

Value Chains of Agricultural Commodities and their Role in Food Security and Poverty Alleviation – A Synthesis

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Background

Agri-food systems are undergoing rapid transformations and the emergence of integrated food supply chains is one of the most visible market phenomena in India. Increasing concentration on processing, trading, marketing and retailing is being observed in all the segments of supply chains. The traditional way of food production is being replaced by practices more akin to manufacturing processes, with greater co-ordination across farmers, processors, retailers and other stakeholders in the value chain. Further, with increase in income, the pattern of food consumption is changing. Demand for high-value commodities like fruits, vegetables, livestock products, fisheries and edible oils is growing and farmers are trying to diversify their production systems accordingly. On the other hand, consumers are becoming more demanding in terms of quality and safety of food commodities. In addition, demographic and income trends are inducing more enlightened consumers to demand convenience foods such as frozen, pre-cut, pre-cooked and ready-to-eat items, together with assurances of product quality and safety. Consequently, production, processing and distribution systems are adapting to such changes.

Organization of agriculture along the value-chain framework has been conceived as one of the strategies to bring more efficiency in the agricultural sector. The value-chain network may be defined as a range of activities that are required to bring a product from its conception, through its designing, sourcing of raw materials and intermediate inputs, marketing and

distribution, to the final consumer. There has been an increasing emphasis on the development of efficient agricultural value chains in India and several innovative and successful value chains have emerged.

These emerging trends though indicative of catering to the expanding consumer base with growing wealth, have generated concerns on the supply as well as demand side. In the case of modern integrated value chains, producers gain from increased knowledge, better quality and food safety, reduced costs and losses, higher sales and greater value-addition in production. However, there are apprehensions about the capability of smallholders to adjust to the emerging environment because of several operational constraints they face in production and marketing. Globally, one of the most controversial issues about the negative impact of the rise of modern value chains is on income equality. Several studies have suggested that the poor will suffer from this process (Elizabeth *et al.*, 2000). However, recent researches have brought in another side of the argument by suggesting that the emergence of modern food value chains has improved linkages between buyers and poor farmers in the developing countries, which have turned out to be beneficial for the smallholders (Dries *et al.*, 2004; Minten *et al.*, 2007; Maertens and Swinnen, 2006; BIRTHAL *et al.*, 2007).

It is with this background that the Agricultural Economics Research Association (India) decided to deliberate on some of the issues pertaining to the value chains of agricultural commodities and their role in food security and poverty alleviation and accordingly selected the topic “Value Chains of Agricultural Commodities and their Role in Food Security and Poverty Alleviation” for its 18th Annual Conference held at National Academy of Agricultural Research Management (NAARM), Hyderabad.

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The outlines provided to the contributors visualized the value chains as a strategy for enhancing food security as well as alleviation of poverty of the stakeholders in the chain. Not to be confused with the familiar analysis of costs and returns of stakeholders involved in a particular value chain, the latter, perhaps erroneously, got more attention from the contributors. The value-chain framework begins with a different premise than used traditionally in most economic analyses. In this case, the focus is on the functions performed, and not on the firm or the economic agent that performs these functions. Judged on these criteria, many papers fell short of presenting a value chain analysis of a given crop/commodity. In spite of these limitations, the response from the paper writers was overwhelming and seventy-six papers were accepted for discussion at the Conference. These papers analyzed a wide range of issues pertaining to value chains of different agricultural commodities. A diverse spectrum of issues emerged from the submitted papers. A synthesis of these papers has been organized under the following sections: (i) Value chains of foodgrains and other cash crops, (ii) Value chains in fruits & vegetables, (iii) Value chains in livestock products, (iv) Value chains in fisheries, and (v) Role of technologies in the value chains

The salient issues discussed at the Conference as well as recommendations have been mentioned at the end of this synthesis paper.

I. Value Chains of Foodgrains and other Cash Crops

Development of agricultural sector has a strong impact on reducing poverty and enhancing food security. Organization of agriculture along the value-chain framework is one of the ways to realize the full potential of this sector. In total, 20 papers were received for presentation under this sub-theme. The authors have addressed different aspects of value chains in respect of cereals, pulses, millets, spices, cash crops, and bio-energy crops, among others. Their findings are summarized in the following paragraphs.

Krishna and Hanumanthaiah have analyzed price spread of cotton in different supply chains in the Warrangal district of Andhra Pradesh. They surveyed 90 small and medium farmers, and identified four important marketing channels of cotton. The farmers received highest share of consumer's rupee in supply

chain IV (96%) in which the Cotton Corporation of India (CCI) purchased cotton directly from the producer and lowest share was in supply chain I (88.2%), wherein the role of village merchant was prominent. The majority of farmers adopted supply chain IV because of higher price and low marketing costs. Cotton has also attracted successful commercial application of biotechnology. **Bala Krishna et al.** have brought out the positive impact of Bt technology in enhancing cotton yields in Andhra Pradesh. Based on secondary data, the analysis has shown that the Bt cotton area had increased to 85 per cent of the total area under cotton cultivation in the state of Andhra Pradesh. The authors have concluded that Bt cotton technology has indeed increased productivity and profits of farmers and eliminated the need for excessive use of chemical pesticides.

Soybean is considered a highly nutritious crop and is a good source of proteins, fibres, vitamins and minerals. **Kaur and Kaur** have examined the scope of value addition in soya products in Punjab. Due to low demand, capacity utilization of the sampled processing units was found very low. The authors have concluded that there is good scope for food processing industries in Punjab, but presently the level of acceptance of soya products by the consumers is comparatively low. **Farkade et al.** have assessed the potential for soybean oil processing through co-operatives in the Vidarbha region. Among the different size groups of processing units, the benefit-cost ratio has been found more or less same for medium (1.13) and large (1.15) processing units, and all types of processing units have good capacity utilization (>96%). It shows a good scope for establishing soybean oil processing units in the Vidarbha region. Another paper by **Farkade et al.** has analyzed trends in market arrivals and prices of soybean in the Vidarbha region. Most of the districts have reported higher growth rates in area, production and productivity of soybean. The index number analysis has indicated a negative relationship between the arrivals and prices of soybean in the selected markets.

Wankhade et al. have found that value addition in *tur dal* over raw *tur* was 19 per cent in the Akola district of Maharashtra, and *tur* processing enterprise has been found to be a profitable venture. **Sinha and Kumar** have assessed how innovative technologies, institutions and policies could help in developing a value chain for *tur* growers. They have analyzed NCDEX

SPOT market in the Gulbarga district of Karnataka, and have found that with the help of NCDEX SPOT, *tur* grower-farmers were able to reduce the marketing cost by 50-70 per cent, incurred small charges for warehousing and realized about 5-10 per cent higher price for their produce as compared to the traditional APMC market. **Gauraha *et al.*** have highlighted positive role of regulated markets in the development of value chains of agricultural commodities.

Vitonde *et al.* have explored the feasibility of paddy processing for different products in the Gondia district of Maharashtra, and have found that benefit-cost ratio for small, medium and large rice mills was positive (>1.50). **Rama Rao** has assessed the scope for value addition in various consumable products of sugarcane in Andhra Pradesh. A mere change in the form of jaggery, from lumps to cubes, has resulted in an additional income of ₹ 1500 per quintal.

Millets are nutritiously rich and at par with other fine cereals but lack technological backstopping for realizing higher incomes. **Dayakar Rao *et al.*** have studied the impact of innovations in value chain on sorghum farmers. The technological backstopping of sorghum cultivation with end-product specific improved cultivars realized 51 per cent rise in incremental net income (₹ 16098/ha) for the participating farmers. The benefit-cost ratio worked out in favour of *rabi* sorghum (1:7.5) vis-à-vis *kharif* sorghum (1: 4.2).

Loksha *et al.* have examined production and marketing of groundnut in the Raichur district of Karnataka. TMV-2 is the ruling variety occupying 85 per cent of the area in the district with average yield of 725 kg/ha. However, the existing seed supply system could meet only 7 per cent of the seed requirement, and there was a need to strengthen the existing seed supply system for speedy seed multiplication and distribution of seeds.

Pal has studied lac marketing in the Kanker district of Chhattisgarh. The study has revealed that there is a tremendous scope for increasing the profitability of lac growers in the study area by group marketing, co-operative marketing, establishment of processing units in the lac production catchments, provision of infrastructural facilities for marketing, strengthening of market extension network and promotion of quality consciousness amongst farmers, traders and manufacturers of lac.

Kumar and Kapoor have attempted value chain analysis of coconut in Orissa. Marketing channels have been found to be well established in the state, particularly in the coastal areas. But no major value addition (by changing the form of product) is being done by the players at any level. **Dixit *et al.*** have examined the impact of technology of extraction of apricot kernel oil from apricot stone. The economic efficiency indicators (NPV, IRR and B-C ratio) have been found quite attractive. This technology has been found superior to the conventional practices (traditional *kohlu*) on account of higher recovery (11%) and lowers costs (22.4%). The mechanical decortications could save not only time and money but also reduced women drudgery.

India is the largest producer, processor, exporter and the second largest consumer of cashew nut in the world. But, the low productivity level is the major constraint in increasing cashew production in India. **Ramanathan *et al.*** have estimated technical efficiency in cashew production and cost of processing of cashew nut in Andhra Pradesh and Tamil Nadu. The results show that the sample farms could increase cashew output by 18 per cent (HYVs) and 24 per cent (traditional varieties) in Tamil Nadu, and 16 per cent (varietal orchards) and 21 per cent (traditional varieties) in Andhra Pradesh through proper adoption of technology without the use of additional resources.

Dhaka and Poonia have shown that farmers' capacity building activities resulted in enhancing the farm incomes and improving performance of coriander value chain in the Bundi district of Rajasthan. **Singh *et al.*** have assessed value addition by a turmeric processing unit run by Farms Produce Promotion Society (FAPRO) in the Hoshiarpur district of Punjab, which handled nearly 72 per cent of the turmeric powder. The major constraints confronted by the growers were : severe infestation of weeds, seed unavailability, scarcity of FYM and labour, lack of market information and highly volatile prices.

Sivaramane *et al.* have examined growth, instability and competitiveness of tea exports from India. Tea export from India is gradually on the decline and is losing competitiveness to the newly emerged competitors like Kenya and China. Measures such as value-addition, developing brand image on geographical indication, better packaging and improving productivity through technological improvement and extension services have been suggested to augment tea export from India.

Increasing focus is being given to the development of bio-energy as a potential future source of energy, and jatropha has emerged as a prominent feedstock for bio-diesel production. **Shinoj *et al.*** have carried out economic assessment of the upcoming jatropha-based biodiesel value chain in the country. They have found jatropha cultivation to be an economically viable proposition in the long-run provided initial government support is available till attaining the break-even point to sustain farmers' interest. The existing biodiesel value chain is characterized by under-developed seed markets, sub-optimal processing infrastructure and ill-defined biodiesel distribution channels.

II. Value Chains in Fruits & Vegetables

Horticulture has emerged as the priority area for agricultural development in India. During the past one and half decades, the sector has been consistently receiving increasing attention and it is being promoted as a means of agro-diversification strategy for the second Green Revolution in Indian agriculture. It is providing the much needed impetus to the growth of agricultural sector through increase in trade, income and employment. The horticultural sector comprising fruits, vegetables, flowers, plantation crops, spices, and medicinal & aromatic plants contributes over 30 per cent to the country's agricultural GDP. India is the world's second largest producer of horticultural produce. However, only an insignificant proportion of horticultural produce (2-3%) is processed, and the post-harvest losses across horticultural commodities are alarming (25-30%). The sector is constrained by low productivity, large post-harvest losses due to inadequate storage, cool chain and transport infrastructure, and inefficient supply chain management (SCM). The development and promotion of efficient value chain is critical for the accelerated development of this sector and for ensuring distribution of substantial gains among the value chain participants.

A total of 15 papers were selected under the sub-theme supply chain management in horticultural commodities for discussion at the Conference. The papers submitted have covered the major vegetables like potato, onion, tomato, cauliflower, okra; and a few fruits like grapes, sweet orange, and pineapple for examining issues related to value chains in these crops. Of the 14 papers, two have looked into the export competitiveness of fruits and vegetables, and one is on

rose cultivation. The salient findings of these papers are summarized below:

Sidhu *et al.* have analyzed the supply chain of onion and cauliflower in the Patiala district of Punjab. They have shown that cultivation of onion was more profitable (₹ 74,597/ha) than of cauliflower (₹ 38,072/ha). These vegetables were being disposed-off mainly through commission agents / wholesalers (more than 90%), followed by retailers and consumers. Study has suggested that efficiency of the prevailing marketing channels could be improved by integrating with the organized retail chains and modernizing vegetable marketing system. The study has also analyzed market integration and has found that markets of Pune, Ludhiana and Patiala for onion; and of Shimla, Ludhiana and Patiala for cauliflower were integrated. The highest elasticity of price transmission was found between Ludhiana and Patiala markets with about 90 per cent price change in Ludhiana market getting transmitted to Patiala market. It was 100 per cent for the cauliflower between Shimla and Patiala markets. Also, price transmission was faster in cauliflower than in onion. In another study, **Saha *et al.*** have examined the supply chain system prevailing in vegetables marketing in the Ranchi district of Jharkhand. Analysis has shown that across farm-size, farmers preferred a short marketing channel (producer—consumer/or producer—retailer—consumer) for disposing perishable vegetables like okra, cauliflower and tomato; and a relatively long marketing chain (producer—wholesaler/commission agents—retailer—consumer) for semi-perishable vegetables like potato and onion. The producer's share in consumer's rupees was higher in the short marketing channels. The persistence of large yield gap II (50–60%) in production of vegetables at farmers' field suggested the need for higher adoption of quality hybrid seeds to bridge the yield gap and increase income of vegetable growers.

Chandrashekar and Murthy have studied the functioning of Horticultural Producers' Cooperative Marketing and Processing Societies (HOPCOMS) in the Mysore City of Karnataka. The HOPCOMS deals with fruits and vegetables, and accepts only quality produce from the member-producers on indent basis. The Society sells collected produce through three channels: retail outlets, processors, and society outlets. Overall, the producers received 80 per cent of the price paid by consumers. Functioning of HOPCOMS has

been rated 'good' by the majority of farmers (71%) and consumers (69%).

Supply chain in marketing of sweet orange in the Nalgonda district of Andhra Pradesh has been analyzed by **Prasad and Hanumanthaiah**. Analysis has revealed that pre-harvest contractor was a key agent in production and marketing of sweet orange. The direct sale of produce between producer—consumer / or producer—wholesaler—consumer was rather low. Though the marketing efficiency was higher in the short market chain, but because of risks (both production and marketing) producers preferred to involve pre-contractor right from the beginning of production to disposing-off the produce.

Ali and Nath have examined the adoption of post-harvest techniques (PHT) like cleaning & washing, sorting & grading, preserving & cooling, dehydrating/drying, packaging, labelling, and storage for value addition in vegetables value chain in eastern Uttar Pradesh. The adoption of cleaning & washing, and sorting & grading was found quite high (50%), while the adoption of other practices varied from 3 per cent to 25 per cent. Age, education, income, landholding-size, credit availability, and market linkages have been found the important factors to influence adoption of modern technology, including post-harvest practices.

Hatai and Raju have analyzed the supply chain of pineapple in West Garo Hills of Meghalaya employing both production and marketing information. The majority of pineapple growers were of small (50%) and medium (33%) farm-size categories. Small farmers preferred selling their produce directly to retailers, while medium farmers sold directly to consumers. The net price received by producers was higher in the long market chain with lower share in consumers' price. The study has suggested promotion of producers' cooperative, access to credit facility, availability of market information and insurance mechanism as measures for boosting production of pineapple in the area.

Gajanana et al. have analyzed market potential and linkage development for underutilized fruits like aonla, tamarind, karonda, citron, jackfruit, etc. in Karnataka, Maharashtra and Gujarat. The under-utilized fruit products like citron pickles, tamarind paste and jackfruit chips in Karnataka, and Maharashtra, the products of aonla (pickles, squash, supari) and tamarind

(like concentrate, pani-puri mashala) in Maharashtra and products of aonla and ber in Gujarat were available, but in small quantity. The consumers have shown willingness to accept these products provided product details and related information are properly labelled. The economics of producing products from under-utilized products has been found profitable in all these three states.

Reddy et al. have analyzed the emerging retail chains in fruits and vegetables in Andhra Pradesh. The study has revealed that apart from the traditional retail chain, quite a few organized retail chains like Food World, Spencer, Food Bazaar, ITC Choupal, Reliance Fresh, Heritage Fresh, Subhiksha, etc. have emerged around the Hyderabad city. The organized retail chains were shorter than the traditional chains, and farmers linked to organized retail chains could receive higher prices for their produce. This may be attributed to factors like technical guidance, availability of inputs, reduction in transaction cost and risk in price and production. Study has also revealed that opening of modern retail chains has attracted consumers' attention due to increased income and growing consumers' awareness about product quality.

Singh et al. have examined the supply chain management in cut flower of anthurium in Mizoram. Financial analysis has indicated that anthurium enterprise was profitable. Though the establishment cost was higher in the hi-tech planting, the quality of the anthurium harvested in hi-tech was superior than those planted in the shade house besides a regular supply throughout the year. About two-thirds of the total cut flowers of anthurium produced in Mizoram were marketed outside the state through a Bangalore-based exporter, ZOPAR Export Ltd. and the remaining were consumed in the state. The authors have argued for further strengthening of public-private partnership for the development of model SCM of horticultural crops in the NEH region.

Kale et al. have analyzed the value chain management of Abhinav Drakash Utpadak Sahakari Sanstha Maryadit, Agar in export of grapes from western (Ahmednagar district) Maharashtra. About two-third quantity of the grapes handled by Abhinav was exported. Eighty-seven per cent of the total export from Abhinav was to the gulf countries and the remaining 13 per cent was to Netherlands and UK. A higher export to the gulf countries was attributed mainly

to the absence of residue testing in those countries. The study has revealed that export of grapes to high-value markets like UK and Netherlands could be increased by cultivating the in-demand varieties along with improvement in quality and safety attributes. Also, grape growers should be updated regularly on the changing government policies and market prices. Another study on supply chain analysis in raisin making in western Maharashtra, reported by **Jadhav et al.** has shown that about 3-4 per cent of the total grape production was used for making raisins, and 96 per cent was sold as a fresh fruit in the market. Almost all the raisin producers (94%) sold their produce in the regulated market through the following market chain: producer—wholesaler/commission agent—retailer—consumer. The net profit per kg of raisin (₹ 15.92) was more than double than of grapes (₹ 7.19). The producer's share in consumer rupee was also higher in marketing raisin (64%) than grapes (50%). However, because of limited marketing opportunities, farmers preferred selling grapes.

Siddayya and Atteri have examined export competitiveness of fresh fruits (mango, grapes and banana) and vegetables (potato, onion and tomato) from India to the traditional importing countries. Based on the values of NPC, EPC, ESC and DRC, the authors have concluded that India has the comparative advantage in production of these fruits and vegetables. However, the interpretation of EPC seems to be erroneous and the conclusions are totally divergent from the empirical findings of this study.

Shah has assessed the trading pattern of grapes in the domestic and export markets under the soft loan scheme (SLS) of National Horticulture Board (NHB). Results have shown positive impact of the scheme in terms of increase in export trade, yield, reduction in post-harvest losses, and more remunerative prices to farmers in both export and domestic markets. To further improve the efficiency of SLS, study has suggested timely availability of credit, financing of entire project cost, regular electricity supply to processing plants, provision of foreign market intelligence, etc. to the grape farmers.

Wani et al. have analyzed integration of production, processing and marketing of vegetables in the Kashmir valley. The majority of vegetable growers are smallholders and have tiny marketable surplus. The analysis has highlighted the income augmentation

opportunities through processing of vegetables whereby profit could be more than doubled as compared to the fresh produce. The authors have argued that the incentives provided by the Government of India in the form of subsidy for the establishment of infrastructure in terms of parks for processing and promotion of contract farming should be utilized for effective post-harvest management of vegetables. The availability of institutional crop loan to the vegetable growers at lower cost should be ensured. This would protect them from being exploited by contractors and distress sales. Moreover, education facilities may be provided on priority basis in order to help tap better marketing opportunities by the vegetable farmers of this area.

Kaviarasan and Singh have studied backward and forward linkages in rose production in Tamil Nadu. Analysis has shown that the majority of rose farmers were small and marginal (83%) and shared two-thirds of the cropped area (68.5%). These farmers allocated about 7 per cent of the cropped area under rose cultivation. The average total cost of rose cultivation was ₹ 2.20 lakh/ha, and net return was ₹ 1.26 lakh/ha. The planting material cost was 50 per cent of total cost, and the planting material was supplied by the traders. The mean technical efficiency level was reported to be 78 per cent and all the rose farmers were above 20 per cent of technical efficiency level. This testified the remunerative nature of rose cultivation. Production of rose being labour-intensive, indicated high employment potential. The study has suggested some value chain activities such as development of long stem, high-yielding and pest and disease resistant rose varieties, adoption of integrated pest and nutrient management technologies, insurance and forward contracts, loan facilities at lower interest rates, women labour empowerment, establishment of processing units around the production centres and cool chain facilities at affordable prices and strengthening of the marketing channels to develop competitive edge and add values in rose production.

III. Value Chains in Livestock Products

Livestock has been recognized to play a strategic role in promoting rural growth and reducing rural poverty in India. Promoting growth and increasing efficiency in production and marketing of livestock products have been the overarching concerns of Government of India. The establishment of an efficient

value chain is more important for the livestock products, which require immediate transportation from farm to consumption centres or storage or conversion into less-perishable forms. Further, value chain approaches can play a significant role in characterizing the complex networks, relationships and incentives that exist in the livestock system. On this sub-theme, 15 papers were accepted for discussion in the Conference. Out of these 15 papers, 8 were devoted to the analysis of issues pertaining to the value chains of milk and milk products and 5 papers have discussed value chains of the poultry sector. The remaining papers are focused on animal and fodder marketing chains. The salient findings of these papers have been presented in this section.

A comparative analysis of costs on milk procurement, processing, manufacturing and marketing of dairy products in the co-operative and private dairy plants in Tamil Nadu has been conducted by **Babu and Verma**. It has revealed that procurement cost of the co-operative dairy societies was higher than of the private milk collection centres. However, the co-operative dairy plant was more efficient in the manufacturing of toned milk, standardized milk, full cream milk and ghee, whereas the private dairy plant had an edge in manufacturing of butter and skimmed milk powder.

In a study on milk marketing chains and their implications for farmers and traders in Bihar have been investigated by **Anjani Kumar**. The study has shown that despite growing presence of modern milk supply chain, the traditional milk supply chain is still in dominance in Bihar. The traditional milk marketing seemed to offer good opportunities for the small and resource-poor milk producers and traders. The author has argued that the traditional milk sector should be addressed in a constructive manner and appropriate policies should be evolved, which may allow the informal players to improve their performance including quality control and integration with the emerging modern milk supply chains.

The broader perspectives of value addition in the Indian dairy sector have been discussed by **Singh and Dutta**. They have highlighted the potential for value addition in milk through manufacturing of different types of dairy products. In another study on broader dimensions of dairy value chain, **Chaudhary et al.** have highlighted different tenets of the organized sector approach for a successful dairy value chain. The case

study of a successful dairy value chain developed by the self-help group in the Seoni district of Madhya Pradesh has been presented by **Shrivastava et al.** The process of farmers' group formation and the economic impact of developing a dairy value chain have been highlighted by them. They have demonstrated that the farmers could get better returns on developing value chain through a self-help group. **Rai and Rai** have conducted economic analysis of dairy marketing in Kanpur, Uttar Pradesh. They have analyzed producer's share in consumer's rupee under different channels in different seasons. The producer's share in consumers rupee has been reported to be 80–98 per cent in these milk marketing channels.

The entrepreneurial behaviour of dairy farmer in the Bareilly district of Uttar Pradesh has been examined by **Kumar et al.** They have used principal component factors analysis to find various dimensions influencing the entrepreneurial behaviour. The study has revealed that most important factors such as management orientation, farm decision making, leadership ability, achievement motivation and self-confidence had higher factor loading. The technical efficiency of dairy farming of members of a co-operative and non-members in Haryana has been estimated by **Surender Singh**. The mean technical efficiency level of dairy co-operative farmers has been found considerably higher (79%) than of non-member dairy farmers (66%).

Worldwide poultry meat is the fastest growing component of global meat production, consumption and trade, with developing and transition economies playing a leading role in its expansion. The poultry development in India has taken quantum leaps in the past three decades. Much of the success of the poultry sector is attributed to greater vertical integration among the stakeholders of poultry value chain. Only a few papers have discussed the implications of institutional innovations in the poultry sector in India.

The broiler supply chain in the national capital region of Delhi has been studied by **Gangwar et al.** They have assessed the marketing cost and price spread of different channels of organized and un-organized poultry value chains. It has been found that the producers received a larger share of consumer rupee in the un-organized sector as compared to that in the organized sector. The study has also assessed the pros and cons of manual dressing vis-a-vis mechanical processing of broilers and has also estimated the cost of processing in the two systems.

The gains of value chain through poultry contract farming have been highlighted by **Navadkar et al.** After presenting a brief overview of the contract companies active in Maharashtra, they have compared economics of contract and non-contract poultry farmers. The per unit return has been reported to be higher in the case of contract farmers than non-contract farmers.

Institutional innovation in the form of contract poultry farming in Andhra Pradesh has been studied by **Reddy et al.** Specifically, the case study of Sugna food has been elaborated. They have argued that the gains to the contract growers in comparison to non-growers were much higher. The contract farmers were reported to shift their risks to the contractor and were also able to have better access to latest technologies and know-how.

The import, export and price competitiveness for eggs in India have been estimated by **Singh et al.** The authors have computed the domestic as well as international competitiveness and have conducted that India has comparative advantage in exporting eggs to many countries including Germany, Indonesia, Denmark, Korea, South Arabian, Japan, etc.

The role of poultry value chain in food security and poverty reduction in India has been discussed by **Kalamkar.** In this study apart from description on trends and changes in poultry production and consumption, the role of poultry in income and employment generation has been discussed.

An interesting analysis of fodder value chain in Bihar has been presented by **Jha et al.** The study based on rapid appraisal has highlighted the market of fodder and the actors involved in the fodder trade in the state. The producer's share in end-users' price has been estimated for different fodder marketing chains. The constraints of fodder marketing and suggestions for their management have also been indicated by the authors.

The sustainability issue in inter-state movement of *murrah* buffaloes has been examined by **Kumar et al.** based on urban dairy farms in Hyderabad. They have highlighted the important supply chains for inter-state movement of *murrah* buffaloes. The price fixation mechanism in the supply chain has also been discussed. The constraints perceived by urban dairy farmers in Hyderabad have been briefly discussed. The incidence

of slaughtering of superior buffaloes and calves resulting into loss of precious germplasm need to be addressed on high priority basis.

IV. Value Chains in Fisheries

Fisheries have emerged as one of the sunrise sectors of Indian agriculture. The contribution of fisheries to the agricultural economy has been rising consistently. However, the understanding about the fishery value chain is limited. Seven papers were accepted for discussion under this sub-theme.

Most of the papers in this section have dealt value chain analysis from the economic prospective. The lessons learnt from the innovative institutions involved in the marketing of fish and fish products in India have been highlighted by **Ganesh Kumar et al.** These innovative marketing institutions could bring economies of scale and technological innovations, better market and credit access and greater degree of vertical co-ordination among the stakeholders. The wider application of such marketing institutions, particularly the self-help groups, producers associations, co-operatives and the private sector would be helpful to improve efficiency of fish marketing in India.

The issues pertaining to supply chain management in sea food export along with its domestic marketing in India have been discussed by **S. Latha.** In this descriptive study, the role of actors along the fish supply chain has been explained. Functioning of some of the organized retail chains engaged in marketing of fish and fish products has also been illustrated.

Tuna is known as the chicken of sea. The potential for value addition in this species has been illustrated by **Prabakar and Sundaravaradarajan.** The authors have argued that the tuna processing industries can create significant business opportunities for the unemployed coastal zones. The economic analysis carried out for assessing economic feasibility of setting up a tuna processing firm, has suggested it to be a successful business venture. The initial investment has been estimated to be of one million rupees which would be paid back within a period of 3 years.

The challenges and lessons learnt from establishing a viable fish value chain based on a success model have been described by **Gopal et al.** The study has analyzed the impact of intervention carried out under the NAIP sub-project on "Responsible Harvesting and

Utilization of Selected Small Pelagics and Fresh Water Fishes”. This intervention formed the cluster of fisher women for operation and management of a community-based processing facility. The intervention is still going on and a review of the interventions has revealed encouraging signals. Apart from economic gains, the interventions are expected to enhance social gains also. For instance, the increasing women’s participation in cluster formation would lead to empowerment of fisher women in the area.

A comprehensive analysis of structure, conduct and performance of value chain in seaweed farming in India by **Krishnan and Narayanakumar** has shown that committed and synergistic productions, marketing and institutional arrangements enabled by co-operative leadership could reduce the transactions cost. This study has analyzed different types of seaweed value chains. The strengths and weaknesses of different value chains have been highlighted in the study. The pros and cons of governance of different value chains have also been adequately mentioned.

The price spread and marketing efficiency of the selected marketing channels of marine fish marketing in Ratnagiri, Maharashtra has been studied by **Singh *et al.*** The price spread and marketing efficiency of pomfret and ribbon fish have been estimated in this study. A comparison of composite index of different channels has helped in identification of the most efficient marketing channels.

Gunakar *et al.* have studied the supply chain system of input supply in a highly risky production environment and the role of a cooperative society in the management of land and other resources. They have presented the success story of a fisherwomen cooperative society in coastal Karnataka.

V. Role of Technologies in Value Chains

Small landholdings, inadequacies in availability of inputs, poor extension and infrastructural support and insufficient marketing avenues are the primary reasons for low crop productivity in India. However, it is believed that changes in institutional arrangements along with availability of new technologies and modern information and communication modes play an important role in the economic growth of the country. They also play an important role in the development of agricultural sector and improvement in the income levels and livelihood situations of the farmers.

In this session of the Conference, there were 19 papers. The section focused on the use of ICTs in evolving value chains of agriculture. Case studies have been presented on the application of ICTs in the value chains. Also, a discussion has been presented on how different agencies or stakeholders impact value chains by reducing transaction cost and improving market efficiency. Lessons learnt from the case studies of value chains in agriculture; issues, challenges, opportunities, and policy implications have also been presented in the papers selected under this session. The summary of the papers under session V is presented below.

Sahoo in his paper on global markets and local players — a value chain system of collaborative strategies—has made an attempt to integrate small farmers and corporate sector and has tried to establish a link between small farmers and global market through an effective value chain system. He has debated on the role of various players in the value chain and how the government, keeping the interests of the farmers in view, can facilitate greater participation of the corporate sector through appropriate policy framework. The paper has highlighted that infrastructure, credit flow, marketing facilities, insurance cover, price structure and information flow are the constraints to such integrations.

Mahalakshmi and Krishnan have evaluated the e-marketing system in the aquaculture value chain. In this paper, developmental impact and measurement of information dissemination have been evaluated using Sen’s capability and Brown’s information-based approaches, respectively. The paper has observed that quality of service as a component of value chain is very important for e-marketing yet very difficult to assess due to its complexity and intangible nature. The evaluation results have shown that the aqua-choupal has definitely been helpful in improving human resource development directly as well as indirectly through the value chain channels of growth and productivity. It has increased the volume, coverage and diversity of information flows in the West and East Godavari districts of Andhra Pradesh. A significant improvement in service quality has been reported by the authors in aquaculture value chain as a result of e-marketing.

Jha in his paper on organic farming and sustainability of value chains has analyzed the benefits of cost-effective bio-inputs and renewable source of plant nutrients to supplement fertilizers for sustainable agricultural development. The study has revealed that

there are a number of intermediaries between producers and consumers, yet organic farming can be beneficial for marginal and small farmers because it offers an alternative market where producer-sellers can command a fair price for their produce. Also, organic products in the international market enjoy 25-30 per cent premium over inorganic products. But, lack of awareness, poor knowledge and skill of farmers coupled with financial crunch and lack of marketing facilities have been reported as some of the constraints before organic farmers.

Singh and Priya have presented a brief review of the rural ICT projects and the issues associated with the use of ICTs for rural development. The findings have indicated that ICT-use must be adequate to utilize their potential effectively in poverty reduction and rural development. This paper has also reflected on empowering of rural India and effects of ICT projects on poverty reduction and finally empowerment of the poor. The paper has concluded that the main challenges are not actually in the technology but they lie in the coordination of a disparate set of local and national factors.

Singh et al. have examined the problems of traders and agribusiness corporates in the marketing of agricultural produce and have tried to find out mechanisms to improve the market access and linkages of small and marginal farmers. A comparison of individual farmers and members of farmers' interest group has revealed that group or aggregation approach has enhanced the bargaining power of the producers. Use of private mobile phones has improved the access to market information and extension. Availability of better price information and understanding of markets have resulted in reduction of marketing costs and realization of better prices of their products.

Kumara Swamy et al. have studied various policies of the government towards retail marketing and the impact of retail sector on farming community. The study conducted in the Ranga Reddy district of Andhra Pradesh, has concluded that the corporate retail sector has a positive effect on the farming community but only when they go in for direct procurement. Indirect procurement method has not shown any impact on the farming community. **Kumara Swamy et al.** have also analysed various constraints and apprehensions associated with corporate retail sector.

Prema and Steephen have presented a case study of home shops in Kerala. The paper has outlined the establishment of "Kudumbashree" in 1999 in Kerala as a unique case of supply chain management mooted for augmenting the income of rural women and thereby ensuring their livelihood security. A 'Home Shop' is an innovative community marketing network aimed at strengthening and sustaining the production-marketing chain. The products from this initiative are procured and marketed under common brand names and with attractive packaging, so that they could compete with other branded products in the market. A survey has revealed that these shops have better acceptance among the customers with regard to acquaintance with the agent, facility for credit purchase and trust.

Kaur et al. have analyzed the cost and return structure of high-value enterprises undertaken by a progressive marginal farm woman in Punjab, and have estimated the annual net income of the farm. Attempts have been to address the production and marketing problems faced by a farmer. Farmers have been found to adopt beekeeping, mushroom cultivation, vermi compost production along with crop farming and dairying. The benefit-costs ratio of these enterprises has been worked out to be more than one, indicating positive net returns. The study has concluded that adoption of high-value enterprises is an important weapon to cut down the level of non-viability of farming.

Sharma et al. in their analysis of value chain and financial viability of agro-processing industries in Himachal Pradesh, have examined the structure, performance and economic aspects of various types/sizes of agro-processing industries in the state. A direct relationship has been observed between the size of firm and the number of backward and forward linkages. It has been found that geographical concentration of the processing industries in the state was influenced more by demand rather than by supply factors. **Asokan and Arya** have presented a case study of broiler chickens – the Saviors of hatcheries in Tamil Nadu. In the early–1990s, layer farming in Palladam, Avinashi and Pollachi around Coimbatore faced a major outbreak of disease, where farmers incurred heavy losses and gave up the activity. Within a couple of years of introducing contract growing of broiler chickens it has become popular and many farmers have taken up the activity again.

Bala Krishna et al. have examined the impact of Bt technology on pesticide consumption with reference

to Bt cotton in Andhra Pradesh. The authors have presented a bright future for Indian agriculture with the adoption of GM technology in general and Bt technology in particular. It would essentially call for many reforms, developmental strategies and institutional and policy interventions covering a wide spectrum of activities ranging from restructuring of the input markets to the output markets.

Bathla and Singh have presented a comparative analysis of gains to farmers and consumers from the organized fresh food marketing and retailing systems vis-à-vis the traditional ones. The paper has explored the likely risks to farmers, retailers and consumers in the newly emerging retailing system. Broad findings have revealed that the organized fresh food retailing has potential in enhancing farmers' income provided they are willing to make timely investments and undertake risks. However, price advantage has not appeared to be conspicuous for consumers at large due to negligible difference between the prices charged by the organized food retail chains and pushcart vendors along with high instability in prices.

Bhardwaj in his paper moving towards sustainable supply chain has highlighted that price volatility is a serious threat to a sustained supply chain of any commodity and thus his paper has captured the existence of price volatility in mustard seed over a period of time in future and spot markets. Through the GARCH model the paper has revealed the existence of persistent volatility in prices of futures as well as spot markets. **Prem Chand *et al.*** have presented a SWOT analysis of agribusiness. The SWOT analysis of this sector brings out the strengths, weaknesses, opportunities and threats for the benefit of investors in the agribusiness sector as well as policy planners for strategic planning and development of the sector.

Sunit Singh has presented a case study of potato value chains in Agra, Uttar Pradesh, where in the critical role of cold stores in improving the value chain efficiency has been elaborated. Nearly 80 per cent potatoes are being passed through cold storage for marketing. About 75 per cent farmers have been found using it as an interface between them and the buyers. Cold storage has emerged as the key player in the potato pathway and thus the paper presents a case of emerging value chains through cold storage with reduced transaction costs and lesser intermediations with improved marketing efficiency.

Pant and Srivastava's paper based on Kumaon Hills of Uttarakhand has examined the constraints in the marketing of traditional crops being faced by producer-sellers in the mid and high hills. Finger millet, barnyard millet, black soybean and horse gram crops being the main traditional crops grown by the farmers in the study area, have been selected. Garrets ranking technique has been used to rank the constraints faced by the farmers. The findings have revealed that non-availability of a nearby market place, low marketable surplus and high transaction costs are the important constraints in the marketing of agricultural products in the hilly areas. Lack of market price information to producer-sellers has been observed as a constraint in realizing better price for their traditional crop produce. Non-availability of co-operative societies has also been reported as a constraint in proper marketing of the crop produce in the area.

Sowmyashree in his paper on role of ICT in India's agricultural development has provided an overview of the prospects and challenges from ICT in the Indian agriculture mainly on increasing mobile network penetration using case studies like RML, IKSK, Fisher Friend, e-choupal and e-sagu. Through these case studies the author has established that these initiatives have helped in improving farm productivity and socio-economic development of the farmers. The increasing penetration of mobile phones will contribute substantially to farmer's growth in the future. The paper has also presented the lessons learnt from some of the failures for improvement in future.

Pandey *et al.* have addressed the issue of financial flows and have discussed how innovative payment solutions along the agricultural value chain can act as a means to greater financial inclusion. The mobile telecom revolution in India has a particular relevance in making mobile phones as a medium for transacting in a cashless environment. The paper has highlighted a business model built on a mobile-based platform for delivery of crop insurance to farmers by creating an enabling transaction environment for a farmer to access such facilities through simplistic mobile phone handset; leveraging technology to extend the convenience that will revolutionize the transaction environment for this section of population.

Indira Devi *et al.* have looked into the concept of value chain system in a different perspective, viewing farm worker capacity building similar to human

resource development, by empowering the educated unemployed work force in the state. The intervention to organize, train and assure the supply of labour in the agricultural sector has resulted in better living conditions to the members. Apart from the better socio-economic upliftment, the intervention could facilitate an increase in the coverage of paddy cultivation in Kerala.

Issues Discussed

At the global level, agricultural sector has seen increasing vertical coordination and emergence of agri-food supply chains to meet consumers' demand for quality and food safety. There are empirical evidences establishing that successful coordination in the value chain has a significant impact on cost reduction and farm-income enhancement as well as resulting in positive externalities. But, the overarching question is whether the agricultural sector has the necessary and sufficient conditions for the development of successful value chains. Under this context, the following issues were discussed at the Conference :

- What are the opportunities as well challenges for strengthening value chains in the agricultural sector?
- Can value chain development in the agricultural sector address the issue of food security and help reduce poverty for those dependants on agriculture for their livelihood?
- Are special institutional and policy reforms needed to ensure inclusiveness of the resource-poor farmers in agricultural value chains?
- What is the contribution of technology, policy and infrastructural facilities in the development of a value chain in agriculture ?
- What are the enabling factors for establishing linkages between farmers and other stakeholders in the value chain?
- Whether organization of farmers on co-operative principles would enhance their bargaining power to deal with other stakeholders in the value chain.
- What are the externalities (social, economical and environmental) generated in the commodity-specific value chains ?
- What are the conditions that would encourage a successful public-private partnership in this sector?

- What role does information sharing play in establishing or hindering the PPP for value chain development?
- How can the constraints of infrastructure, literacy and appropriate policy be removed to strengthen the supply chain?
- How can technology and information be disseminated across farmers so that that they may utilize its maximum benefits?
- What are the challenges that technology transfer and modern ICTs face in the present supply chain?
- How can a smooth supply chain lead to reduced transaction cost and improved income levels of farmers?
- How can price volatility be captured so that the supply chains can work efficiently and the small farmers are not affected by high price fluctuations?
- How can the organized retail chain, mobile banking and transmission of agriculture-related information through mobile phones be linked with efficient supply chain mechanisms?
- What lessons do we learn from the various success stories and failures in the area of agriculture to draw implications for the future?

Recommendations

The above issues were debated at length during the Conference. Since the concepts of value chains and value chain analysis have been evolving in India, the need of clarity on these issues was felt unanimously. Therefore, it was suggested that both professional societies like AERA and the national institutions like NAARM, NCAP, etc. should take lead in developing conceptual framework for value chain analysis and addressing the issues and concerns related to value chains for different agricultural commodities. Besides, several specific recommendations emerged after in-depth discussion during the Conference. Important among them are given below :

1. The institutional requirements to ensure inclusiveness of resource-poor farmers in agricultural value chains should be examined.
2. The pathways for scaling up of successful value chains should be identified.

3. The contribution of technology, policy, institutional and infrastructural facilities to the development of value chains in agriculture should be assessed.
4. The role of information in value chain development should be studied and modes to enhance farmers' access to information should be evolved.
5. There is a need to assess the roles of various externalities (social, economic and environmental) in commodity-specific value chains.
6. There is a strong need to undertake different capacity building programmes like organization of trainings, demonstrations, awareness generation, exposure visits and farmer-scientist interactions on different aspects of agricultural value chains.
7. Appropriate policy and support system should be evolved to promote the alternative sources of energy. The bio-fuel plants like jatropha should be encouraged in wastelands and unculturable lands.
8. Capacity building in the participatory risk assessment for improving quality and safety along the value chain should be encouraged.
9. Farmer-friendly communication networks should be established to transform Indian farmers from being information-poor to information-rich.
10. Strengthening of farmers' linkage with markets should be accorded high priority.
11. The role of Bt-foods in enhancing the food security must be examined scientifically and objectively.

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