeline.

2.1 Characteristics of Traditional Agricultural Marketing System

The problems of agricultural marketing have received the attention of the government for a long time. As early as in 1928, the Royal Commission on Agriculture had pointed out that the then existing system did not meet the requirements of an ideal marketing mechanism. Some of the important characteristics of the traditional marketing system for agricultural commodities have been discussed below: Many of these still exist, though efforts are under way to improve them.

2.2 Heavy Village Sales of Agricultural Commodities

A majority of farmers in India sell a large part of their produce in villages resulting in low returns for their produce. There is a difference in the price prevailing at different levels of marketing, i.e., the village, the primary wholesale market, the secondary wholesale, and retail levels. The extent of village sales varies from area to area, commodity to commodity, and also with the status of the farmer. The village sale is 20 to 60 percent in food-grains, 35 to 80 percent in cash crops and 80

to 90 percent in perishable commodities. This practice is very common even now. The factors responsible for village sales are:

- a) Farmers are indebted to village moneylenders, traders or landlords. They are often forced either to enter into advanced sale contracts or sell the produce to them at low prices.
- b) Many villages are still not connected by roads. Adequate transport means are not available even in villages connected by roads. It is difficult to carry the produce in bullock or camel carts to markets, which are often situated at long distances.
- c) There is only a small quantity of marketable surplus with a majority of the farmers because of the small size of holdings.
- d) Farmers are hard-pressed for money to meet their social and other obligations, and are often forced to sell their produce right in the villages.
- e) Most of the perishable products need to be marketed in the villages because of their low “keeping” quality and the non-availability of quick transport means.
- f)
- g) Many farmers disliked city markets mainly because of their lack of knowledge about prevailing market practices, the possibility of theft or robbery in transit and problems faced by them for selling their produce in city markets.
- h) The information on the prices prevailing in the nearby primary and secondary wholesale markets is not readily available to the farmers.

2.3 Post-Harvest Immediate Sales by Farmers

A majority of the cultivators tend to sell their produce immediately after the harvest at low prices prevailing at that time. Because of substantial supplies, Indian markets are glutted in the post-harvest season. Traders often take advantage of this situation. About 60 to 80 percent of the food grains are still marketed in the first quarter of the harvest season.

Besides the above, the agricultural supply chain management system of the country suffers from the following limitations.

- (i) Inadequacy of Institutional Marketing Infrastructure and Lack of Producers' Organizations
- (ii) Multiplicity of Market Charges
- (iii) Existence of Malpractices in the marketing system
- (iv) Lack of Reliable and up-to-date Market Information

- (v) Low Marketable surplus of a Large Variety of Products
- (vi) Absence of grading and Standardization of Produce
- (vii) Absence of Quick Transport Means
- (viii) Oligopolistic nature of market due unhealthy unionisation of traders and market functionaries.

2.4 State Marketing Departments

Marketing Departments were set up in the States as counterparts of the Central Marketing Department. The structure of the State Departments varies from State to State, and their status ranges from that of a full-fledged department to a cell under the Agriculture Department. However, all the States now have a marketing department/cell to look after the marketing problems of farmers.

With increasing role of agricultural marketing in the economic development of the state and the increasing activity of market regulation, State Agricultural Marketing Boards were set up in States and Union Territories. These State Agricultural Marketing Boards look after the regulation of markets and bring about an effective level of coordination in the functioning of the regulated markets at the State level. The market regulation scheme received momentum after the establishment of State Agricultural Marketing Boards in the State. In some states Agricultural Marketing Departments were merged with boards. However, National Commission on Agriculture in 1976 again recommended establishment of separate Directorate of Agricultural Marketing in every state.

2.5 Regulation of Agricultural Marketing

The features like high marketing cost, unauthorized deductions and prevalence of various malpractices prompted regulation of agricultural marketing in different states of the country. Establishment of regulated markets has been able to overcome the problems of traditional marketing system to a great extent. However, these problems still persist in the case of village sales.

Definition of Regulated Market:

A regulated market aims at ensuring correct weighing of produce, prompt payment to the farmers and avoidance of exploitation of farmers by middlemen. Regulated market is one that aims at the elimination of the unhealthy and unscrupulous practices, reducing marketing costs, and providing facilities to the producer-seller in the market. A legislative measure designed to regulate marketing of agriculture produce basically focuses on establishment of regulated markets.

2.6 Objectives of Regulated Marketing:

- a) To prevent exploitation of farmers by helping them overcome the handicaps in the marketing of their produce.
- b) To make the marketing system effective and efficient so that farmers may get remunerative prices for their produce and the goods are made available to consumers at reasonable cost.
- c) To provide incentive prices to farmers for inducing them to increase the production both in terms of quantity and quality.
- d) To promote an orderly marketing of agricultural produce by improving the infrastructure facilities.

2.7 History of Market Regulation

The need for regulation of markets arose from the anxiety of the British rulers to make available supplies of pure cotton at reasonable prices to the textile mills in Manchester. The first regulated Karanjia Cotton Market was established as early as in 1886 under Hyderabad Residency Order. The first legislation was the Berar Cotton and Grain Market Act of 1897. The 1897 Act became Model Act for legislation in other parts of the country. The then Bombay Government was first to enact Cotton Market Act in 1927. This was the first law in the country that attempted to regulate markets with a view to evolving fair market practices. In order to overcome the problems of agricultural marketing in India, the Royal Commission on Agriculture in 1928 and Central Banking Enquiry Committee in 1931 recommended establishment of Directorate of Marketing and Inspection under the Ministry of Food and Agriculture.

Progress of Regulated Markets in India

Year ending	Number of Regulated Markets	Regulated Markets as percent of Wholesale Assembling Markets
March 1951	236	3.23
March 1956	470	6.44
March 1961	715	9.80
March 1966	1012	13.87
March 1976	3528	48.37
March 1976	4446	60.96
March 1986	5766	79.06
March 1996	6968	95.54
March 2001	7161	98.19
March 2011	7190	--

2.8 Reforms

The main Act for market regulation, “Agricultural Produce Market Regulation Act” is implemented by the State Governments. A network of more than 7100 regulated markets & about 28000 Rural Primary Markets services the marketing system of the country; and about 15% of which are also regulated. The objectives of market regulation initially were to ensure correct weighment, prompt payment to the farmers for their produce and to avoid their exploitation at the hands of middlemen. However, the markets originally meant for protecting the farmers from the clutches of the exploitation by middlemen ended up inhibiting the free play of market forces, pushing the interests of the farmers to the backburner.

Under the APMC Regulation, no exporter or processor could buy directly from the farmers, thereby discouraging processing and export of agri-products. Only State Govt. could set up markets, thereby preventing the private sector from setting up markets and investing in marketing infrastructure. The Inter Ministerial Task Force, set up by the Govt. of India in 2002, made an assessment of investment gap of Rs.12,400 crore by the year 2012 in agricultural marketing infrastructure.

The increasing focus on liberalization, privatisation and globalisation is both a challenge and an opportunity for our farmers. However, in order to enable our farmers to reap the external opportunities, effective internal reforms in the agricultural marketing system of the country are inescapable.

2.9 Regulatory Reforms undertaken

Since 2003, Govt. of India has initiated a number of reforms in Agricultural Marketing, while some others are in the pipeline. As a major initiative, the Govt. prepared a Model Act called Agricultural Produce Marketing (Regulation & Development) Act, 2003. All the States/UTs have agreed to amend their respective State APMR Acts in the line of the Model Act to bring about requisite reforms in the sector. The Salient features of the Model Act are setting up markets in the private/co-op sector, rationalization of market fees, promotion of contract farming, direct marketing and grading and standardization, including setting up of a Grading and Standardization Bureau in each State/U.T. The states have amended their Acts in respect of three aspects, i.e. contract farming, direct marketing, setting up of private markets only.

Agriculture being a State subject, the States have got to play a proactive role to adopt the desired reforms and push the frontiers of the agricultural marketing system of the country to the next level of excellence. It is time the States should go beyond the three areas of reforms and should adopt other areas of reforms such as setting up of Bureau of Standards and Grading at State level, promotion of marketing extension and setting up of responsive market information system etc. These reforms would go a long way towards attracting private investment to the sector, putting in place an integrated supply chain management system and promoting processing.

As regards other reforms, the Government of India has taken up the following measures:

- A warehouse Development and Regulation Authority has been set up. This is entrusted with the task of negotiable warehouse receipt in the agriculture sector. This will go a long way towards saving the farmers from distress sale of their produce
- A Food Safety Regulatory Authority has been set up to look after the food safety and quality issues.
- Strengthening of the Forward Markets Commission through amendment of the FCR Act is in the pipeline.
- Launching of the infrastructure scheme (AIGS Scheme) and the Rural Godown Scheme has gone a long way towards attracting private investment to agricultural marketing sector.

- Market Research Information Scheme of Government of India has been successful in disseminating price and arrival related information from almost all the wholesale markets of the country.
- The terminal market scheme of the government has the potential to promote setting up of a chain of Hub and Spoke model of markets through the country in PPP mode.

Chapter - 3

Supply Chain Management in Horticulture

We discussed some case studies of organised supply chains of some horticultural commodities in the first chapter. However, there is a need to make an in depth analysis of the issues regarding supply chain management of horticultural produce in India. The chapter covers an all India scenario of horticulture sector, followed by a case study of supply chain management issues prevailing in A.P., as the scenario is, more or less, same through the country.

3.1 Horticulture production in the National context

India is the fruit and vegetable basket of the world. It grows a variety of fruits and vegetables and has huge production of both fruits and vegetables. India is the second largest producer of both fruits and vegetables in the world after China. In fruits, India is the largest producer of banana, mango and papaya, sixth largest producer of pineapple and seventh largest producer of apple in the world. In vegetables, it is the largest producer of okra, second largest of producer of brinjal, cabbage, cauliflower, onion and potato and third largest producer of tomato in the world. The production and productivity of fruits and vegetables in India for the last three years is given the adjacent chart.

The vast production base of horticultural produce offers India tremendous opportunities for export. During 2012-13, India exported fruits and vegetables worth Rs.5730.85 crores which comprised fruits worth Rs.2467.40 crore and vegetables worth Rs. 3263.45 crore. Mangoes, Walnuts, Grapes, Bananas, Pomegranates account for larger portion of fruits exported from the country while Onions, Okra, Bitter Gourd, Green Chilles, Mushrooms and Potatoes contribute largely to the vegetable export basket.

The major destinations for Indian fruits and vegetables are UAE, Bangladesh, Malaysia, UK, Netherland, Pakistan, Saudi Arabia, Sri Lanka and Nepal. Though India's share in the global market is still nearly 1% only, there is increasing acceptance of horticulture produce from the country. This has occurred due to concurrent developments in the areas of state-of-the-art cold chain infrastructure and quality assurance measures. Apart from large investment pumped in by the private sector, public sector has also taken initiatives and with APEDA's assistance several Centres for Perishable Cargoes and integrated post harvest handling facilities have been set up

in the country. Capacity building initiatives at the farmers, processors and exporters' levels has also contributed towards this effort.

3.2 Domestic consumption and exports

Fruit and Vegetable (both fresh and processed) based products constitute close to 17% of the food and groceries consumption of the Indian households. Consumers in India are used to buying fruits and vegetables in the primary form and process the same at their homes. Households spend time in cleaning, sorting and cutting, before cooking food.

Close to 80% of the fruits and vegetable are consumed in primary form with little value addition. In case of tertiary products, confectionery products and potato chips have a major share. Consumer spending on categories such as canned food, jams, pickles, and other ready to eat processed products is still at a low level in India, thereby showing high potential for growth. An opportunity exists for players to offer tertiary processed products, which can substitute the home, based processing — such as soups, ready-to-eat meals, and canned food amongst others.

3.3 Horticulture – Andhra Pradesh- a case study:

The following is a case study of the horticulture scenario and supply chain management issues of horticultural commodities of Andhra Pradesh, as it has the highest production in respect of some of the country's horticulture crops, due to its varied climatic conditions such as tropical, sub-tropical and warm temperate zones. In 2008-09, Andhra Pradesh produced about 11.4 million mt of fruits, which is highest among all states in India, and comprising of 19% of the total production of fruits in India. Andhra Pradesh ranks second in area of cultivation of fruits among all Indian states. It ranks ninth in production of total vegetables produces about 5% of the total vegetable production in the country. It also ranks first in production and second in area under major spices and contributes about 29.5% of the country's total production of spices. The state is the leading producer of some of the spices such as chillies, turmeric, tamarind ginger, coriander, etc. Crop wise, Andhra Pradesh ranks first in production of citrus, papaya and spices; second in mango and tomato; third in pomegranate, fourth in banana, grape and okra in the country.

The production of fruits in Andhra Pradesh increased from 6.2 million mt in 2001-02 to 12.2 million mt in 2007-08 before dipping to 11.4 million mt in 2008-09 (as shown in the graph). Vegetable production in the state has increased from 2.6 million MT to 5.3 million mt in 2008-09 as shown in the adjacent figure.

The average productivity of fruits, vegetables and spices in the state is 12.2 MT/Ha, 16.2 MT/Ha and 0.99 MT/Ha respectively. The average productivity is comparable to national average as shown in the graph. The average productivity of fruits (12.2 MT/Ha) and spices (0.99 MT/Ha) in the state are higher than the national average (11.2 MT/Ha for fruits and 0.95 MT/Ha for spices), whereas for vegetable it is close to the national average (16.2 MT/Ha). Crop wise major production districts are summarized in the table below:

Crop	Districts
Lemon/ Sweet lime	Nellore, Nalgonda
Banana	East Godavari, West Godavari, Anantapur, Kadapa
Mango	Krishna, Chittoor, Khammam, Adilabad
Papaya	Anantapur, Kadapa
Tomato	Chittoor, Kurnool, Adilabad, Ranga Reddy
Chillies	Guntur, Khammam and Warangal
Turmeric	Karimnagar, Nizamabad
Other Vegetables	Ranga Reddy, Medak, Chittoor, Kurnool

3.4 Status of Horticultural products processing - Andhra Pradesh

Horticultural products processing in Andhra Pradesh is better in the state compared to other states in the country. However, it is nowhere close to the potential for processing of fruits and vegetables.

As per Food Products Order statistics, 2.35 lakh tons of fruit and vegetable products valued at Rs. 821 crores were manufactured during the year 2007. This constitutes about 18% of the total fruit and vegetable product manufactured in India. In terms of the volume of fruit and vegetable processed in the state, Andhra Pradesh comes first among all the states of India followed by Tamil Nadu and Maharashtra. However, in terms of value of processed fruits and vegetables the state ranks second behind Maharashtra.

As on 01st January 2009, there are 296 Fruit Product Order (FPO) licensed fruit and vegetable products manufacturing units in the state. There are 117 large-scale units, 37 small scale units, 44 cottage scale and 54 home scale units in the state. Apart from these, there are

several non-licensed small-scale industries in the unorganised sector that are involved in fruit and vegetable product manufacturing. While, the state has produced over 17 million tonnes of fruits and vegetables in 2008-09, only 2.35 lakh tons have been processed by registered processors. Assuming that the unorganised sector is twice the organized sector, the state still processed only 2.76% of the total fruits and vegetables produced in the country.

The main fruit and vegetable-processing cluster in the state is in Chittoor district, which primarily consists of mango pulping units. There are about 65 units operating in the cluster with about 50-55 units involved in canning of mango pulp and about 15 units having aseptic packaging facilities. Details of the Chittoor cluster have been presented separately. There are 2 IQF facilities in the cluster as well, which process different vegetables for export. Apart from mango, many of the units also process other fruits such as guava, papaya, tomato, etc., although in less volume. Apart from the mango-pulping cluster in Chittoor, there is a prominent mango jelly cluster in East Godavari and Vijayanagaram districts. There are an estimated 800 mango jelly units in East Godavari, which are mostly tiny units in unorganised sector. As per an estimate the combined processing happening in the cluster is about 0.12 lakh metric tons per annum.

There are about 58 major registered units in processing and production of chilli powder. A majority of these units are located in Guntur, Warangal and Hyderabad. There are about 40 registered turmeric-processing units located mostly in Nizamabad and Medak districts of the state. Rest of the horticultural product processing units are scattered across the state.

3.5 Supply chain – Horticulture crops in A.P

The Supply chain for fruits, vegetable and spices in the state consist of multiple intermediaries and handling, which sometimes leads to high physical wastage and/or value loss of the produce. Although the supply chains may vary from produce to produce but the main players in most of the horticultural produce supply chain are farmer, post-harvest contractor/aggregator, commission agent, wholesaler, retailer and final consumer. Supply and value chains of some of the major crops are given below for illustration.

3.6 Supply chain of Banana:

When the fruits are ready for harvesting, the farmers visit the Banana Supplying Company or Commission agent and requests for the price the day. The farmer, then requests the commission agent to visit the farm and inspect the quality of the fruits. The commission agent in turn sends the pre-harvest contractor in the village/block of the farmer to visit the

farm and report the quality of the fruit. This chain of activity can start with the farmer requesting the pre-harvest contractor in his village to visit his farm and who in turn contacts the commission agent for price and requirement for the day.

The commission agent is in contact with the wholesalers in the consumption markets who place the orders depending on demand in their markets. The commission agent on getting a confirmed order from the wholesaler, in turn instructs his pre harvest contractor to visit the farm by matching the supply (quality and quantity of produce) with demand and arrange for harvesting. The commission charges of the commission agent vary from region to region and market to market. The commission agent also charges some service charges to the buyer. The service charges are independent of the prevailing price in the market. Harvesting cost, transportation to the main road for loading into the vehicle, weighing charges, pre-harvest contractor expenses are borne by the farmer. There are no deductions of weight in these markets for the weight of the stalk (pedicel).

3.7 Supply chain of Chillies in Guntur

The various players involved in the supply chain are farmers, commission agents, wholesalers, processors and retailers. The farmer harvests, dries the chillies and brings the produce to the APMC mandi. In the mandi, the produce is sold in open auction. Firstly a model auction is conducted. Purchase and sale of chillies usually commences at 7:00 AM. The arrival register records the arrival of chillies in the market yard. The commission agents arrange the stock in their shops in grower wise lots for sale. Traders/wholesalers purchase chillies in an open auction after inspecting the lot on quality parameters. Though the method of sale is open auction, it is practiced to a limited extent and the sale and purchase is generally carried out by mutual negotiation. Multiple varieties of chillies is reported as a practical constraint for auction system to be practiced.

At present the commission agents charges 2.5 % as commission to the farmers. However, depending on various other factors including credit provided by the commission agent to the producer, the commission ranges from 2 % to 8 %. Additional handling charges of Rs 10 to 20 per bag are also levied. The payment is made on the 13th day from the sale of produce, failing which the commission agent pays an interest to the seller at the rate of 24 % per annum. Interestingly, in spite of the high production, the value addition is limited. Trade estimates that about 70 per cent of the chillies are sold as dried un-ground red chillies, about 20-25 per cent as ground chillies powder and in only about 5-7 per cent of the crop; value addition (as processing) is taking place.

Processing of chillies is generally done at processors level to produce different products. The dried chillies for commercial purpose fall into three categories (a) Highly pungent Chillies (b) Moderately to mildly pungent Chillies (c) Paprika, which may be sweet or mildly pungent. All three types are also extracted with solvents to prepare oleoresins, and blends of ground chillies and capsicums.

3.8 Supply chain for Mango in Chittoor Mango processing cluster

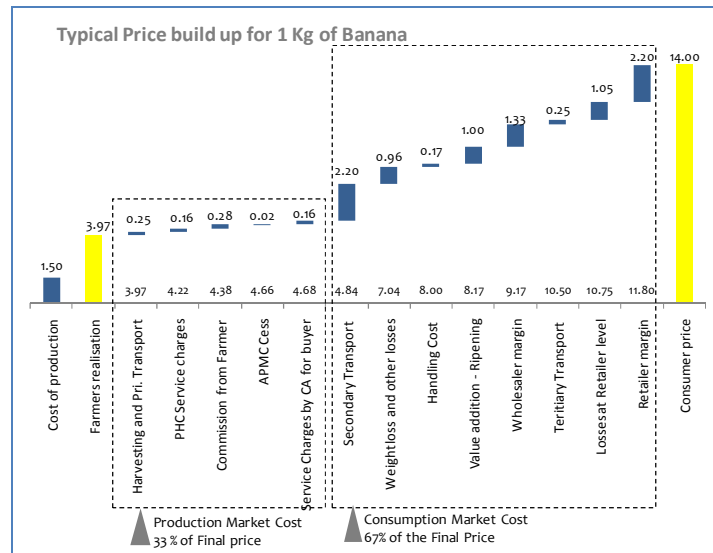
Majority of the farmers are selling their produce to the commission agents operating in nearby APMC market yards/ mandis. Majority of processors purchase the produce either from the commission agents or from the local mandi. Some processors buy directly from large farmers. However, as per trade sources, direct procurement from farmers accounts for less than 10% of the total procurement.

After processing pulp and concentrate are supplied to secondary processors of juice, squash, jam and jelly, confectionery and ice cream making units for value addition. The table varieties are supplied by the traders/commission agents to major consumption markets at Bangalore, Chennai, Kolkata and Hyderabad and are further distributed by retailers to end consumers. Few processors export the pulp directly; otherwise exports are through export houses/ export firms.

3.9 Value chain – Some Horticulture crops

Value chain of Banana

A typical cost build up for one kg of banana is indicated in Figure.



As shown in the illustration above, in case of banana farmer's share in the final rupee spent by the consumer is low at 28%. However, there is high loss in the value chain due to high perishable nature of the produce and the cost of transportation is also high. The ripening cost is also high although the facilities are conventional in nature leading to higher wastage. As there is negligible cold chain post-harvest infrastructure available in the state, by the time the produce reaches the retail level, wastages become very high leading to almost a loss of rupee per kg of banana. With modern ripening facilities and cold chain infrastructure, the present losses can be reduced to a great extent and value realization at each level of the value chain can be increased.

3.10 Value chain of Chillies:

A typical cost build up for one quintal of Chillies to chillies powder is indicated in

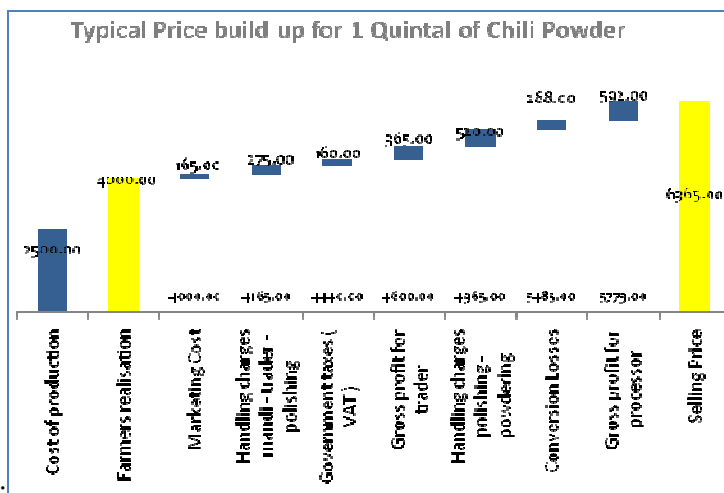


Figure:

As shown in the illustration above, the share of chilly farmer, in the final rupee of selling price of chilly powder at the processor level is 63%. However, there is high loss in processing which leads to less realization to the processor. Another significant cost in the value chain is the processing cost. Commission agent charges to the farmer are at the rate of 2.5 %. If the price discovered is 4000, his commission is Rs 100. This cost can be easily avoided if the purchase is done directly from farmers. An analysis of the value chain indicates that - the total cost addition in the chain between ex mandi to ex- cold store is close to Rs 275 per quintal; the cost of value addition is Rs 800 per Quintal, The taxes (VAT and mandi cess) are close to Rs 200 per Quintal, Total gross margin of the chain is approx Rs. 2000 per Quintal, The cost benefit for farmer, trader and processor per unit is Rs. 1.5, 1.2 and 1.3 respectively.

Fruit processing cluster in Chittoor district:

The main fruit and vegetable-processing cluster in the state is in Chittoor district, which primarily consists of mango pulping units. There are about 65 units operating in the cluster with about 50-55 units involved in canning of mango pulp and about 15 units have aseptic packaging facilities. There are about 2 IQF facilities in the cluster as well, which process different vegetables for export. Apart from mango that is available for about 2 months, many of the units also process other fruits such as guava, papaya, tomato, etc., although in less volume. The average capacities of canning units and aseptic packaging units are 1500-2000 MT and 4000-5000 MT of mango pulp in the season. Most of the units in the

cluster are classified as small scale. The main variety of mango, which is processed, is Totapuri, which is grown in abundance in the region and is amenable to processing. The other variety, which is also processed, is Alphonso, which is costlier but has better flavor and hence used for blending. About 85% of the pulp produced in the cluster is exported and rest is sold within the country to several big brands including Coco cola, Parle and Pepsi Co India. Middle eastern countries are major buyers of the pulp followed by Germany, UK, Singapore and Thailand.

SWOT analysis:

<p>Strengths</p> <ul style="list-style-type: none"> ▪ Established Processing location with over 60 active Mango and tomato processing units. ▪ Availability of processable and export quality raw material for Mango, Papaya, Lime and pomegranate ▪ Proximity to cities like Chennai and Bangalore ▪ Availability of other processable raw material for almost 8-9 months 	<p>Weaknesses</p> <ul style="list-style-type: none"> ▪ Shortage of water for processing ▪ Competing fresh market. The cluster supplies fresh product throughout the country. ▪ Shortage of power forces the units to use diesel generators increasing the production cost ▪ Unavailability of labour
<p>Opportunities</p> <ul style="list-style-type: none"> ▪ Huge opportunity for export of fresh Mangoes, Papaya and Banana ▪ Opportunity for setting up of common value added product units such as tetra pack, etc and creating a brand for the cluster 	<p>Threats</p> <ul style="list-style-type: none"> ▪ Quality assurance of the raw materials due to heavy use of pesticide ▪ Unscientific handling of the produce at the farm level leads to higher wastages and losses ▪ Increasing incidence of bacterial and viral diseases in many crops and difficulty in control ▪ Reducing acreages of some crops because of shift to other crops of eucalyptus and Casuarinas

Suggested interventions:

- Promoting common units for further value addition such as common Tetra Pack units and creating a brand for the cluster.
- The cluster produces significant amounts of solid waste, which is presently rejected. A Common Biomass Power plant may be promoted in the cluster, which would utilize the solid waste to generate power for both captive use of the cluster as well as supply to the grid.
- Promoting water conservation methods in the cluster with focus on rain water harvesting, etc.
- Promoting unit level small scale Effluent Treatment Plant (ETP) that would ensure environmental health of the region.

3.11 Challenges related to supply chain in A.P

Inadequate post harvest management infrastructure:

Non-availability of farm level post-harvest infrastructure is a major gap in the supply chain of the horticultural crops in the state. Farm level collection centers are mostly absent; sorting, grading, washing, packaging and other crop specific post harvest activities are virtually absent at the farm proximate level. This leads to higher losses and lowers the value realization by the players along the value chains especially producers.

Poor packaging practices:

Majority of the transportation of the produce to the mandi/units is done without proper packaging and buffer/insulation leading to high losses in the form of wastages. Typically, in the market yards the produce is dumped on the ground for weighing and price negotiation. Some sorting and grading is done manually in the market yards before dumping into the transporting vehicle again for further transportation. Such handling causes higher wastages.

Long and multi-layered supply chain:

Both in the case of produce to meet fresh market requirement as well for processing industry the large numbers of small farmers are unable to effectively bargain a better price in the wholesale markets. Inefficiencies in wholesale markets coupled with small farm size results in a long chain of intermediaries, multiple handling, losses in quality and increase in the gap between producer and consumer prices. Intermediaries and system inefficiencies consume a disproportionate share of consumer prices. Large number of small retailers, each handling small quantities, create high overheads leading to high margins on produce making the consumer pay for the inefficiencies in the marketing chain.

Lack of scientific ripening facilities for crops like Banana and Mango:

In case of banana, traditional methods of post harvest handling leads to damage of fingers. Similarly, there is a lack of farm level collection centres and pack houses. De-handling is done at the destination markets and transportation of central stem along with the bunch adds up to the cost of transportation. Due to these reasons, 25-30% of the fruits are wasted due to various reasons along the value chain as mentioned earlier.

There is need for new modern ripening facilities for different fruits such as banana and mango in the state at major consumption centres. The existing ripening chambers use-outdated technologies. They can be upgraded with ethylene generators, ethylene scrubbers, automated temperature control, palletisation facilities etc. This will ensure better quality and

longer life of the fruit ensuring higher price realizations for the producers and better quality product to the consumers.

Lack of cold chain facilities:

Presence of integrated cold chain infrastructure is low for horticulture products in the state. There is very less use of refrigerated trucks even in case of highly perishable products. In the existing cold stores in the state horticulture crops such as apple, orange, chillies, turmeric and tamarind etc are stored but there is need for more cold stores near the major consumption centres. Moreover, many of the cold stores have outdated technologies and hence have low energy efficiency. Further, availability of trained human resources for technical operations and administration in cold stores in the state is inadequate. With new cold stores coming up in good numbers, the entrepreneurs are having difficulty in recruiting and retaining the right skilled human resources.

3.12 Challenges related to processing units

Power supply:

Processing of fruits and vegetables is highly seasonal with processing during the peak arrivals season of the concerned product. Generally, the fruit and vegetable processing units run only 120-150 days on an average per annum. Bulk of the processing is done during peak arrivals season hence, non-supply of power during this peak processing season leads to high cost of processing as the processors use fossil fuels for power production. Moreover, the perishable nature of fruits and vegetable compared to other agricultural products like paddy and oil seeds makes the issue much more serious.

Minimum demand charges:

As discussed earlier, the fruit and vegetable processing industry is highly seasonal and hence the power requirement is not uniform throughout the year. During the field survey, several processors have shared that the processing units need to pay minimum demand charges based on connected load irrespective of the usage resulting in additional cost to the processed product.

Human resources – Labour laws:

As the industry is seasonal in nature, the units have to run in all the three shifts when the raw material is available for processing. However, complying with labour laws related to working hours for women workers and weekly offs is becoming a challenge for the processors.

Quality testing / assurance labs:

Most of the quality assurance labs that are accredited by the clients are located in large cities like Hyderabad, Bangalore and Chennai, while the processing units are located in hinterland. The processing units have simple quality labs at the unit level, but samples have to be sent to far off cities for sophisticated tests like tests for pesticide residues resulting in high costs and higher time.

Common facility centres/ Incubation centres:

There are no common facility centres, which are equipped to help the new entrepreneurs in setting up processing units such that the initial cost of establishment of the processing units comes down and the energies of the new enterprises can be used for developing a new product or a new market. There are no incubation centers in the state to help the enterprises develop new products or find new solutions to existing problems.

3.13 Suggested interventions in the Horticulture sector

There is a need to prepare a multi-pronged strategy to address all the concerns and challenges identified in the previous section. However the challenges fall under the purview of several departments and addressing all the challenges, especially production related, is beyond the scope of this study. Based on our assessment of relevance of interventions related to Department of food processing/ Department of Industries, the following interventions are suggested.

3.14 Infrastructure related interventions

1. Promoting Integrated value chains (IVC) for all the potential products in the state across all the regions. IVCs would cater to all the major horticulture crops in the regions by developing appropriate infrastructure at all levels of the value. All potential districts will have a hub that would have primary processing facilities such as state of the art pack houses, ripening chambers and cold stores depending on the requirements of the locally dominant crop. An illustration of the facilities for an IVC for Banana is illustrated below: Modern Pack houses may be created at the main banana production clusters in the region, which would cater to the banana grown in the surrounding area having a truck travel time of about 2-3 hrs from the farm to the pack house. The pack houses would have the following infrastructure:
 - De-handing, Washing and De-sapping facilities
 - Sorting and Grading Line
 - Fungicidal Treatment facility

- Packaging facilities (in corrugated cartons/crates)

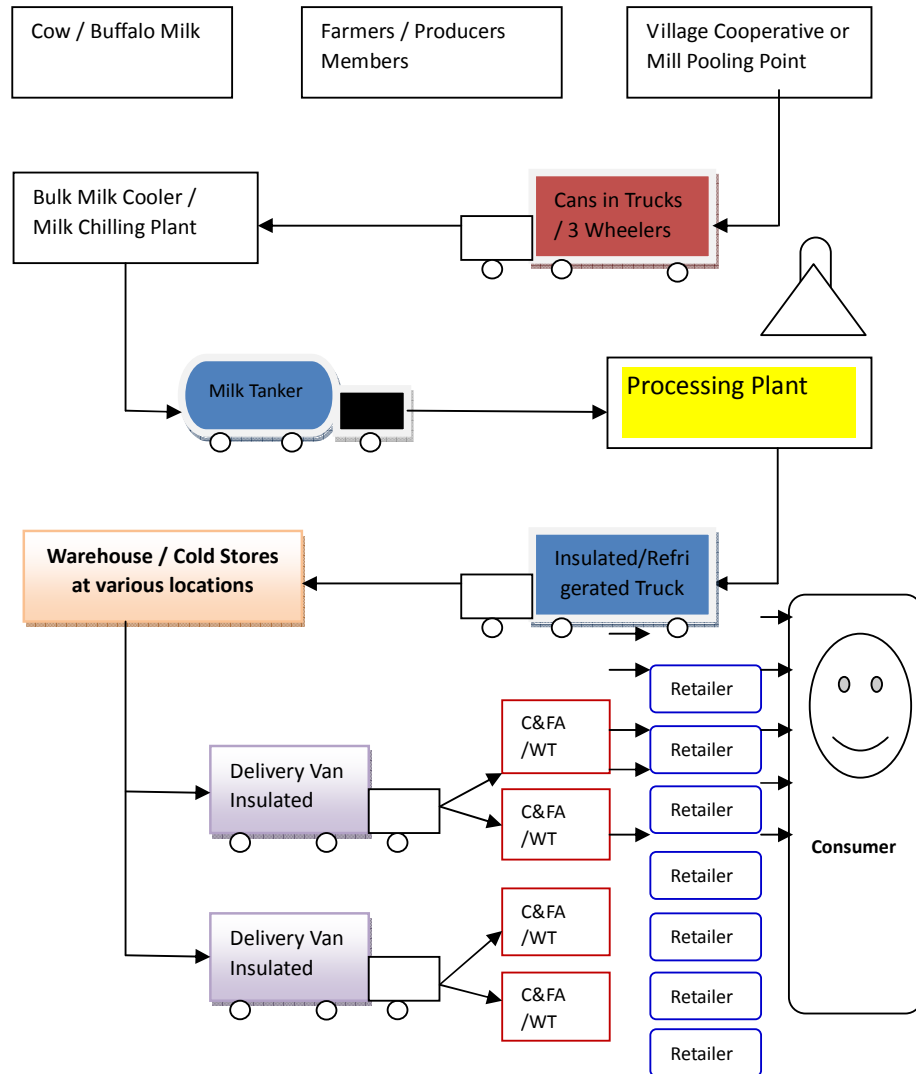
The pack houses for mango may have facilities for:

- De-sapping
 - Washing: may include hot water treatment and fungicidal application.
 - Sorting/grading
 - Packing in corrugated boxes
 - Pre-cooling
 - Cold storage
2. Promote establishment of food parks, which will have integrated food processing and handling facilities. The Food Parks will have additional storage capacity both for cold and ambient temperature and will have processing units for high value addition (secondary processing).
 3. Promote establishment of modern Rythu Bazaars with facilities, which will provide better shopping experience to the consumers.

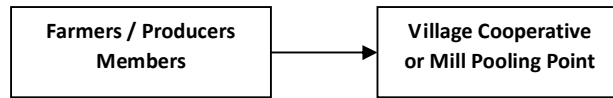
Supply Chain Management in Dairy - 4

Milk production in India is the highest in world with annual production close to 130 million MT. and growing over 5% per annum, contributing 5% of the GDP.

4.1 Dairy supply chain



4.2. Procurement



Group of farmers in a village pour milk in a collection centre during morning and evening. In cooperative the farmers or producer members call it Village Level Cooperative Society (VLC), which is owned. In Reliance it is called as Village Level Milk Pooling Point (VLPP). The milk thus poured by each farmer is weighed and tested for measuring the percentage Fat and SNF. Based on quantity and percentage Fat & SNF, the value of the produce is determined. Farmer is paid once in a week or ten days.

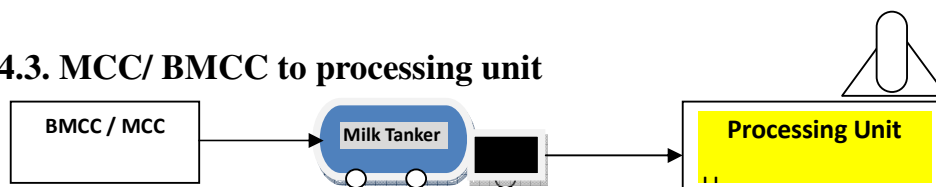
4.3. Village collection centres to BMC / MCC



Raw milk collected from cows or buffalo is rich in nutrients and also has high bacterial count. Therefore in ambient temperature bacteria start growing and multiply at a rapid pace and so milk is very susceptible to spoilage. To avoid spoilage milk procured from farmers at village collection point is sent to a nearby Bulk Milk Chilling Centre (BMCC) or Milk Chilling Centre.

Through auto or truck milk is lifted from multiple VLC or VLPP. At BMCC or MCC milk is chilled below 4 degree Celsius because at this temperature microbes cannot grow further so milk remains safe and can be transferred later to a processing plant located far from the original village collection point. Depending upon the requirement installed capacity of a BMCC varies from 2000 to 5000 litre whereas MCC can be from 6000 to as high as 30 to 40 thousand litre also. So each BMCC or MCC extends chilling facility to hundreds of villages mapped under it through multiple routes.

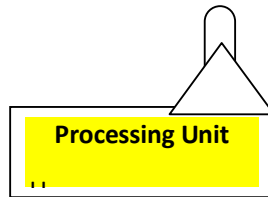
4.3. MCC/ BMCC to processing unit



Chilled milk from BMCC / MCC is transported to processing unit through insulated milk tanker. Insulated tanker maintains the temperature during its journey to processing which at times takes 30-40 hours also. Before filling the milk tanker it is mandatory to clean and sanitise the inside chamber thoroughly. One sample is drawn from filled tanker for analysis of Fat and SNF. A document mentioning milk quantity, Fat, SNF, acidity etc is sent along with the tanker to the processing unit. Lactic acid indicates the quality of milk.

Till now what has been narrated (A, B and C) forms one part of Dairy SCM. It is important to mention that inbound logistics plays a significant role in the entire supply chain. Challenge is to coordinate with several VLC/VLPP with BMC/ MCC and taking the raw material safely i.e. maintaining its quality to the processing plant. So besides quality etc. challenge of the logistic is how to keep the cost of transportation as low as possible.

4.4 Processing unit –manufacturing



Almost 46% of the total milk is consumed in the form liquid milk and followed by 27% for Ghee. 6.5% goes in Butter and for curd it is over 7%. Approx 4% is utilised for conversion to Milk Powder (Whole Milk Power, Skimmed Milk Powder, Dairy Whitener, Baby Food etc). Rest goes in making Channa, Khoa, and Cheese etc. Cheese is a value added product and consumption is growing with changes in the life style of urban high-income group. Manufacturing process of different product as mentioned above is different and a domain of Dairy Technologist associated in this field. However an example of making the pouch milk is as below:

Raw Milk - →Chilling- →Pasteurization- →Standardization- →Packing →Dispatch to distribution channel

Milk received from the BMC or MCC is once again chilled and stored in the silos till it is subjected to a process called Pasteurization to kill the pathogenic bacteria present in the milk to make it safe for human consumption. However milk is standardized to meet the minimum specification prescribed by PFA. For example Toned Milk must contain minimum

3.0% Fat and 8.50% of SNF. Post pasteurization and standardization milk is sent for packing in the polythene pouches. Packed milk is kept in the cold store below 4 degree Celsius and from there milk is dispatched through insulated vans to the agents spread across a specified area. Dispatch happens in the night however in some markets dairies are dispatching even in the afternoon also.

4.5 Marketing, sales and distribution

Channel of distribution, nature of logistic and marketing activities greatly depends on the category of product.

Different categories of dairy products

Type	Dairy products
Chilled (0 to 10 C)	Pouch Milk, Paneer, Curd, Yoghurt, Butter, Cheese etc.
Ambient (Long Shelf Life)	Ghee, powder, Tetra Pack et Milk.
Frozen (-21 C)	Ice Cream, Frozen Desert.

Chilled (0 to 10 C):

In chilled dairy product a set of product has a long shelf life may be 1 to 3 days, which is called as “fresh dairy product”, and some are having longer shelf life, which can be consumed even after 3 to 9 months (below 4 C).

Fresh dairy product:

Liquid Milk in Pouch, Buttermilk in Pouch, Curd in Pouch, Fresh Paneer etc.



Here company directly supplies to the hundreds of agents spread across a particular city. The despatch of materials usually happens from a factory to agents / distributors located in nearby city. Delivery happens any time in the night from factory to agents and selling starts from morning 5.30 AM to 8.30 am. However 10-20% of the volume gets sold in the evening. All products have a shelf life of 1-2 days. Because of the perishable nature of this category delivery vans are all insulated to maintain the temperature below 5 degree Celsius.

Ambient products:

Ghee, SMP, WMP, Dairy Whitener, Baby Food, Tetra Packet Milk

Channel of distribution:

Company- →C&FA-- →Distributor--- →Retailer--- →Consumer

Products in this category can sustain ambient temperature and so does not require insulated vehicle.

Frozen product:

Ice Cream and Frozen Desert; Channel of distribution

Company- →C&FA-- →Distributor--- →Retailer--- →Consumer

Entire distribution takes place below -20 degree Celsius. So distribution is under refrigerated condition. Ice cream is sold in counters having deep freezer, Ice cream parlour and through pushcart vendor. Demand of this category fluctuates in summer and winter.

Supply Chain Management in Poultry - 5

India is the third largest egg producer and fifth largest poultry meat producer in the world. The Indian poultry industry employs about 2 million people, and contributes 1.1% to the national income (Source: http://www.ciionline.org/news/newsMain.asp?news_id=1262004125333PM). Among all the meat categories, poultry meat is witnessing the highest growth rate, at over 15% per annum, compared to the overall meat industry growth rate of 5% per annum (Ali et al., 2004). Currently, poultry meat constitutes approximately 25% of the total meat production in the country (Source: http://www.vethelplineindia.com/art_poultryind.htm). The poultry industry has made a rapid progress in the last three decades. Several breakthroughs in poultry science and technology have led to the development of genetically superior birds capable of high production, even under an adverse hot climate. Manufacture of high-tech poultry equipment, quality poultry feed, pharmaceuticals and health care products including vaccines are some of the important factors contributing to higher productivity. The industry is dominated by the private sector and majority of the poultry producers still belong to the unorganised sector with backyard rearing of birds numbering anywhere between 25 and 250. Furthermore, the contribution of processed meat to the total value of meat production is negligible.

5.1 Threats and Opportunities

Though India is one of the largest producers of poultry products in the world, per capita consumption of eggs and poultry meat is among the lowest. The annual per capita consumption of eggs and poultry meat in the country are around 40 and 1 kg, respectively, well below 180 and 10.8 kg, respectively, recommended by the Nutritional Advisory Committee (Source: <http://www.poulttrysolutions.com/knowledg/about/product.htm>). Poor consumption of poultry products is attributed to socio-cultural and religious factors (About 40% of the Indian population is vegetarian), high prices and low per capita income (~ USD 500). High feed costs, low meat yield, inefficiencies, and diseconomies of scale and lack of modern processing facilities cause high prices. Feed costs, which form 70-75% of the total cost, are almost four times as high as those of other countries, e.g., Brazil. A principal cause of these high costs is low yields of feed ingredients such as maize. Another reason why feed costs have remained high is the reservation of this sector for small-scale units.

These units suffer from poor economies of scale and typically lack the resources to invest in modern technologies (Source: www.aponline.gov.in/quick%20links/vision2020/c12.pdf).

Indian breeds have lower Feed Conversion Ratios (FCR) compared to the breeds used in developed countries, resulting in lower meat yield. The FCR in India is typically 1:2, meaning thereby to put on a weight of 1 kg by a broiler; 2 kg of feed have to be administered. In most of the developed countries, the FCR is 1:1. Obviously, low FCRs result in high overall costs. Poor meat yield is also caused by the lack of research on genetics to produce high-yielding varieties, nutrition and ambience for healthy growth of broilers, and the lack of modern poultry rearing technologies. Moreover, since most poultry producers are backyard farmers belonging to the unorganised sector, as mentioned before, they suffer from inefficiencies and diseconomies of scale, and lack funds to invest in technologies due to their small size.

The processed meat industry in India is growing at a very slow pace. In developed countries, almost 100% of broilers produced are processed and sold as value-added products in the form of portions, boneless and further processed products. Even in countries like Thailand, Indonesia and Malaysia, most chicken sold is processed and branded. In India, however, poultry meat is a commodity product, and only about 2-3% of the total poultry meat produced is sold in the processed and branded form. Two main reasons for this are consumers' preference for live chicken and scepticism about processed chicken, and inadequate infrastructure like lack of cold chains etc. To Indian consumers, chicken is fresh if it is live and cut before their eyes, even in a very unhygienic manner. Since live birds are available in plenty in the markets, consumers prefer live birds to processed chicken, which they perceive to be "not as fresh". Also, as processed chicken is costlier than live chicken, buying of processed chicken has so far been confined to the upper income group.

The change in consumer mindset in favour of processed chicken would gradually evolve with promotion and awareness. The absence of cold chains from the processors and upto the retailers and the lack of adequate refrigeration facilities at the retail outlets result in deterioration of the quality of processed meat, ultimately affecting consumer health. Most of the poultry meat produced in India is consumed domestically. Only a very small amount of this is exported. High costs of production of Indian poultry products make them uncompetitive in the international market. Indian poultry meat is over 50% costlier than the average world price. Exports have also suffered due to the lack of adequate infrastructure (cold storage etc.) at the seaports and airports.

However, the opportunities for the Indian poultry sector are immense. Not only India has a huge live bird population, but also the poultry sector is the fastest growing among all the meat categories since it is one of the quickest and most efficient converters of plant products into food of high biological value (Ali et al., 2004). Demand for poultry meat is expected to rise faster due to India's sustained economic growth, increasing per capita income, rising non-vegetarian population (about 60% of the total population) and increasing awareness towards healthier poultry meat. Demand for processed meat is also expected to rise with increase in health awareness and rise in living standards. Venkateshwara Hatcheries introduced processed meat in the Indian market in 1986, the largest vertically integrated poultry farm in India, under the brand name "Venky's". Later, many regional poultry farms have started selling processed chicken on smaller scales.

To boost the growth of the Indian poultry sector, there should policies and simplified procedures to encourage private investments in the poultry sector. Existing infrastructure such as roads and power conditions should be improved and new infrastructure such as warehouses, refrigerated transportation and cold storage facilities should be created with adequate capacity. Poor road conditions not only delay the transit time for processed chicken, thus severely affecting its quality, but also reduce the weights of live birds before they reach the markets. Chilled and frozen chicken also needs a steady power supply to maintain the chilling and freezing temperature, respectively. The government should itself invest, and also encourage private investments, in research on genetics, nutrition, automation, ambience and food safety to increase yield and food value, shorten lead times for production of broilers and ensure preservation of the quality of meat products for longer periods.

There is a need to promote contract farming of corn, maize etc. required for processing of feed for chicks and broilers. The private sector poultry farms can work with the contract farmers to increase the yields of crops that will not only ensure a steady supply of ingredients of chicken feed, but also smoothen out price fluctuations. This is exactly what happened in Thailand, where the poultry industry, once relatively fragmented and unorganised, has transformed itself into an organized sector consisting of large integrated farms such as Charoen Pokphand. These farms work in close association with the crop farmers, feed producers, growers, hatchers, processors, fast food retailers and the government, and supplement meagre government investments in R&D to improve breeds of layers and broilers, look for alternative feed sources and develop better disease control

methods and vaccines. They play active role in stimulating domestic demand and developing the export market (Source: www.aponline.gov.in/quick%20links/vision2020/c12.pdf).

To stimulate demand for processed chicken, focus has to be laid on awareness campaigns (now on various media for processed and canned foods). Export of chicken need be facilitated by simplifying the customs procedures and building up adequate infrastructure (cold storage and warehousing facilities) at seaports and airports. Phasing out of subsidies on agricultural products internationally under WTO agreements would likely to open up new markets like those of Russia and Eastern Europe for the Indian poultry exporters. The thrust should be on consolidation in the Indian poultry industry through mergers, acquisitions and strategic alliances, and creating vertically integrated poultry supply chains. Vertical integration not only allows a farm to have complete control over all the elements of the supply chain, but also enables it to be lean, efficient and price-competitive. Because of scale economies enjoyed by the integrated farms, the prices and qualities of processed chicken would also become competitive in the international market.

Some case studies of supply chain management in the poultry sector are given below:

5.2 Case Study: Bengal Hatcheries Ltd.

Bengal Hatcheries Ltd. (BHL), located in Kolkata, capital of West Bengal, an eastern state of India, started its business in 1974 with the selling of hatching eggs, day-old chicks and feed for chicks and broilers. It also started exporting hatching eggs to Bangladesh and U.A.E. However, with increase in competition from new entrants, BHL started losing market share. Also, it had to stop exporting hatching eggs because this was no more profitable. BHL then thought of forward integration, and accordingly set up its first commercial farm in early 1980's for production of broilers. In early 1990's, BHL set up its dressing unit for production of processed meat. In 1995, with the development of own cold chain, BHL opened its first outlet in Kolkata, followed by more outlets in different parts of the state. To expand the retail business more rapidly, BHL started franchising in 1998. These outlets sell both processed meat and ready-to-eat chicken items cooked at "kitchens" set up by BHL at certain strategic locations. Today, BHL is a reputed name in the chicken business in eastern India, occupying more than 50% of the market share in this region. Besides selling processed meat and live birds, BHL continues its original business of selling hatching eggs, day-old chicks and feed for chicks and broilers. In 2000, BHL achieved yet another milestone by opening "Food Mart", a chain of convenience stores to sell groceries, confectionaries, toiletries, and chilled and frozen items.

BHL achieved a turnover of Rs.2.193 billion in 2004-2005. It earned Rs. 1.34 billion from processed meat and live birds, Rs. 230 million from selling day-old chicks, Rs. 180 million from its business in poultry feed, Rs. 150 million from retail groceries (Food Mart) and Rs. 30 million from selling hatching eggs. The scare of bird flu all over the country led to a 40.4% drop in its net profit at Rs. 31 million. To maintain a steady growth of 25% from sales, BHL plans to raise the share of processed meat and live birds (currently about 70%) in the total turnover by opening more retail outlets in the next couple of years. Though the share of day-old chicks in the total turnover has come down gradually from an earlier level of 50%, BHL still is the largest breeder of day-old chicks, breeding 1.2 million chicks a week.

5.3 Chicken supply chain:

BHL has a vertically-integrated chicken supply chain from hatching of eggs, breeding of day-old chicks, production of broilers, processing of feed for chicks and broilers to selling of live birds, processed meat and ready-to-eat chicken items through distributors and own or franchisee outlets. The supply chain broadly consists of the following 6 units:

1. Breeding farm for hatching of eggs and production of day-old chicks.
2. Commercial farm for production of broilers.
3. Feed processing unit.
4. Dressing unit for production of processed meat.
5. Kitchen for preparing ready-to-eat chicken items.
6. Own or franchisee outlets for selling processed and ready-to-eat chicken items.