

Food Supply Chains and their influence on Resurgence in Institutions of Commons

- A V R Acharyulu and Ajoy Mathew*

Introduction

Agriculture, fisheries and forestry are three key sub-sectors of agrarian economy, which provide us with food and are linked to market economy. Commons are interlinked to the production and distribution of food and food products – both in terms of production resource base and in distribution resource base. Food production by farmers, fishermen and tribal communities using land, water and forests hinge upon linkages built with supply chain management processes in order to link to the value addition and consumer markets. Food supply chains are pivotal in any economy and they impact and influence the hunger; poverty alleviation measures; remunerative prices and generation of productive employment. A critical assessment of supply chains that are operational in a country like India would give an understanding of issues involved, alternatives and opportunities available to develop alternative mechanisms and improve the efficiencies of supply chains; enhance the role of commons and support building institutions that are proactive, economically viable and harness technological tools.

Food supply chains depend on - at the production level - land; forests and water (lakes, rivers and oceans), which have an increasing proportion of common property in that order. Each of these is controlled through state controls that maneuver production systems and output levels. Managing commons as production base is one area where communities waged struggles and have tried to evolve institutional mechanisms. Several studies have attempted bringing out into the fore, the issues, complexities and inter-relations of these with larger societal issues. Shah (1995), Singh and Ballabh (1996) and Vandana Shiva (1997, 2001) highlighted these in their works and have also tried to discuss the evolution of institutions in managing the commons. However, addressing the

issues of managing them as means of logistics, links for supply chain management and tools to deploy cost and service efficiency measures has not yet received the attention and treatment that has increasingly become imperative.

An overview of a typical food supply chain

In Indian scenario, the food supply chain is operated at two levels. The first is operated at farmer level and the second, at the food processor level. These together form the food supply chain. In European, American and Australian contexts, these two are together and operated as one single supply chain. Due to natural characteristics, monsoon patterns and the crop features, and market characteristics, the supply chain is disjointed in India. We discuss some of the salient features of the system:

A farmer level agricultural supply chain may be depicted as below. It comprises of a chain of processes and flows related to farming; processes and flows related to disposal of produce by the farmer through a market process called procurement, agri-processing or value addition, which is essential for any farm produce to become edible at the simplest level; and finally, the retail supply chain through which the foods may reach the shelves for consumers or distribution through an appropriate agency for hungry. Other than food grains also go through similar process and stages, though the length of the chain and cycle times may vary. A generic agricultural supply chain comprises of the following players and flows as shown in diagram 1.1.

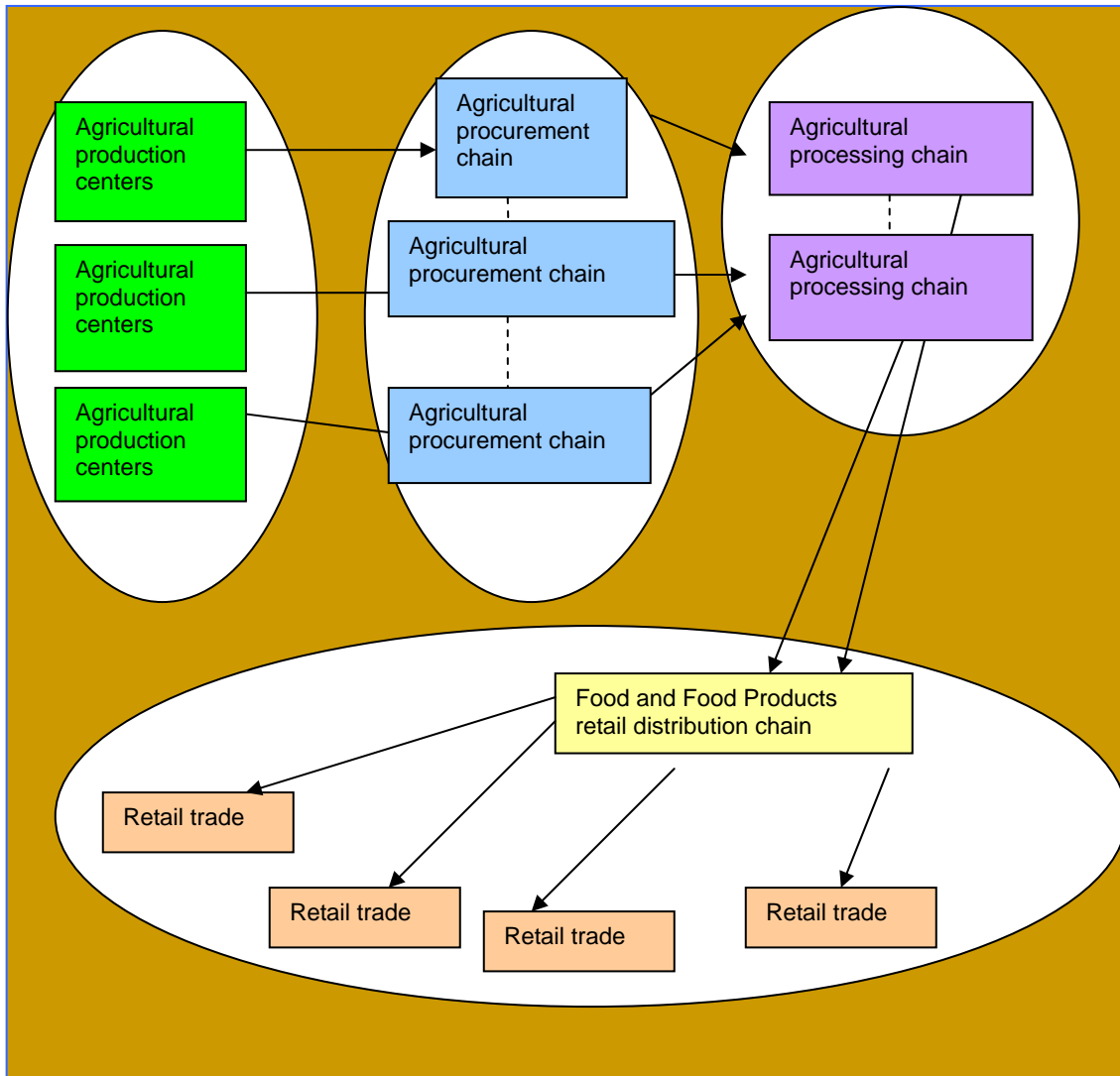


Diagram 1.1. Agricultural supply chain of a farm producer

The food processors' supply chain may be seen as a part of the above, taking care of the movement of food from farm gate onwards through processing to consumption centers.

A cursory examination of different agricultural produce supply chains show us that a specific function of logistics - warehousing has become an essential part of the management of the supply chains in the country, Few crops studied during 2005-06 provided a snapshot view of the flows of the farm produce at a national level in India, which are presented in the subsequent paragraphs and diagrams.

II. Supply Chain Networks of select crops

Supply Chain Flows of Banana

Major production centers: Tamil Nadu, Maharashtra, Karnataka, Gujarat, Andhra Pradesh, Kerala and Assam, with a total annual production of 16.82 million tons⁶.

Major marketing centers are: four metro cities – Mumbai, Delhi, Kolkata and Chennai, with almost all the cities and towns having a share in the consumption of this fruit. On a typical day, the market inflows amount to, 1100 mt in Delhi, 640 mt in Mumbai, 120 mt Kolkata, 110 mt Chennai and 225 mt in Bangalore for raw bananas.

Major processing centers of banana are in Mumbai, Jalgaon, Kolhapur in Maharashtra, Gujarat, and New Delhi. A small proportion is accounted for the states of TN and Kerala. Processed foods such as chips, syrups, jams, and jelly are some of the major processed and exported items.

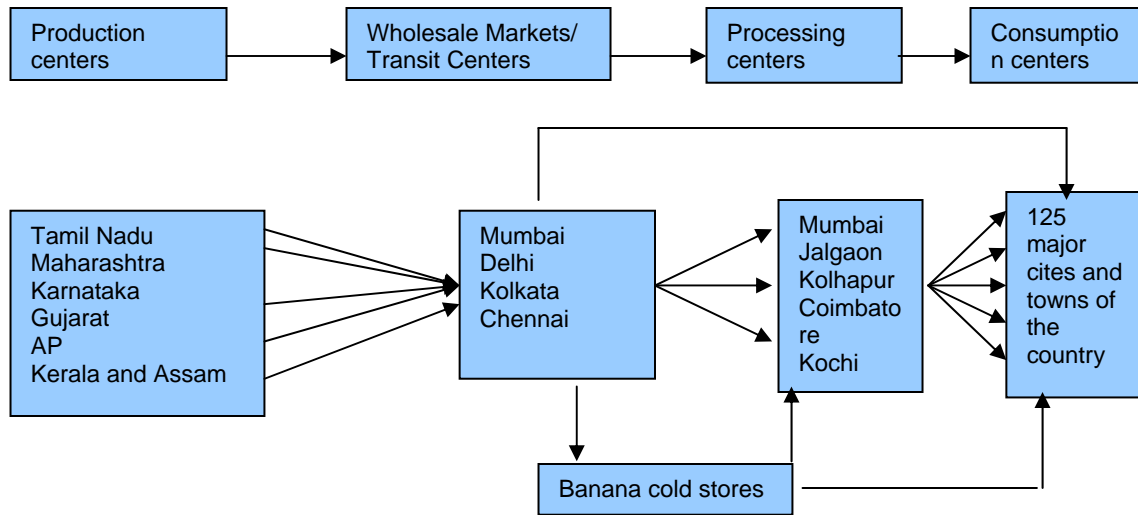


Diagram 2.1. Supply Chain Flows of Banana

Supply Chain of coconut

India produces 9 billion to 13 billion coconuts a year, from 18 states and union territories, with more than 93% accounted by the states of Andhra Pradesh (9%), Tamil Nadu (25%), Kerala (41%), Karnataka (14%) and West Bengal (3%). Coconut processing is divided between processing of nut and copra for value added products and edible oil on one side; and coir processing and manufacture of coir products on the other side. Majority of coconut processing and coir processing is concentrated in Kerala and Tamil Nadu, with edible oil processing concentrated in Kerala, Tamil Nadu, Karnataka, Andhra Pradesh and Maharashtra⁷.

The macro supply chain of coconut is therefore having a two tier flows, movement of coconut from the farms of AP, TN, Kerala, Karnataka, WB to the processing enters within each of these states, to various cottage and small scale industries for edible oil manufacture, and coir flowing from these initial coconut

processing centers to coir industry in the borders of Kerala and Tamil Nadu. Coconut oil and other edible products are consumed across the country, with a majority of the coconut oil consumed within Kerala. Coir is consumed both in coir rope and twain form and as coir products across the states of Maharashtra, MP, UP, Assam, Bihar, Jharkhand and Chattisgarh.

As such, the mapping of the flows of coconut shows at least two times internal flows and thereafter flows out of the production and processing areas.

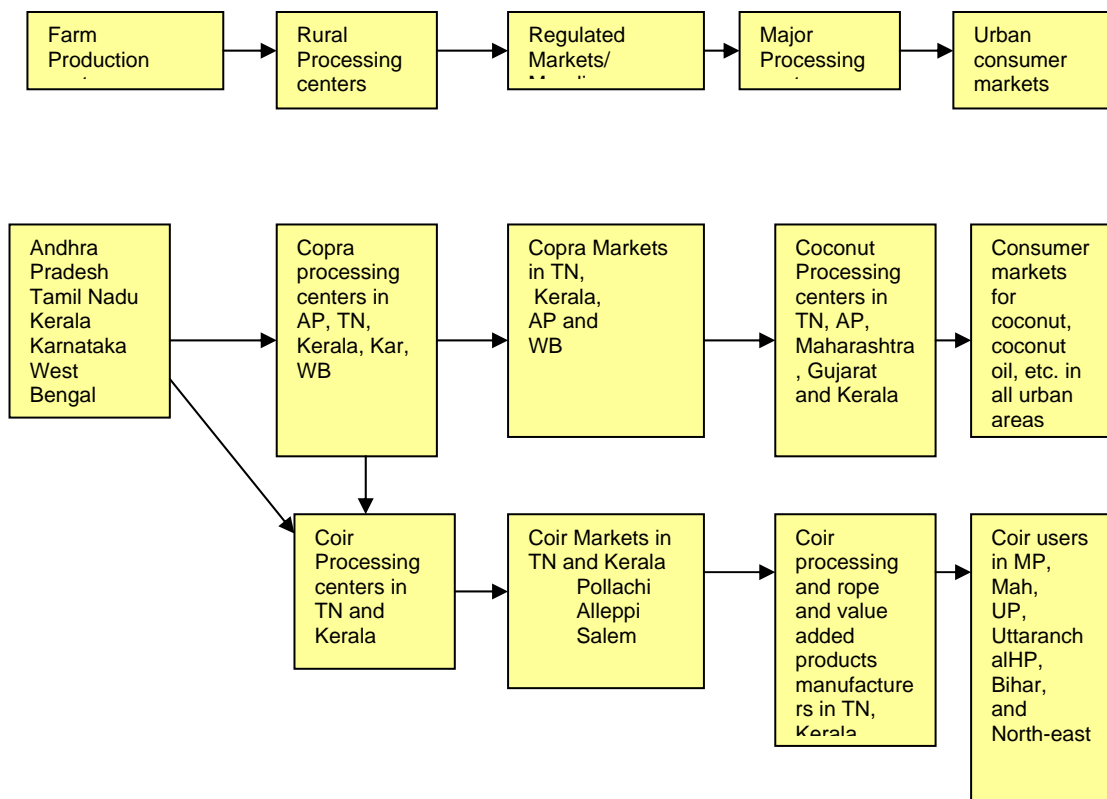


Diagram 2.2: Supply Chain Flows of Coconut

Supply Chain of chillies

AP, Karnataka and Orissa are the top three states producing chillies, accounting for 46%, 15% and 10% of the total production of the country, pegged at 0.96 million tons⁸. Major markets for chillies are: Guntur, Warangal, Khammam in AP and Raichur, Bellary in Karnataka and Jalgaon in Maharashtra. Chillies are consumed as a major spice in the country, and average consumption ranges from 50 gms to 60 gms per capita per month. The commodity is consumed both raw as well as a powder, graded and packed and sold both for household and food processing industries. Major food processing industries are located in AP, TN, and Mumbai, where pickles manufacture requires Chillies as powder form.

Its supply chain could be described as below:

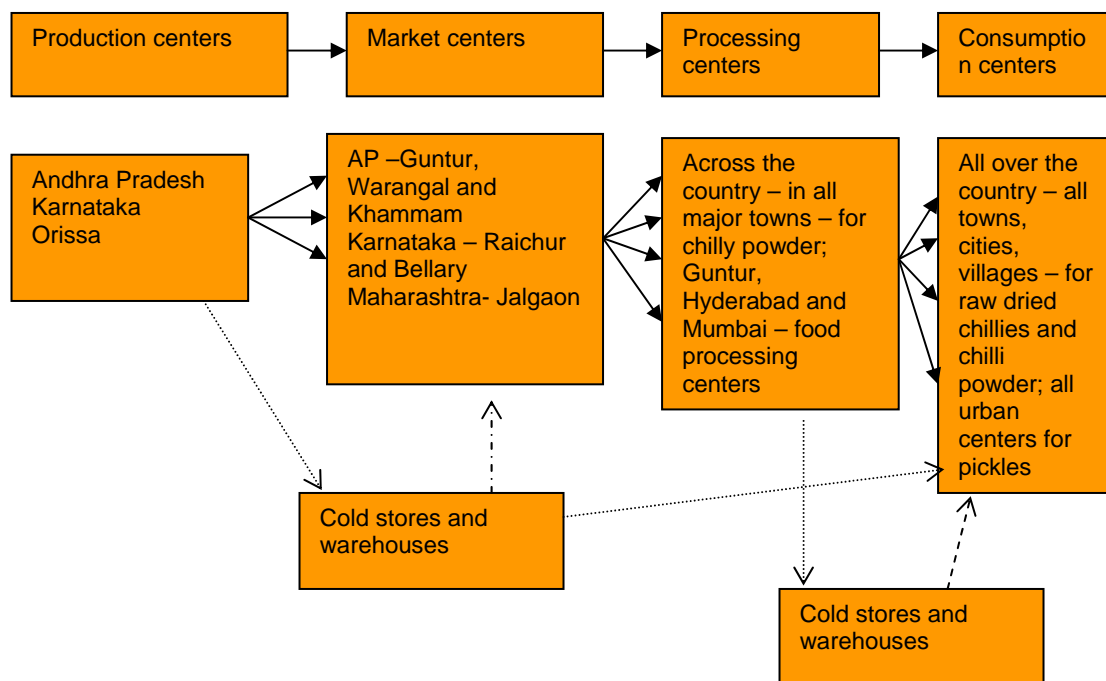


Diagram 2.3. Supply Chain Flows of Chillies

Chilly, a crop with high commercial value, produced both by marginal and small farmers as well as large farmers in these three states, brought to the six major mandis in the country, where anywhere between 80,000 – 100,000 bags of chilly, amounting to 35,000 tons per day per mandi are sold by farmers during the season. Around 60% of the total chilly produced is traded and bought at these six centers. Major value addition occurs with both warehousing and cold storage, which is done at these locations, paving way for movement of chilly to various consumption centers across the country during the year. Unlike banana, chilly trade utilizes the warehousing function both to synchronize the supply chain and to meet market demands.

Supply Chain of Turmeric

A crop grown in Andhra Pradesh, Tamil Nadu, Orissa, West Bengal and Assam. Total production ranges from 0.65 to 0.70 million tones per annum, with 0.375 million tons produced from AP and another 0.15 million tons from T Nadu. Other major production centers are: Kerala, Karnataka, Maharashtra, Chattisgarh, Jharkhand, Bihar, UP, Uttaranchal, Rajasthan, and north eastern states, accounting for around 30-33% of production⁹.

Turmeric, a major condiment in Indian cuisine, is used universally across the country, for household purposes, while also being used in various food processing industries, pharmaceutical, paints and dye making industries across the country. Major trading centers are Nizamabad, Duggirala in AP, Salem, Erode, Dharmapuri and Coimbatore in Tamil Nadu and Sangli in Maharashtra., where farmers bring in the dried corms during the harvest season and dispose off their crop. Storage centers located in around these markets serve the purposes of warehousing and distribution for further processing and value

addition, across the country. Major processing centers are located in Nizamabad, Medak, Salem and Dharmapuri, from where consumer distribution supply chains become operational.

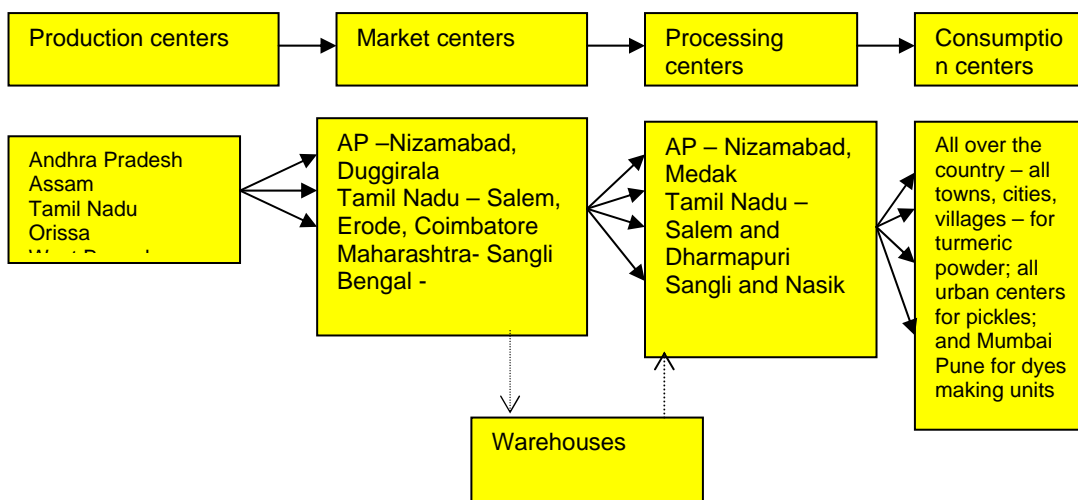
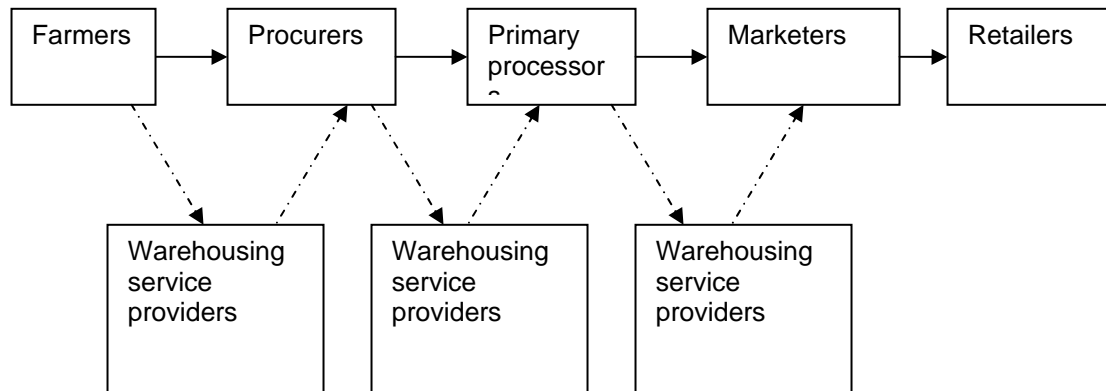


Diagram 2.4: Supply Chain Flows of Turmeric

Some insights from the Crop Flows

In a nutshell, it may be seen that a typical food supply chain is supported by warehousing service providers at almost every level as below:



For several decades, warehousing was a function that was kept under the wraps as a service by the government, both at central level and also at state. All the warehousing space was created to meet the needs of one single agency, Food Corporation of India, and many private agencies were encouraged to develop warehousing and provide it to state. As the markets got liberalized and private sector progressed, the warehousing facilities started to get created under private ownership. While large industrial houses went ahead in developing these, the primary resource – land - was continued to be the critical issue. Land that was primarily part of commons, was made available to develop these warehousing facilities. As time progressed, the function of warehousing became a stand alone business proposition and several entrepreneurs and Small and Medium

Enterprises (SMEs) came forward to offer this business service – to all those who needed the warehousing and not just one or few businesses.

- Today, there are 3253 cold storage warehouses with a capacity of 8.73 million tons of specialized commodity storage (APEDA, 2004)¹;
- Food Corporation of India (FCI) has more than 1700 warehouses with a storage capacity of 23 million tons (agricoop.nic.in.2005)² and Central Warehousing Corporation (CWC) another 17 million tons space in dry commodity storage.
- Privately owned storage godowns contribute to another 10 million tons storage space.
- Procurement activities of different state and central level government agencies, cooperative marketing federations and few corporate houses place huge seasonal demand on storage space, leading to sharing of the above capacities among various agencies, including individual farmers.
- The business opportunities emerging from the above scenario lead to highly specialized logistics service companies designing and delivering warehousing solutions to the users on user pay for time, space and organization

Resurgence of Commons through Food Supply Chains

Agricultural supply chains started receiving attention only in the last decade or so, especially from the point of developing integrated supply chain networks, in enhancing their effectiveness with the objective of consumer service satisfaction (Trienekens & Trienekens (1993), Hughes D. (1994), Fritz and Schiefer (2002) Merlins (2004), Wysocki (2000) Pauwels (2000) and Buelens (2004) have tried to provide both structural and managerial complexities involved in managing the food supply chains. Nallan (2005), Mandyam (2004), Clendenin (2003 and 2005),

Koudal (2005), Shah (2005) have highlighted the need to both decision systems deployment as well as deployment of technological tools in order to improve the performance of supply chains in many a sector.

These and several related attempts and initiatives by the industry and academia world wide were primarily in terms of technical improvements, development of financial controls and improving administrative abilities. These initiatives may be categorized into three areas – one, developing technical and technological solutions to build seamless supply chain networks; two, developing methods and processes to improve cost-leadership; and three, developing managerial capabilities in handling various players involved in supply chain management, infrastructure management and logistics management. These initiatives collectively have brought in breakthrough advances and changed the perspectives of managerial leadership and organizational capabilities.

Role of and Significance of Commons in businesses and economy

There are variations in these supply chains, insofar as the number of players, the value addition made and the length of process time and costs.

Beulens provides a framework for design of food supply chains for that will support management of Supply Chains for both efficiency and effectiveness. According to Buelens, a supply chain network exists when it has four basic features:

1. Structure – which defines *who are its members, and what is their relationship;*
2. Process – which defines *whether the activities to be performed are identified and recognized with transparency and traceability parameters, level of integration of these processes;*
3. Resources - which defines *the infrastructure, people, machines, including the transport; vehicles, systems and physical movement procedures, ownership and availability to the chain; and*

4. Management – which defines stakeholders *who coordinate the chain network and with what objectives, how much of the scope of operations are mutually agreed and accepted by the Network members and what are the responsibilities of whom and whether they are legally bound by contracts and laws.*

Of the above, the third aspect, “resources” require a critical appraisal and understanding. The food supply chains depend on: people – who contribute in physical movement of food; machines or vehicles, vessels, vehicles and containers and tools and tackles that help movement possible, and infrastructure in terms of roads, ports, railway lines, airports, pipelines, ropeways that facilitate the traffic; and finally warehousing facilities that provide critical support for movement of goods in time in required form. Warehouses – in their various forms and facilities, provide the most critical value addition in the logistics function through storage, stocking for delivery, sorting, and packaging, bundling and making movement and distribution possible. A more detailed discussion on this aspect is offered in a different paragraph.

These warehousing service providers – have a role in two levels of commons management – one, the land that’s provided for the service from the commons, and offering warehousing as a commons’ service, with each user performing the function of a user of a common property. A role that is similar to roads, ports, railway lines and waterlines may be seen for these warehousing service providers, as long as they are open for all who are willing to take the responsibility for them – either as a paid user or as a paid manager.

Emergence of Businesses with a renewed emphasis on collective management

Supply Chain Networks function on the principles of CPR management, as the key of supply chain management is management of flow of information, flow of material and flow of finances; of which the former two are critical for successful functioning. Broadly stated, they treat:

- transport facilities and vehicles;
- warehousing facilities;
- packaging facilities and
- information technology and information as commons for the use of SCN participants and partners. As such, the management of transportation; warehousing, packaging and information are governed by the below framework.

A typical Third Party Logistics Service Provider's role in managing Supply Chains:

Fleet of transport vehicles are considered as pool of resources to offer optimized network of transport, use of Shipment Management System provides for load management, routing, equipment and driver management as well as freight analysis.

Warehouse management is based on space sharing, time sharing and volume sharing basis on a inventory management mode, radio frequency scanning systems to track the material, bar coding and labeling systems to share the data regarding the material among supply chain players. The same is used to also share data about the retail space required for outbound consumption delivery (also called retailing in modern trade).

Packaging systems are designed and maintained to do final packaging at the warehouse, to suit the need to ship product to off-site markets, providing for reduced product handling, reduced cycle time and reduced costs. As the Warehousing service providers offer variety of packaging services like custom pallets, display shippers, inserts and coupons and wrapping and bundling, to each customer.

Information Technology: is used to reduce intermediate tracking, cross docking and merge in transit; to enhance tracking and tracing capabilities, leading to better coordination and management of inventories and goods in transit.

The Supply Chain Players who provide these services are called Third Party Logistics Service Providers or 3PL operators, who are located at a centralized place or co-located at the shippers' production location, to take care of the varied demands of customers. They manage, as stated before, the physical commons and virtual commons together, and deploy CPR management principles in a meticulous and cost effective manner. The key principle of their business model is to retain and build synergies from the physical and virtual commons, without which both profitability and effectiveness would be under duress.

While the business management concerns and delivering value for the customers override the demands of a typical supply chain, it is interesting to note that traditionally and in modern trade too, the food supply chains are critically dependent on three major commons – land, water and space (here, used to connote the internet and data space, which is a virtual common), without which the agricultural produce cannot reach the consumer or hungry. When countries offer incentives in the form of provision of land for developing warehousing facilities; offer incentives to develop mega ports, exclusive railway lines for freight movement, or for air cargo shipments on one side; inter-state pipelines

construction cutting across diplomatic maneuvers, it underlines the critical nature of commons and resurgence of commons in maintaining and enhancing a country's economy in a globalized era.

Conclusion

Each of the business models and work processes that are essential to be performed on a “must to deliver” basis hinged on the methods, processes and institutional structures built around commons that have formed the foundations for costing; for developing physical infrastructure and finally developing organizational capacities and capabilities as those that govern and coordinate the movement of foods – both raw and ready-to-eat forms - from the production centers to consumption centers and not on the premise of developing and managing institutions of commons for improved supply chain performance. It is attempted to map the food supply chains as they exist in India – from the perspectives of commons forming the foundation for a strong, vibrant supply chains and highlight the role new institutions play in managing these supply chains and in managing the commons.

References and Notes

1. Shah, Tushaar. Making Farmers' Cooperatives Work, Sage Publications, New Delhi, 1995.
2. Singh Katar, B Ballabh., Cooperative Management of Natural Resources, Sage, New Delhi, 1996.
3. Singh Katar, Rural Development: Principles, Policies and Management, Sage, New Delhi, 1999.
4. Madura Swaminathan, Impact of Globalisation on Food Security, BSC, Dec.2001.pp.15-19
5. Vandana Shiva, Yoked to Death: Globalisation and Corporate Control of Agriculture, RFSTE, New Delhi, 2001
6. Vandana Shiva, Stolen Harvest: The Hijacking of the Global Food Supply, Indian Research Press, New Delhi, 2001.
7. Vandana Shiva, et al., The Enclosure and Recovery of the Commons, RFSTE, New Delhi, 1997
8. APEDA, A Report on Agriculture, 2002
9. Beulens, Adrian., Management and Transparency Issues in Food Chains and Networks, Wageningen University, Wageningen, Netherlands, Aug.2004
10. Trienekens Jacques, Adrie Beulens, Innovation through food supply chain development, A Report, 1993
11. Hughes D. (1994
12. Fritz and Schiefer (2002
13. Debbie Newton, Supply Chain Learning for Australian Agribusiness, Food Group, Agriculture, Fisheries and Forestry, Australia, 2000
14. Merlin Bettina, The Value Chain Approach in Development Cooperation, Deutsche Gesellschaft fur Technische Zusammenarbeit, Dag-Hammarskjold-Weg 1-5 (2004)

15. Nick Saltmarsh, Tully Wakeman, Local Links in a Global Chain, Leader-Broads and Rivers Program, East of England Development Agency, 2004
16. Wysocki Allen, Supply Chain Management: Past and Future, University of Florida, Extension Institute of Food and Agricultural Sciences Newsletter, December, 2000
- 17.) Pauwels Jerred, Replacing Supply Chains with Value Chains, Food Traceability Report, December 2002
18. Clendenin, Evolving Food Supply Chains, on the internet: www.iclogistics.com as visited August,2005
19. Acharyulu, AVR, and Ajoy Mathew, Agricultural Supply Chains in India – a Pan-Indian Perspective of few spices and condiments and fruits, ISCAN, Issue 1, Vol.1, November, 2005
20. Acharyulu, A V R., Indian Agricultural supply chains and market information systems, 9th International Conference of Society of Operations Management, Pondicherry, November, 2005.
21. Kocabasoglu, C., and Suresh, N.C., Strategic Sourcing: An Empirical investigation of the concept and its practices in US manufacturing firms, *The Journal of Supply Chain Management*, (forthcoming), 2005
22. Mandyam Srinivasan, 14 Principles for Building & Managing the Lean Supply Chain, South-Western Educational Pub; 1 edition (October 26, 2004)
23. Raynaud Emmanuel and Egizio Valceshini, Governance of agri-food supply chains as a vector of credibility for quality signalization in Europe, 10th EAAE Congress, August 2002, Zaragoza, Spain