

Knowledge Based Economies Study of Agriculture Value Chains in India

Mango and Pomegranate

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Knowledge Based Economies

Study of Agriculture Value Chains in India

1. Introduction

An important aspect of “inclusive growth” in the Eleventh Five Year Plan (2007-12) of the Government of India (GoI) is the target of 4 per cent per annum growth in GDP from agriculture and allied sectors. This target is not only necessary to achieve the overall GDP growth target of 9 per cent per annum, it is also an important element of ‘inclusiveness’ since the global experience of growth and poverty reduction shows that GDP growth originating in agriculture is at least twice as effective in reducing poverty as GDP growth originating outside agriculture (Planning Commission, 2010).¹ One of the strategies to achieve this growth rate has been a policy to encourage diversification towards higher value crops and livestock.

The share of high value agriculture in total agriculture (crops, livestock and fisheries) has gradually increased over the years and today it accounts for more than half the value of agriculture. This segment of agriculture is perishable in nature, and therefore needs a very different approach than has been the case in food grains. It must be recognised that development of this high value segment of agriculture will be possible only when it is pursued as a demand led strategy, closely linked to modern logistics, processing and organised retailing, all as a part of one integrated agri-system in the form of value chains.

With only about 5 per cent share in total area under cultivation in the country, fruits and vegetable account for more than 25 percent of value of output of crop sector, and about 18 per cent of the total value of agriculture output (including livestock and fisheries). The dietary transition from food grains to high value commodities such as fruits, vegetables, livestock and marine products is already observed, and is being followed by rising demand for processed and semi processed food items. Along with these trends there are growing concerns with food quality and the need to adhere with food safety norms. In responding to these evolving demand trends, and to boost export competitiveness, the Indian food system is undergoing structural change (Gulati et al., 2008).² Growing markets for these products, both for export and import substitution, presents an opportunity for farmers to diversify their production away from cereals and raise their incomes by improving crop productivity and efficiency in the value chains. On the other hand retailers’ sophisticated requirements that reverberate down the chains pose a major challenge to smallholders.

The growth of this high value segment has to be demand led, from plate to plough, and very closely coordinated between input suppliers, farmers (especially small holders by “clustering” them into groups), logistics providers (including cold storages and warehouses), large scale modern processors and organised retailers in an integrated value chain of the modern agri-system. The major players driving this change will come from the private sector. The role of government policy is to create an enabling environment for private entrepreneurs to enter this agri-system, coordinate the sourcing of their supplies from millions of farmers, and deliver them to consumers in processed or fresh forms. This requires high

¹ Planning Commission (2010). Mid Term Appraisal for Eleventh Five Year Plan 2007-2012. Available at http://planningcommission.nic.in/plans/mta/11th_mta/MTA.html. Accessed on April 12, 2011.

² Gulati, A., Ganguly, K., Landes, M. R., (2008). Toward Contract Farming in a Changing Agri-food System. ICAR, IFPRI, USDA, New Delhi.

degree of coordination all along the value chain, and only then the risks are minimised and benefits accrue to farmers, which incentivises them to produce more (Planning Commission, 2010).³

Therefore, it is being increasingly realised that in order to accelerate growth in agriculture, we need to move from farming approach to value chains, and reform the three “T”s...Investments (subsidies), Incentives, and Institutions. However, another increasingly important “T” that is emerging is Information. Use of appropriate information and the associated knowledge for improving productivity and hence incomes are increasingly becoming a game changer in agriculture practices given the role of information in altering the transaction costs of agricultural operations.

It’s not just about “providing” information, it is also about a new way of generating it through validation and feedback of all actors involved – and this would apply to full range of activities involved from farming to retail for both fresh and processed products. What is different now is the ability to provide and access useful information in real time opening the window for productivity increases throughout the chain. In the context of agriculture value chains analysis this would mean a detailed study of information flows in these chains and see how ‘business as usual’ may not be appropriate given the availability of various channels of information sharing and transfer.

These new channels may be altering the institutional arrangements in agriculture such as small farmers being “clustered” through cooperatives, or farmers clubs or contract farming etc., to create a scale in marketing their produce and acting as aggregators of information. This is important as in India, where smallholders dominate agriculture, there is concern that the transformation of the agri- food system ensures participation of these farmers and fosters inclusive growth. A key challenge is how to successfully link the farmers, particularly marginal and small farmers, with the emerging markets and deliver them the requisite information to participate in these markets

What are the service process “innovations” that reduce the transaction costs,⁴imposed by information/knowledge gaps? On the other hand what institutional reforms will integrate marginal, small and even medium scale farmers in the aforementioned growth paradigm?

The organising of the retail sector is expected to create opportunities for small holders but also potential threats to their continued access to remunerative markets. Unless the domestic supply side can be improved and current fresh produce supply chain constraints resolved, the important urban retail markets could become dominated by imported fresh produce. This has happened in Manila supermarkets, where much of the fresh vegetables are supplied from Australia and the Jakarta market, where domestically sourced vegetables prevail, but a significant volume of tropical fruit is imported from Thailand and Malaysia. In both of these cases, the inherent ability to produce vegetables or fruit that is competitive in both quality and price is not a constraint; the fault lies in the inadequacy of the supply chains (Taylor & Jones, 2005).⁵

³ Planning Commission (2010). Op cit.

⁴ Transaction costs, occasionally referred to as “hidden costs” are the observable and non-observable costs associated with exchange of goods and services. These costs arise due to the frictions involved in the exchange process as it entails transfer and enforcement of property rights. Transaction cost focuses mostly on explaining the existence and properties of alternative modes of organization and the tradeoffs among them. Mäki (1999) noted, incorporating positive transaction costs necessarily involves institutions. Mäki, Uskali (1999) “Theoretical Isolation and Explanatory progress: Transaction Cost Economics and the Dynamics of Dispute”. WP. Rotterdam: Erasmus University

⁵ Taylor, D. & Jones, Z. (2005). Fresh fruit and vegetable supply chains in India. Growth Oriented Microenterprise Development Project, ACDI-VOCA.

Changes are happening in India. Organised retailing and the success of brands such as Naamdharis, Choupal Fresh⁶ and others are successful examples of value chain development in the fresh fruits and vegetables sub sector in India. Private partnerships can play a key role in creating farm to fork linkages that can, on the one hand, satisfy the market demands for high quality and safe food, while retaining small holders in the value chain. While the private sector in India has been fast to enter organized retailing and most have definite plans for at least some kind of linkage, relatively few companies are actually reaching the farm gate (Misra, R., 2009).⁷

Information Communication Technologies (ICTs) are also increasingly been seen as a way to integrate, the hitherto excluded small farmers, into these value chains. It is expected that ICTs as instruments of knowledge/information will alter the transaction costs by (a) assisting the farmers in searching for a trading partner with whom to exchange or assist in searching for a market (b) Improve the farmer's ability to negotiate and bargain particularly when there is imperfect information regarding prices.

In this above context we propose to study mango and pomegranate value chains, recognising the high value of the output of fruits and their contribution to increasing farm incomes. In some sense pomegranate value chain shows the importance of integration with global value chains for improving farm incomes. In the case of pomegranate, growers get better price for the produce when compared with mango as there are less number of middlemen. Since, post harvest support requirement in the case of mango is greater than pomegranate the dependence on middlemen is greater and there are several middlemen who do not provide any service or add value but only book profits. This makes pomegranate value chain smaller and amenable to clustering of the small farmers with the large farmers.

Given these differences and the earlier context as outlined above we analyse the mango and pomegranate value chains on the dimensions of transaction costs of their operations (prevailing governance structures, i.e., the modes for organizing transactions),⁸ information/knowledge flows along the value chain, the extent of inclusiveness of the small and the marginal farmer in the value chain. We seek to understand what shapes the transaction costs in these two value chains. Are the costs due to (i) information and "knowledge" gaps? (ii) the incentive structures in place? (iii) due to rigidity of institutions? or (iv) due to other frictions involved in the exchange process? Having focused on these dimensions we provide some observations on how to reduce transaction costs, improve knowledge and information flows and thereby make the supply chains adequate to meet the demands of organised retail. We also explore the role of ICTs, if any, in improving the efficiencies along the value chain.

2. Study of Mango Value Chain

Mango is the most important fruit accounting for 37.60% of area (1.3 million hectares) under cultivation and for 22.21% of total fruit production (14.0 million metric tons) in the country. India's export of fresh mango has increased from USD 31.45 million (Rs.1.27 billion) in 2007-08 to USD 42.33 million (Rs. 2.01 billion) in 2009-10. The major mango growing states are Andhra Pradesh, Uttar Pradesh, West

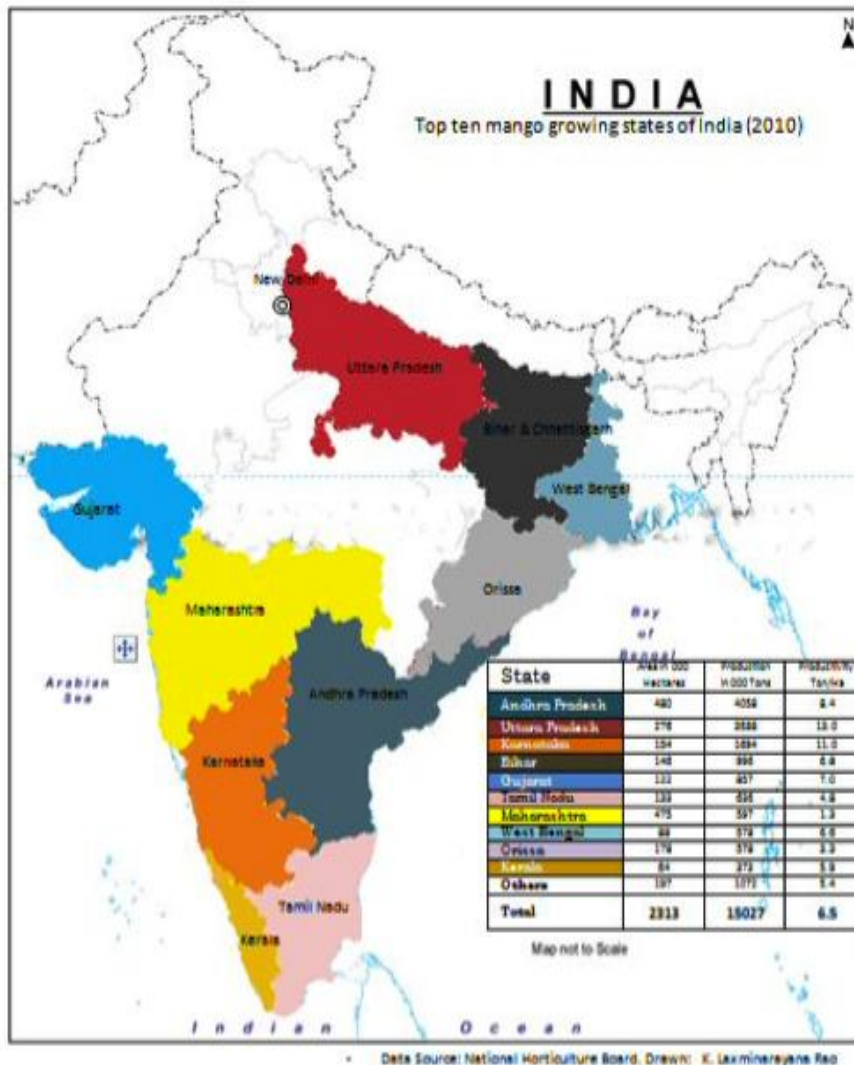
⁶ Namdhari is a seed company and retailer with contract farming scheme for local and export markets Namdhari Fresh and Choupal Fresh are the Retail and wholesale stores for Fruits & Vegetables owned by Namdhari and ITC respectively.

⁷ Misra, R. (2009). ITC choupal fresh: A case in pro poor value chains, Occasional Paper Series, No. 8. Coady International Institute.

⁸ Institutions of governance refer to modes of managing transactions and include market, quasi-market and hierarchical modes of contracting.

Bengal, Maharashtra, Gujarat, Karnataka and Tamil Nadu. Andhra Pradesh, Uttar Pradesh and Karnataka are amongst the top three producers.

Figure 1: Major mango producing states of India and their share in production (2010)



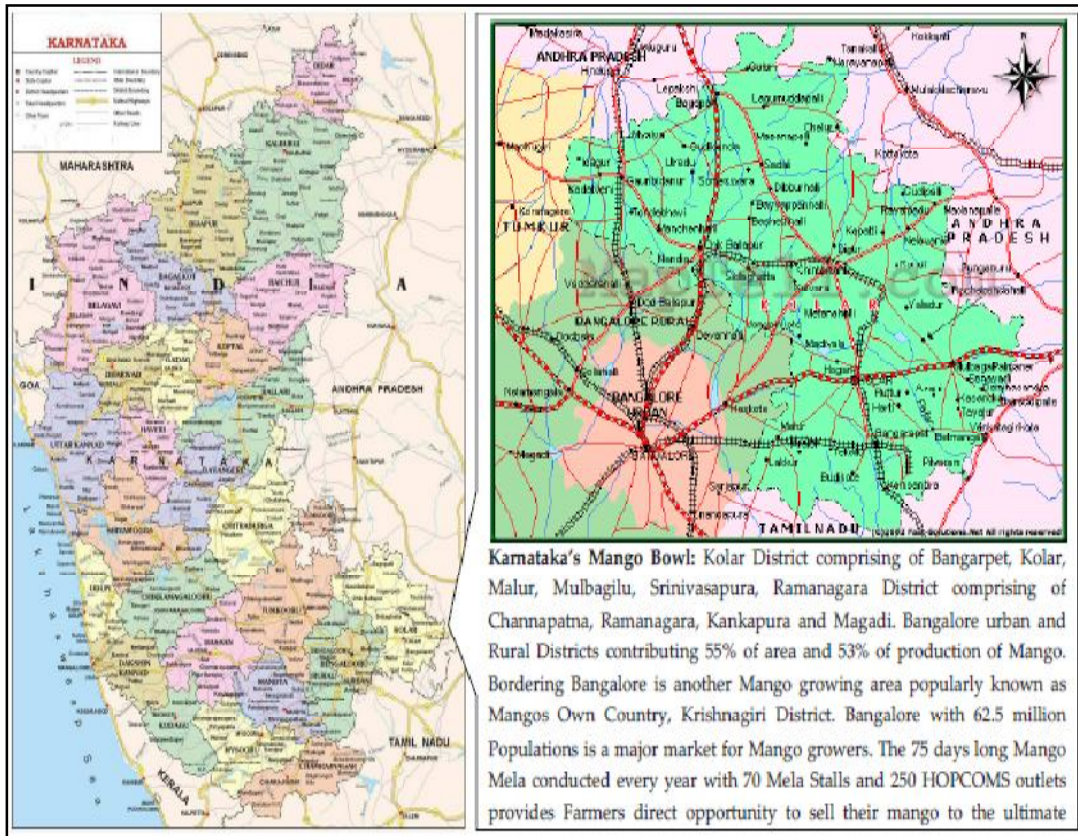
2.1 Value Chain Analysis Mango

The mango value chain can be defined as the full range of activities required in bringing mango to final consumers passing through the different phases of production, processing and delivery. In this study we analyze the mango value chain in the Kolar district now bifurcated into Kolar and Chikkaballapur districts and Bangalore rural district now bifurcated in to Bangalore rural and Ramanagar district in the state of Karnataka.⁹Karnataka ranks 3rd in terms of production of mango, with a share of 12.5% and has recorded an average productivity of almost 12 tones/hectare during the season 2010.¹⁰

⁹ Lessons from other mango growing regions like Krishnagiri in Tamil Nadu and Aurangabad in Maharashtra will also be used in the analysis

¹⁰ See Annex 1 for the methodological details for studying the mango value chain in the abovementioned districts of Karnataka.

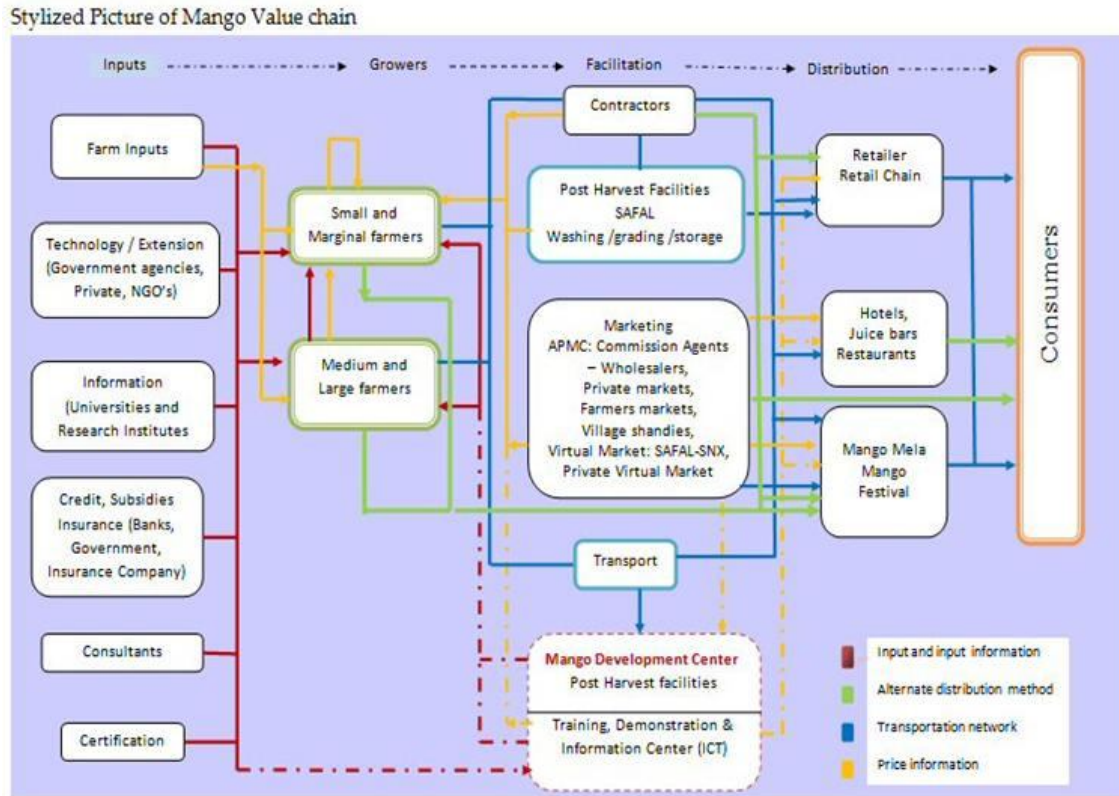
Figure 2: Karnataka Mango Bowl



2.2 Major stakeholders and the value added at each stage




The starting point of understanding the transaction costs of producing mango, and factors that can reduce the same requires a rigorous understanding of the various stakeholders and their operations along the stylized value chain as shown in Figure 3 below.¹¹

¹¹ We have categorized inputs as hard inputs and soft inputs. Hard inputs are shown as farm inputs in the diagram and these are planting materials, fertilizers, pesticides and chemicals. Soft inputs are detailed under different heads such as, technology and extension (provided by government department and NGO's), information (provided by Universities, research Institutes etc.), credit, insurance and subsidies (used for buying inputs, pay labour, pay other expenses and cover risks), consultants services (GAP and management), certification (Natural or Organic certification), traceability, and post harvest practices etc.

Figure 3: A stylized mango value chain


Farmers: Most small farmers (farmers with less than 2 hectare/5 acres land) adopt diversified cropping system particularly in dry areas / draught prone areas and do not grow mango as a solo crop. If mango is grown as a solo crop in a 2 hectare orchard, then there will be a maximum of 200 trees. Farmers supplying to exporters have global GAP certified farms. However, only 10% of the total production is of export quality and the remaining is as follows:

Figure 4: Grade wise mango production

Grade	Average Fruit Weight	% of total production
 A*	250 – 300 grams	20
 B	200-250 grams	30
 C	150 - 200 grams	40
Rejects D and below	<150 grams	10

Note: * About 50% of grade A is of export quality.

Tree crops like mango and tamarind provide income only during the season (maximum 3 months a year), thus mango is not grown as a solo crop. Mango is harvested at least 10-15 times during the season lasting 3-4 months. The volume harvested each time is less than a ton. Farmers find it difficult to transport mango to collection centres of corporate buyers since the quantity is less than the minimum quantity prescribed (1 ton by SAFAL) for purchase and are thus forced to sell at Agricultural Produce Marketing Committee, APMC, (Srinivasapur) where price is fixed by agents/wholesalers and farmers may not get remunerative price.

However, if small farmers can be aggregated these problems can be overcome and transaction costs can be reduced and the farmers can realise better prices. However, aggregation alone will not solve the problem as the biggest bottleneck or the market failure occurs on account of lumpy investments in post harvest activities, which we explain later in the next section.

Most of the farmers lease orchards to the contractors at the time of flowering or fruit setting. The price received by the farmer largely depends on the stage of the orchard at which the contract takes place. Pre-harvest contract at the advance fruiting stage fetches better price to the farmers, as the yield estimates are more realistic at this stage leading to lower output risk.

Pre-Harvest contractor (PHC):PHC is the most commonly used sales system of mangoes in the region. Most of the medium and large farmers (nearly 80% of the orchards are < 10 Hectares in size and sell their produce to PHC's under pre-harvest contract. PHCs visit the farmer's orchards during flowering as well as fruiting season. The contractors evaluate the orchard during the flowering or initial stage of fruiting and payment is done to the farmer on lump sum basis. Once the lump sum price is agreed and advance is paid to the farmer, PHC will take care of complete farm management, cost of farm management, including nutrients if required, spraying, pest and insect control, harvesting and packing and transportation at the farm gate and also bear the weather risk.

Normally small and marginal farmers with a mango orchard size of 1-2.5 hectares prefer contract at the time of early fruiting when the fruits are of very small size and the PHC's offer a purchase price to the farmer on the basis of their own estimate of quantity and quality of the expected fruit. However, the weather risk remains with farmer only.

In case of export, harvesting is done in the supervision of representative from contractor and trained persons do plucking. The fruit is plucked manually.

Post-Harvest Contractor:evaluates the orchard during the initial stage of fruiting and payment is done to the farmer on per kg basis. Cost of activities such as harvesting, packing and transportation at the farm gate are borne by the contractor.

Some small and marginal farmers as well as farmers having few mango trees (<40 trees) sell their produce to contractors who visit them when the orchard is ready for the first harvest and contract with the farmers for the duration of the season. Here again farmers bear the weather risk. Cost of harvesting, packing and transportation is borne by the contractor. Contractor will sort out good mangoes (generally fruits having a weight of 150-250 grams) and makes payment on the spot for the quantity purchased by

him. Collector will contract at least 3-5 orchards in a particular location. Price realised per kg by the farmer is slightly higher than when sold to PHC's during flowering or fruiting stage.

Small Retail Businessmen: including small retailers and roadside vendors also purchase their requirements directly from the growers, once the regular contractor harvests the quantity contracted to him. In this case the price is fixed by the grower depending upon the quantity purchased and the market price or contractor's price as the basis and the growers get about 10-15% higher price for their produce.

These retailers also purchase mangoes directly from small farmers. The mango mela organised at Bangalore and local weekly village shandies or the farmers markets in Yelahanka near Bangalore have provided opportunity to entirely new generation entrepreneurs. Farmers' market concept attempts to cut out middlemen and allow farmers to sell directly to consumers.

Purchase by Processing Units: Among the processing units that are mainly based in Bangalore only SAFAL fruit processing unit at White Field, Bangalore procures its requirements directly at the farm gate. Safal has established Safal Growers Association (SGA) in Ramangara District and collection centers in Srinivasapur and Hoskote area.

Other processors like Mysore Fruits Private Limited buy generally from pre harvest contractors and from commission agents in Mandi (located at APMC's at Bytarayanapura and at SingenaAgrahara).

APMC Market Yards: Farmers in the catchments of nearest APMC (Srinivasapur market yard, Kolar market yard, Ramanagara market yard, or mango market yards at Bangalore - Bytarayanapura and Bangalore - SengenaAgrahara) bring their produce, which is supposedly to be sold under open auction mechanism or sold at a price based on sample auction for the day. Most farmers say auctions are not held in smaller markets of Srinivasapur market yard, Kolar market yard and Ramanagara market yard and the price is fixed by the agents and grower has no say in the price fixed.

Linkage with Corporate buyers¹² (Retail Chains and Export Houses): There are two types of corporate buyers operating either directly or through agents in and around Bangalore. SAFAL, KEPEC, Reliance Fresh, HOPCOMS have established linkage with growers directly in regions of their choice and collect their requirement of mangoes through own collection centers or through farmers associations established for the purpose.

However, very small growers do not have normally the minimum quantity (1 Tonne) and quality (>150 gm weight/fruit) prescribed by the corporate buyers. They, thus, sell it to contractors visiting the grower's orchards or sell to local retailers or medium and large farmers who pool the mangoes and sell it in Mandi.

Commission agent: facilitates trade between the contractor and the wholesaler for which they charge 6-10% commission from the contractor.

¹² Retail giants like Star Bazaar (Tata group), Reliance fresh and SAFAL (A unit of National Dairy Development Board), who own retail chains as also the HOPCOMS a cooperative venture of farmers with more than 350 outlets across the state and with plans to open more outlets procure their requirements directly from the farmers. These corporate buyers have set up collection centres near growing areas with facility for weighing, sorting, grading and packing. The price paid is generally based on the day's market price and payment is made on the spot.

Wholesaler is responsible for distribution of produce to various retailers. Second level of sorting/grading has also been observed at the secondary/terminal markets. Accordingly, the produce is sold to retailers based on specific grades.

2.3 Reducing transaction costs for increasing farm incomes

Small and marginal farmers, being small, are not capable of investing alone in post harvest infrastructure. This means they cannot meet the requirements of the corporate buyers, who on one hand have a minimum quantity of 1 tonne requirement as well as have stringent requirements regarding the agriculture practices followed. Post harvest activities such as de-sapping, washing and drying, grading and packing, HWT/VHT/Irradiation (for exports), palletizing (for exports), pre-cooling and cold storage (occasionally), transportation and distribution to retailers impose huge costs and hence preclude the small farmers from being directly linked to the corporate buyers. This forces them to sell mango to local traders or contractors or in APMC,¹³ where agents fix price and are generally lower. Auctioning is generally not done at present. Small quantity and variations in quality from farmer to farmer and non-availability of grading facility are some of the reasons for not introducing auction facility at APMC.

Community/Cluster approach involving harvesting in a group followed by de-sapping, washing and grading and selling as a group would ensure quantity as well as quality required for marketing. Clustering of small farmers is possible only when all farmers follow good agriculture practices, and grow similar varieties of mango in a cluster to make the group able to supply economical quantities for transportation and meet buyer conditions. If good practices cannot be assured due to high costs of post harvest practices individually, then the farmers can impose negative externalities on the others in the group making traceability difficult.¹⁴

In the light of the above discussion, post-harvest facilities are then should be treated as an infrastructure facility, to correct for the market failure, and should be provided as a common facility. The provisioning can be either public or private, but given the nature of investment required it is unlikely to be provided by the private sector till large scale retailing becomes a norm. Once this weak link of the entire value chain is addressed with a common facility, it will hugely reduce the transaction costs of the small farmers and allow them to organize as clusters and exploit the benefits of economies of scale.

2.4 Institutional support to make the mango value chain inclusive

Having discussed the transaction costs and the mechanisms of reducing them (through clustering to create a scale in marketing and integrating the farmers with the global value chains and ensuring them better prices for their yields), we now analyse the readiness of the institutions to support the same.

¹³ At the APMC the farmers can sell without engaging in good post harvesting activities, which, however makes the mango susceptible to spoilage.

¹⁴ Even one farmer in the group not following good practices can spoil the chances of the entire group in getting good price or can make the entire lot rejected. (A merchant exporter of fresh fruits and vegetable suffered losses on account of collecting and pooling mango for export to Middle East on account of this). Transport and storage scale economies require a certain minimum to be transported by the Mandi merchant making it difficult to separate the produce based on quality, hence mixing of lots which causes spoilage. Lack of traceability further results in underinvestment in good post harvest practices. Growers from Srinivasapur who adopted good farm practices for the production of Mallika took it to Delhi on their own and reaped benefits.

Implementing Model APMC Act: Even though, Karnataka is one of the progressive states and has introduced the model Act in key areas of direct marketing, contract farming and establishment of private markets as suggested in the model Act, the implementation is slow. Private market establishment will help the farmer as well as consumer, only when proper post harvest facilities are available and transparency in pricing and quality (proper grading) are introduced and the private market takes responsibility of helping the farmer in areas like productivity improvement, orchard management, and provides post harvest facilities and transportation system. This will only happen if private or farmer association owned farmers markets are established near producing areas within driving distance of metros. However, in the absence of road network linking mango growing areas with the urban areas private initiative is not forthcoming.

SAFAL a public sector fruit and vegetable marketing and processing center has chosen Ramanagar District and Bangalore rural district as dedicated source of supply of mango for its retail operations and processing into mango pulp. SAFAL is able to procure fruits and vegetables directly from growers and introduce modern marketing system as well as post harvest facilities and do extension work and help the farmer. However, its success too has been limited due to the limited post harvest facilities it provides. SAFAL has only washing, sorting, grading, packing and cold storage facility and do not provide WHT/VHT/Wax Coating/Irradiation facilities.

Thus, a virtual mango trading exchange of SAFAL (SNX) that was procuring Alphonso and totapuri mango from Krishnagiri in Tamil Nadu, and Ramanagar and Srinivasapur areas of Karnataka suspended its operations due to complaints from customers related to quality issues. SNX exchange suspended its operations mainly because right kind of post harvest infrastructure was either not in place or farmers did not practice the right kind of postharvest operation.¹⁵ Thus, until the post harvest facilities in mango growing clusters is put in place and each lot is certified by the facility offering post harvest services, till then growers will not get remunerative prices. Individually, it is not viable for the farmers to do so and the private initiative is lacking due to other infrastructure constraints, the farmers are caught in a low-level equilibrium trap.

However, the dynamics of private markets will play out, albeit slowly, once the road infrastructure is in place to make it profitable for private markets with post harvest facilities to be located near the farm gate. Other suggestions that can increase the remuneration of farmers are if corporate wholesalers with or without retail chain of their own are permitted to become members of APMC and participate in auctions. Moreover, the APMC Act should permit collection centers of corporate buyers with retail chain operations as private market, if post harvest and other facilities are incorporated. Small retailers, street vendors, institutional buyers (hotels, hostels and clubs) and those who shop once a week and stock home requirement in refrigerators could be club class members for such institutions.

¹⁵ Mango growers when asked why they are not practicing good harvesting method and post harvest practice (like de-sapping, washing and drying, packing in crates) said they get the same price at the Mandi/APMC yard whether they follow the practice or not. This was due to asymmetry of information between the farmers and the buyer. Some farmers complained that even when the mango is sold to corporate buyers they manipulate the grades (example 10% A grade, 20-30% B grade and 50-60% C grade 10-15% D grade (below acceptable grade) and also deduct for wastage). Therefore unless facilities for de-sapping, washing/ drying, grading are provided and price of each grade is negotiated, growers will not be interested in following good practices.

Cluster Development Programme of MSME

These schemes provides for inclusion of growers, trader, processors in the management by making them members and contribute to the equity in Special Purpose Vehicle (SPV) to be formed for managing the common facility. The SPV can be a private limited company involving all the stake holders and can be initiated by any private individual. The facility could provide for Post harvest facilities for mango including grading and selling A, and B grades to retailers and exporters and C & D grades to processors. Facility can help increase the mango processing season by wax coating of mango to retard ripening process and controlled ripening for producing good quality pulp and also fresh ripened mango for table purpose. However, other than 2 proposals in Tamil Nadu the cluster development programme has not evinced any response in Karnataka.

Mango Development Centre (MDC)

Karnataka horticulture department is setting up a Mango Development Centre (MDC) at an investment of Rs. 190 million. The centre is a first-of -its-kind in the country. It is being set up under a centrally sponsored scheme of RashtriyaKrishiVikasYojana (RKVY), at Srinivasapur and Chintamani in Kolar district in the state. The objective is the improved production, marketing, export of mangoes from the state.

As our discussion shows that most of the transaction cost issues in the mango value chain can be addressed with the setting up of MDC providing the following facilities:

1. De-sapping
2. Washing: may include hot water treatment and fungicidal application.
3. Sorting/grading
4. Packing in corrugated boxes
5. Pre-cooling
6. Cold storage
7. Modern cold stores may be set up to store unripe mangoes. Mature green mangoes may be stored at 13 degree Celsius and RH of 90-95%, which increases its shelf life by 1-2 weeks.
8. Ripening chambers may be set up at hub for uniform ripening of mangoes.
9. Transportation in refrigerated vans to prevent wastage and spoilage in transit

The proposed MDC expected to start from June this season if started on schedule might pave the way for export of mangoes directly from Karnataka / Srinivasapur. In addition the irradiation facility even though is ready in Innova Food Park at Malur Industrial Area in Kolar District could not start functioning this year for want of permission from the agencies concerned.

Transportation and Road Infrastructure

While most of the farmers sell their produce at the nearest market yard, at times they travel to a bigger market yards in expectation of a better price and immediate payment of cash on delivery. Srinivasapur farmers have marketed mango in markets like Shimoga, Chennai and Pune. While good 4 - 6 lane roads connecting Chennai and Pune is a favourable factor, high cost of road transport does not always make

economic sense to do this in the absence of a facility to transport mango using the rail network. A mango train service is being introduced from the current year (2011 season) from mango growing areas of Maharashtra to Pune, Mumbai and Delhi, during the mango season. The mango train service will help growers to send mangoes to distant markets at a reasonable cost since the rail freight charge is almost one sixth of road transport cost per / ton/kilometre.

Mango festivals

Mango festivals are conducted in Delhi, Haryana and metro cities during mango harvesting season where buyers can taste varieties of mangoes and mango products. Growers have access to information on technologies, farm inputs and harvesting tools and opportunity to meet scientists from universities to discuss their problems in such festivals. Unlike mango festivals in other states, that is organized for 2-3 days, in Karnataka Mango Mela lasts for about 30-75 days during the peak season starting from mid April to end of June. Mango growers and the grower cooperative societies lead by HOPCOMS directly sell mango to the consumers in Bangalore (Homes, Hotels / Hostels, and Processors). However, this does not resolve the deep institutional and other complementary infrastructure problems that have an impact on the associated transaction costs.

Role of contract farming to reduce information asymmetries and the associated market failure

Currently, in the absence of any certification¹⁶ system the buyers have no mechanism to ensure that the sellers are following good farm practices. This asymmetry of information on farm practices is another source of market failure. Thus, the farmers have no incentive to invest in good farm practices especially post harvest, as it is difficult to separate farmers who follow these practices from one who do not. As a result it is not possible for the farmers to get price in line with quality, as “quality” is unobservable.¹⁷ This leads to a classic problem, bad quality crowds out good quality mangoes, till quality can be established by mechanisms such contract farming, and increasing wholesale competition through auctions. Auctioning is generally not done at present. Small quantity and variations in quality from farmer to farmer and non-availability of grading facility are some of the reasons for not introducing auction facility at APMC.

Hence, farmers sell the mangoes in bulk at the mandi. The commission agents fix prices based on the average quality they expect (taking into account spoilage etc.) Farmers are demanding for an auction or at least price fixing based on sample auction for the day to be conducted in the morning.

Some form of contract farming where, the buyer is supervising the orchard from flowering to harvesting stage can also reduce information asymmetries. In the case of tree crops like mango, with orchard life of

¹⁶ Certification for WHT/VHT treatment of mango and irradiation of mango is issued by respective Pack houses having such facilities it is already practiced in Maharashtra, and in Karnataka when once the post harvest facilities are in place growers who utilise the facility will get certificates from the respective facilities.

¹⁷ This further necessitates the establishment of post harvest facilities as a common facility. At present no one supervises the farmers creating information asymmetries about the adoption of good farm practices. Once post harvest facility is in place in the mango cluster, and the facility certifies that the mango has undergone the post harvest treatment of de-sapping, washing, drying, HWT/VHT treatment/irradiation etc as required based on importer/buyer requirement for each grade of mango the Mandi, CA/wholesaler will be willing to offer a better price as the information asymmetries have been reduced. If such certified mango when ripened does not show up sap burn on the skin and when cut does not show up the injury caused by fruit fall during harvest/ or chilling injury occurred due to inappropriate storage condition, then wholesaler in Mandi will believe the grower and offer better prices. Building up such trust between the buyer and the grower has to take place over a period of time. Formation of group (SHG's) of small and marginal farmers and providing assurance by the group leaders may speed up such trust building process.

30 – 50 years, the tree starts yielding only after 5th year and reaches full potential after 12-15 years. In such cases contract farming would mean entering into contract for a given variety and supporting all the farm activities through extension work, supervision of orchard maintenance and management of the crop after flowering, creating post harvest facility to improve shelf life and reduce wastage, controlled ripening, grading/packing storage and transportation as required. In the case of tree crops/fruits other than banana (which is an annual crop) contract farming is difficult. Therefore, companies may enter into a contract depending upon the variety they require for purchase and at best provide guidance and supervisory support from flowering till harvesting, organise grower groups and buy the crop as per specification and quantity when delivered at their collection centre or processing unit like SAFAL. Even this will be possible if the companies can achieve economies of scale and scope and do it for many fruits and vegetables.

2.5 Knowledge/Information flows

It is well recognised that increased information on farm supplies, market information on arrivals, prices and price forecasts, weather forecasts, agro technologies, information on events like training, seminars and exhibitions can greatly increase the productivity of the farmers.

Simple things such as lack of knowledge of right harvesting method and the time of harvest leads to fruit damage. De-sapping of mango fruits with lime or a mango wash can induce better returns to the stakeholders by controlling sap injury and improving the cosmetic look of mango fruits. Severity of sap injury was less in morning as compared to other times of the day. So, maximum benefit of de-sapping can only be obtained, if the fruits are harvested and de-sapped during morning hours. Mango wash helps in controlling sap injury. Farmers require training in such techniques. Modern facility for de-sapping, hot water washing with fungicide, drying, wax coating, vapour heat treatment, grading and packing is required and has to be made available to the farmers through a common facility.

Second, most of the mangoes produced in the region are plucked manually by beating the branches or shaking the branch and catching the mango in tarpaulin held below the tree, and marketed in bulk. Chalk – Mango Nipper (mango harvesting device) is not used by the Kolar growers at present since most of them sell mango in bulk and bulk price and not according to grade and as such adopting good harvesting method not remunerative to farmers since it slows down number of fruits plucked/labour.

Third, weather risks such as hailstorms destroy the crop and cause large-scale devastation and losses to the farmers. While the government has brought mango under weather risk insurance scheme most farmers are yet to take advantage of the scheme. Proper education regarding the benefit of the insurance scheme is required.

However, in the light of the discussion in the previous sections it is clear that most small and marginal mango growers at present do not participate in supplying to processing industry or corporate retail chains directly, because of quantity constraints (minimum 1 ton at a time) and quality requirement for fresh mango retail trade (Grade C and above). So, while information is important this will not be an end in itself if the farmers are not clustered based on varieties they produce and have access to adequate postharvest facilities. Currently, such practices are not followed, as inadequate post harvest facilities do not allow for the benefits of clustering to be exploited as traceability still remains an issue.

At present information required by mango grower can be obtained from extension workers of universities and the horticulture department or calling the toll free number of the farmers help desk. The purpose of establishing mango development centre (MDC) in the mango producing area is to make available all the information required by the mango sector in one place and setup a post harvest facility. MDC, however, does not provide e-trading facility. SNX exchange of SAFAL in Bangalore is an e-market for perishables like Mango. In the absence of appropriate post harvest facilities for mango e-trading through SNX exchange has been suspended after customers complained regarding quality issues.

The range of information needs and the sources of information are provided in the table below:

Table 1: Flow of information along the mango value chain

Source of Information	Additional Information provider	Type of Information
Markets (APMC) Market (Corporate) Market (Exporters) Market (Importers) Market (Processors) Government and its agencies	<ul style="list-style-type: none"> • APMC • EXIM Bank • APEDA • NHB • Govt Dept • MDC • Kisan Kendra 	<ul style="list-style-type: none"> • Market Arrival (Quantity) • Market Price and Price Trends • Market Forecasts • Export Market Buy notifications • Buyers contact details • Policies and procedures of importing countries • Market related exhibitions and Melas, Seminars • Demand and price trends offered by processors
Packaging and Processing Centres	<ul style="list-style-type: none"> • MDC • Kisan Kendra • Processing Units 	<ul style="list-style-type: none"> • Contact details of post harvest service providers • Rates for various Post harvest services • Procedures for registration with service providers • Importing country requirements of Post harvest Treatment • Benefits of Post harvest treatments • Requirements for Processing type of mango (Maturity, post harvest treatments, varieties, Maturity level) • Logistics support provided by the processors and pack houses
Aggregators, Sorters graders AGMARK, BIS	<ul style="list-style-type: none"> • MDC • Kisan Kendra 	<ul style="list-style-type: none"> • Contact details of PHC's, Agents, Wholesalers • Specifications and grades for mango • Wet and DRY Warehouses and Tariffs
Agriculture Universities, IIHR Equipment & Tool Suppliers Other Farm input Suppliers Nurseries Media	<ul style="list-style-type: none"> • MDC • Kisan Kendra • Media 	<ul style="list-style-type: none"> • Agro technology (initial establishment, farm management, disease control, intercropping) • Varieties, seasons and methods to increase / change fruiting seasons • Harvesting methods and equipment, tools • Post harvest technologies (De-sapping, washing, fungicides, wax coating, VHT, grading) • Contact details of input suppliers and tools
Credit and Insurance providers	<ul style="list-style-type: none"> • MDC • Kisan Kendra • Media 	<ul style="list-style-type: none"> • Credit Policy: designated banks, credit limits, interest rates, margins required, repayments, government Subsidies, group loans • Availability and Types of Insurance and contact details, documentation details, claim procedure, group Covers • Kisan Card for small & marginal farmers
Government	<ul style="list-style-type: none"> • MDC • Kisan Kendra • Media 	<ul style="list-style-type: none"> • Support price • Subsidies • Government Purchases • Compensations during natural disasters and Crop Losses due to weather • Welfare schemes for farmers and their families

While information sources and availability is not a major constraint, lack of incentives lead to problems of adopting and availing information. The incentive problems have been detailed in the previous sections. Basically, lack of scale economies and asymmetric information and the consequent market failures result in such rigid organisation of transactions that cannot be dismantled purely by information. The causation seems to operate the other way, once the rigidity of organisation of transactions is broken either by encouraging private markets, contract farming and most important of all by the provision of post harvest operations as a common facility, better knowledge and information will be used.¹⁸

However, the reason why the use of information is not fully exploited is that the mango farmers are highly dependent on contractors for marketing their produce as well as for credit/ advance payments, which reduces their bargaining power.

Information dissemination system is also inadequate. Small farmers even though connected through mobile phones are not aware of the SMS registration facility available through Karnataka State Agriculture Marketing Board (KSMB) for obtaining market and other information and have not registered for the service, since KSMB do not provide detailed variety wise market information for all market yards on mango at present. Farmers' lack of market information about prices and demand of mango results in lower value realization for them. Free helpdesk for providing market information established by Karnataka State Agriculture Marketing Board do not provide information on mango yet for all markets yards.

While, training is adequate for new orchard establishment and management of farm from flowering stage, but in the absence of arrangement for purchase of produce according to quality and grade farmers are not taking interest in such training. Only SAFAL growers association members take benefit of such training at present. Skilled labours who are trained in use of mechanical sprayers, and enticing net, harvesting technique, determination of maturity for harvest, packing and transport from orchard to pack house, minimal processing techniques involving washing, drying, grading and packing are absent.

2.6 Role of ICTs

This study confirms the findings of Mittalet.al, 2010 study.¹⁹ The study shows that the quality of information, its timeliness and trustworthiness are the three important features that have to be ensured to enable farmers to use it effectively to improve productivity. This study, like the study referred to too found evidence that mobile phone is being used in ways which contribute to productivity enhancement. However, to leverage the full potential of information dissemination enabled by mobile telephony will require significant improvements in supporting infrastructure and capacity building amongst farmers to enable them to use the information they access effectively.

Though, a multitude of constraints are inhibiting the farmers to exploit the benefits of ICTs for improving the productivity and reducing transaction costs along the value chain, some benefits of ICTs are still percolating and are hard to ignore.

¹⁸ The presence of transactions costs then implies a search for an economic governance structure (in this case, an absence of post harvest facility) that minimizes these costs

¹⁹ Mittal, S., Gaurav Tripathi & Sanjay Gandhi, 2010. Socio-Economic Impact of Mobile Phones on Indian Agriculture, INDIAN COUNCIL FOR RESEARCH ON INTERNATIONAL ECONOMIC RELATIONS. Working paper No. 246.

While medium and large farmers have telephones and/or mobile but a large majority of small and marginal farmers interviewed for this study have access to phones only through public telephone service providers. Most of the small and marginal farmers did not feel the need for having own telephones and are able to get required information from neighbouring farmers or visits to local offices of the horticulture department/ university extension centres. Small and marginal farmers generally have multiple crops including fruits, vegetables, food grains and oil seeds and quantity available for marketing do not justify the additional ICT infrastructure (Internet facility) according to them.

However, they do acknowledge that if groups are formed to consolidate each variety of fruit to make a lot size to achieve transportation/storage economy, the group as a whole will be better placed if they have own telephone/internet facility. The agriculture and market information can help them in improving productivity; reduce wastage as well as for selling the produce at right price as a group. Safal has formed Safal growers association in Ramanagar and procures nearly 15% of its requirements of Alphanso mango through them for processing and retailing.

The Safal market in collaboration with Multi Commodity Exchange (MCX) had also started SAFAL National Exchange (SNX) in Bangalore exclusively for horticulture produce spot trading and the operations began during 2008, which as mentioned has been suspended. SNX provided opportunity to Totapuri Mango growers in Krishnagiri district to sell their produce through the exchange. Buyers were mostly the 6 Modern Pulping Units in Krishnagiri. With trading of mangoes going online - a 'One India-One Market concept' - farmers in Krishnagiri were getting fair prices for their mangoes. They were able to market their produce worldwide at the click of a mouse, using the on line spot trading introduced by Safal National Exchange (SNX),²⁰ for Tothapuri mangoes in Krishnagiri district. SNX was also conducting on-the-spot electronic trading of mangoes in Krishnagiri and Pochampalli. Dharmapuri and Krishnagiri mango growers could sell around 2000 tonnes of fresh mangoes at a premium price.

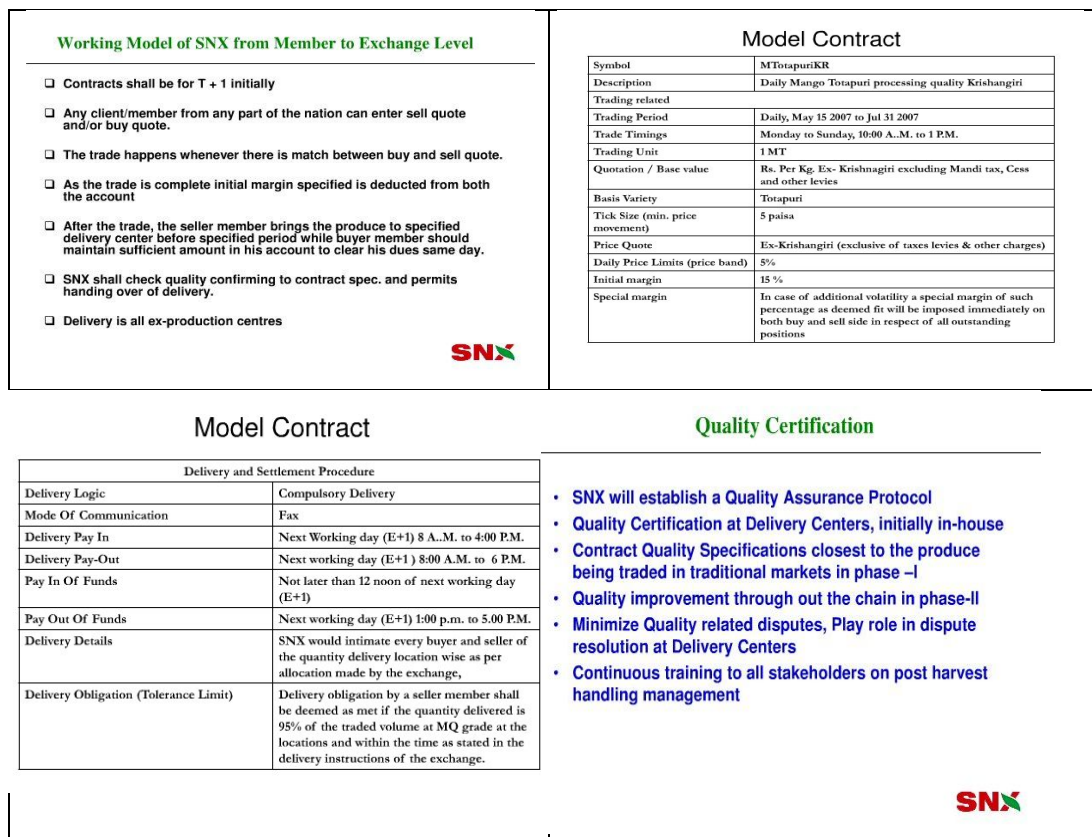
Even after the suspension of mango trade through the SNX, the link once established continued and growers were able to contact a few processors through phone and decide about the price and whom to supply. However in case of fresh market it failed because the quality problems and customer complaints. This only shows that for the benefits of ICT to accrue to the players along the value chain only when, the entire post harvest infrastructure is in place and farmers use the infrastructure to ensure every mango harvested undergoes right kind of treatment to ensure the quality and reasonable shelf life. The middlemen thus, continue to exploit the grower by fixing the price to accommodate the losses and rejections. The proposed mango development centre when it becomes operational at Srinivasapur and Chintamani may solve this problem and according to SAFAL sources they might start trading in mango through SNX exchange again.

However, Safal is confident of restarting mango trade through virtual mango trade portal (SNX Exchange) after solving the issues (quality and traceability) involved. Safal has contracted farmers in Ramanagara (Karnataka) and Krishnagiri District (Tamil Nadu) and has formed grower associations and started the training of growers this season.

²⁰ SAFAL National Exchange was started in November 2007, but in absence of a proper supply chain network and relevant State permissions, failed to take off.

As we see in the figure, below how the establishment of the SNX exchange resolved the problems of asymmetric information between the buyers and the sellers and changed the entire transaction architecture, by linking the grower to the buyer directly.

Figure 5: Working Model of SNX



There are some other ICT interventions that have improved the bargaining powers of the farmers by providing them pricing and other information and also helping them in searching for traders.

SMS Empowering Mango Farmers- FFA-Coca-Cola initiative in neighbouring District: The project uses the applications available on mobile phones. FFA bought an SMS package from a telecom provider and now the farmers are able to send the messages for almost free. According to the FFA representative who is coordinating the FFA-Coca-Cola initiative:

“FFA collected phone numbers of the farmers in the MACS (Mutually-Aided Cooperative Societies) in the area and segregated them into several commodity groups. To begin with, FFA started disseminating the price information for mangoes. About 3,200 mango farmers benefitted from the information. FFA is planning to extend this to paddy, cotton and chilli farmers as well. For the first time in 45 years of farming, a farmer could reject the price offered by a middleman for his mangoes during 2010 season. He now gets an SMS at sharp 8 p.m. informing him about the asking rate for his mangoes for the following day.”

With increased knowledge and information the farmer can take a call on whether he should accept the price or wait for another day when he may get a better price. The price quoted in the SMS would hold

good for the next 24 hours till another SMS comes the following day, according to a farmer from Chittoor district who supplies Tothapuri mangoes. He recalls the days when middlemen were exploiting farmers like him. Farmers used to sell for whatever price they quoted, because they did not have any information on the market price in the mandis, forget about the upcountry markets. The SMS initiative has helped the farmer to discover the right price.

However the market info provided through SMS is not adequate even though it covers about 30 market yards of Karnataka where mango is traded. The information is not detailed by variety, grade, arrival quantity or price forecast.

Web based Interface to provide price information in markets across the country

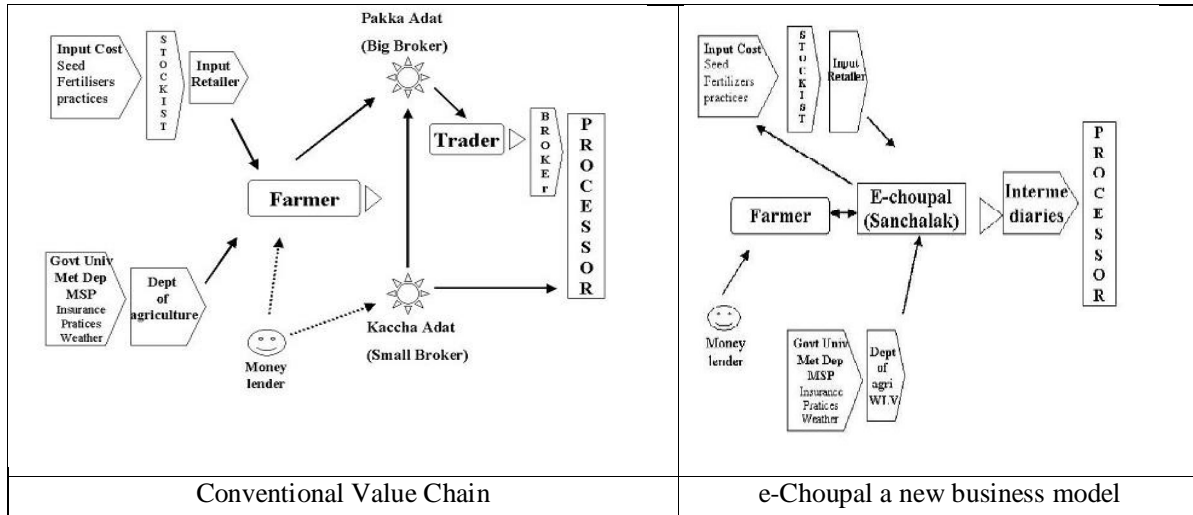
The Marketing Department of the Andhra Pradesh Government is providing a Web-based interface where farmers and traders can see a snapshot of all the prices in various markets, including the commodity exchanges.

However, these are only a few examples how ICTs can alter the transaction costs but the potential for the use of ICTs are many. Infact all the information needs as documented in the Table 1 above can be facilitated better through ICTs applications. The information on prices, post harvest facilities, technologies, insurance etc. can be mediated with ICTs. One such intervention is e-choupals, which are successfully used elsewhere. E-choupal²¹ is a virtual market place where farmers can transact directly with a processor. It has the advantages of the market but spans very large varieties of vendors and customers. The main disadvantage of conventional market is that information asymmetry is inherent in the market, whereas e-choupal provides for transparent transactions. This enables the participation of smaller as well as larger players. Elimination of some layers of intermediaries allows for larger share of profits to reach the lower end of value chain. This intervention can in principle change the hierarchical structures of governance in agriculture markets like the one described for mango.

Internet is used in e-choupals as a low transaction cost backbone for communication. Physical delivery of produce to the processor is still done through the existing intermediaries. E-choupal does not attempt total elimination of intermediaries, as intermediaries are indispensable in economy like India, where intermediaries are adding value to the every step of value chain at a low cost. Intermediaries have the expertise in storage, transportation, quality assessment and counter party risk reduction, which are difficult to replicate. E-choupal provides farmers with all the market information and this helps them to become market oriented. In e-choupal intermediaries are leveraged but they are dis-intermediated from the market information flowing to the farmers.

²¹ B. Bowonder, Vinay Gupta and Amit Singh, Developing a Rural Market e-hub; The case study of e-Choupal experience of ITC, http://planningcommission.gov.in/reports/sereport/ser/stdy_ict/4_e-choupal%20.

Figure 6: E-choupal



E-Choupal is an ICT platform for carrying out trade at a number of locations. In this, ITC sets up a back-up physical service support at the village level, called Choupal, through Sanchalak: a lead farmer, who acts as the interface between computer and the farmer. ITC accumulates information regarding weather, modern farming practices, and market prices from sources like meteorological department, agri-universities, mandi's (regional market) etc., and upload all information on to e-Choupal web site. All information is customized according to local farmer's requirements and provided into the local language through computer set up by ITC in Sanchalak's house. Sanchalak accesses this information and facilitates its dissemination to farmers. Information regarding weather and scientific farming helps farmers to select the right crop and improve the productivity of their farms. Availability of market information helps farmers to become market oriented. They know what price ITC is quoting and the price prevalent in the local market, thereby helping better price realization for farmers. If farmer decides to sell to ITC, Sanchalak works as the aggregator of small farmers produce to sell them to ITC. Sanchalak also aggregates farmers input purchase orders for various items like seeds, pesticides and places them directly with the suppliers through internet and facilitate supply of high quality farm inputs as well as purchase of farm produce at farmers' doorstep with the help of intermediaries as shown in the figure above.

In summary e-Choupal is an ICT platform that facilitates flow of information and knowledge, and supports market transactions on line.

- Transmits information (weather, prices, news),
- Transfers knowledge (farm management, risk management)
- Facilitates sales of farm inputs (screened for quality) and
- Offers the choice of an alternative output-marketing channel (convenience, lower transaction costs) to the farmer right at his doorstep
- It is an interlocking network of partnerships (ITC + Met Dept + Universities + Input companies + Sanyojaks, the erstwhile Commission Agents) bringing the "best-in-class" in information, knowledge and inputs.

E-choupal is, thus, distributed transaction platform that brings together sellers, buyers along with information and service providers. E-choupal is a model with a number of non-conventional characteristics namely:

- customer centric
- capable of being used for many commodities and multiple transactions
- easily scalable once it is verified
- uses local talent and local people and develops local leaders
- can be extended to local as well as global procurers
- stimulates local entrepreneurs to extend their innovativeness
- uses all the existing institutions and legal frameworks and
- many others can join the market as transaction time is low.

The concept of e-choupal is applicable to any agricultural & allied activity in rural India. The basic character of agriculture is the same across India, but value chains of different crops have their own intricate dynamics. So are the socio economic characteristics of different regions. These complexities must be factored in, while making e-choupal operational. Consequently the supply chain efficiencies/revenue models vary across commodities & geographies.

Observing the success of e-choupal and its huge potential for setting up a electronic market, several other players are also contemplating building portals and setting up of kiosks and operating e-choupal kind of business model.

Once the proposed post harvest facilities are established business model (VC) similar to e-choupal can be adopted for mango with growers association taking the role of e-choupalSanchalaklinking growers association with information providers (Government agencies and universities/Kisan Kendra/ E-choupal), post harvest facility providers (MDC/SAFAL/ Irradiation facility) and trading facilities such as SNX exchange / Private trading portals.

Having, analysed the mango value chains on the dimensions of transaction costs of operations (prevailing governance structures, i.e., the modes for organizing transactions), information/knowledge flows along the value chain, the extent and problems related to inclusiveness of the small and the marginal farmer in the value chain, we replicate this analysis for pomegranate.

3. Study of Pomegranate Value Chain²²

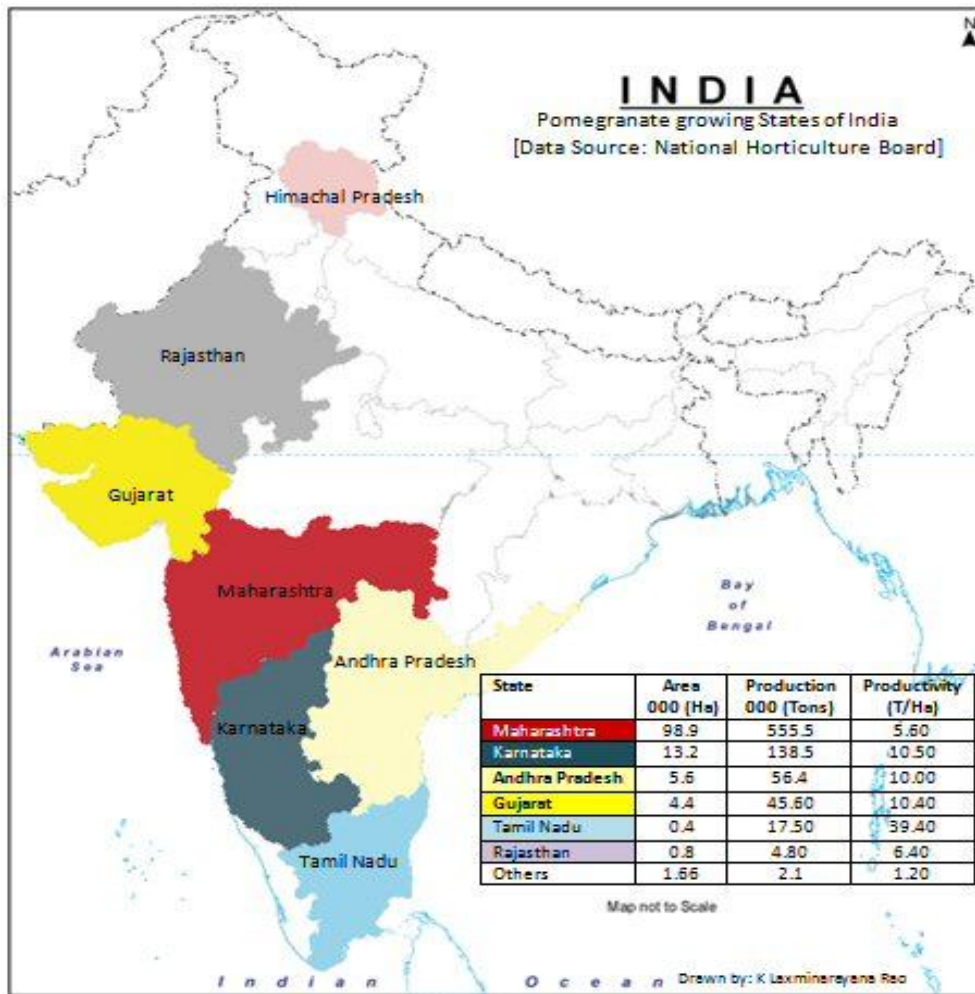
India is the largest producer of pomegranates in the world with over 900,000 tons produced per annum. This accounts for almost 43 per cent of the total world production. However, exports from India are approximately 35,000 tons that is about 6-7 per cent of total world pomegranate trade. At the global level, India and Iran are the major producers of pomegranate collectively contributing about 85 per cent of the total pomegranate production.

²² See Annex 1 for the methodology for analysing the pomegranate value chain in the study cluster

India is the second largest exporter of pomegranate after Spain. During 2009-10, India exported about 33,400 tonne of fresh pomegranate valued at about Rs. 119.3 million (USD 26.6 million). Over the last decade (between 2000-01 and 2009-10), export of fresh pomegranate has increased at a CAGR of about 25 per cent in volume terms. In 2009-10, the major export destination was the UAE which accounted for 52 per cent of the total export in volume terms. Other export destinations include Bangladesh, the Netherlands, Saudi Arabia, Nepal, the UK and Russia. The major production season in India is from November to June with only Maharashtra and Tamil Nadu producing throughout the year. This gives a strategic advantage for export from India as peak producing seasons of other countries such as Spain and Iran is from August to January leaving a specific export window for India.

In India, Maharashtra leads in terms of production (69.3 per cent) followed by Karnataka with 17.3%. However, in terms of productivity Karnataka leads with a productivity of 10.5 tons/ha compared to Maharashtra's 5.6 tons/ha.

Figure 7: Pomegranate growing states in India

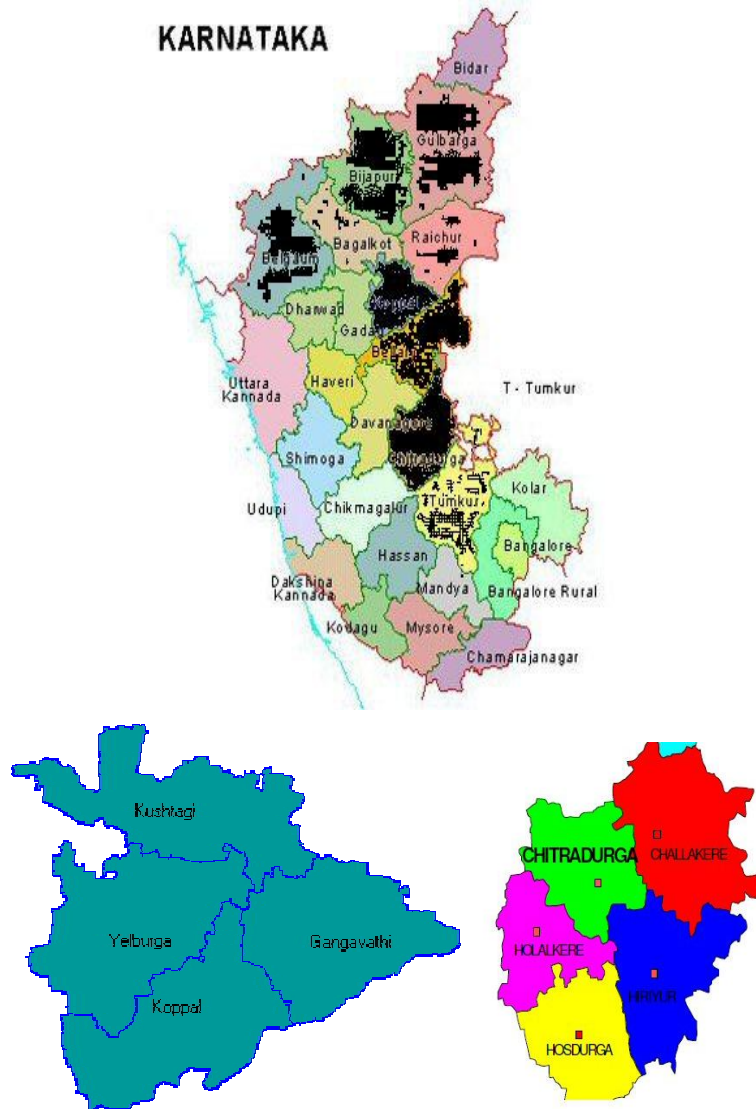


3.1 Value Chain Analysis of Pomegranate

The study for the value chain analysis was carried out in two major pomegranate producing districts of Koppal and Chitradurga in Karnataka. These two districts contribute more than 58 per cent of the states' production and rank 1st and 6th respectively in terms of production.

Koppal district is a major pomegranate exporting district of the country and helped Karnataka achieve number 1 exporting state status in the country. The district also has the distinction of successfully controlling bacterial blight disease (BBD) that devastated most pomegranate growing areas of Maharashtra. On the other hand Chitradurga district is a catchment area for the Akshay Agro Food Park (AAFP) that is establishing a pomegranate processing facility comprising of Aril separation plant and a juice plant. AAFP is actively associated alongwith the University of Agriculture Sciences, Institute of Agriculture Technologists and the horticulture department in the promotion of pomegranate plantations.

Figure 8: Pomegranate growing districts in Karnataka



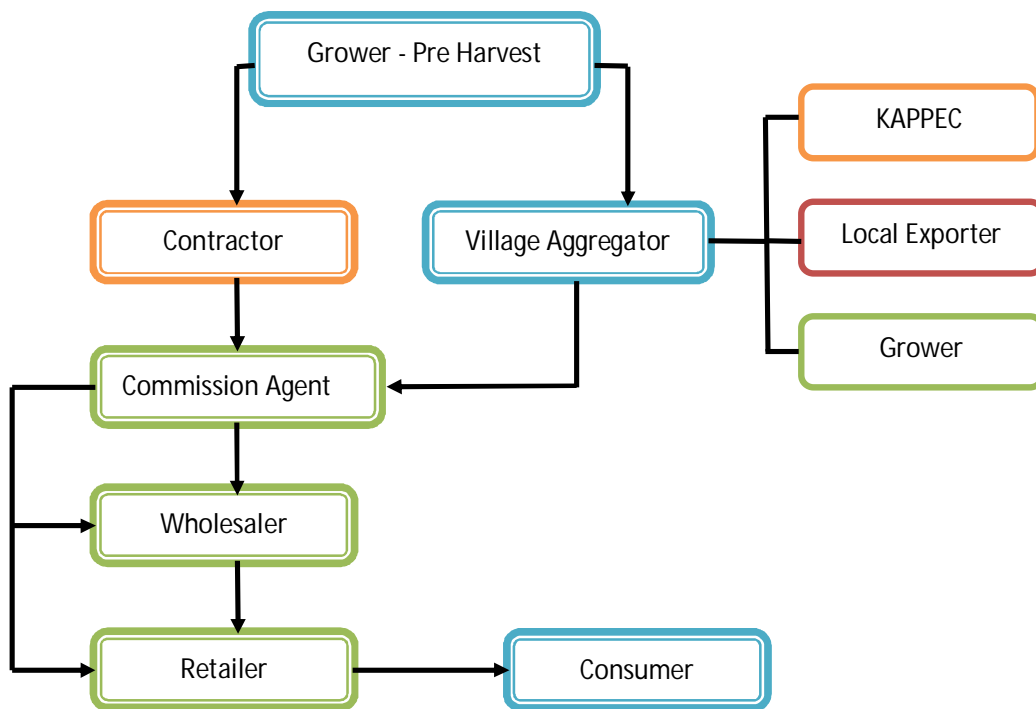
Koppal District, Karnataka Chitradurga District, Karnataka

Prior to entering the export market the trade channel for pomegranate consisted of:

- (i) grower
- (ii) contractor
- (iii) commission agent (APMC)
- (iv) retailers.

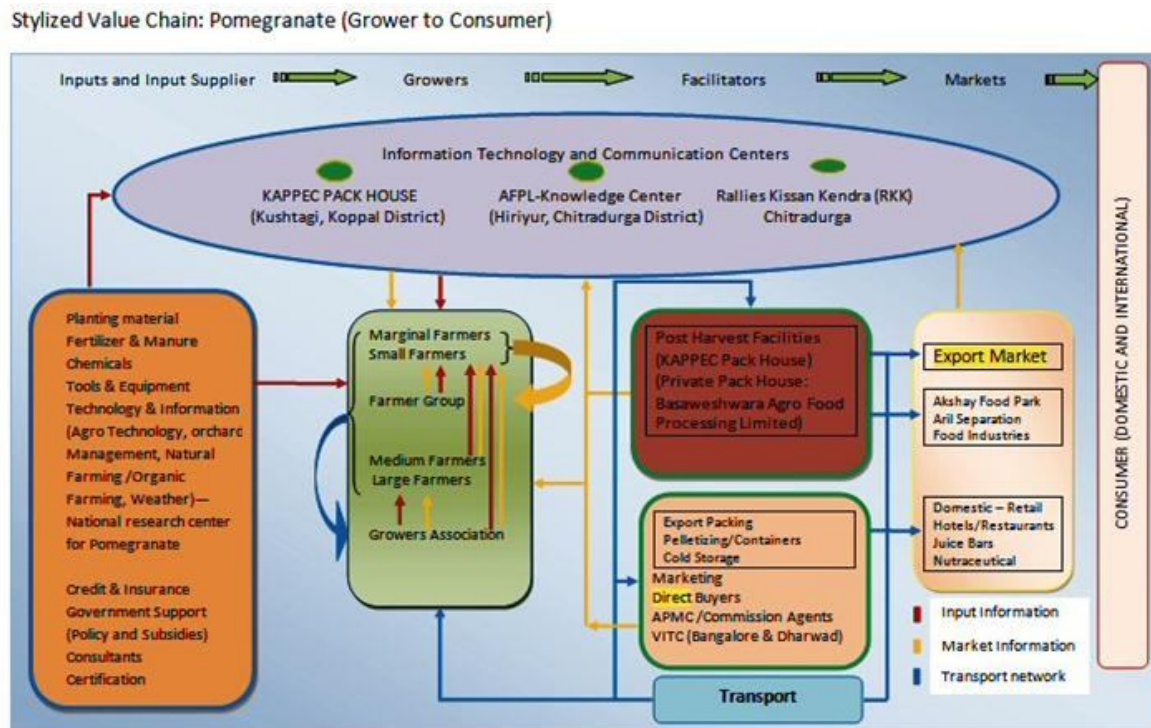
Most small and marginal growers in the cluster used to sell their produce through a contractor or a village aggregator who could be a grower or a local exporter or a local dealer. Large and progressive farmers provided information to small and marginal farmers regarding the price and farm management practices and new trends.

Figure 9: Conventional trade channel of Pomegranate



However, the export orientation and the setting up of the AAFP changed the transaction costs of the conventional value chain and the main actors in the value chain are depicted in the stylized value chain below.

Figure 10: Stylized Value Chain Pomegranate



Farmers: The average landholding of pomegranate farmers is around 6 Ha, which is spread into 2-3 land parcels. Around 50% of the land is used for pomegranate cultivation and the rest is used for growing other crops. An important feature that has attributed to the success of these Karnataka districts as pomegranate growers is the fact that growers in major pomegranate districts are united and help each other. Large farmers help small and marginal farmers for control of bacterial blight, market information sharing and in consolidating and exporting the produce in north Karnataka districts (Koppal and Raichur).

Some of the medium and large growers are themselves exporters and act as aggregators and collect exportable grades of pomegranate from small and marginal farmers and use Karnataka Agriculture Produce Processing and Export Development Corporation Limited (KAPPEC) a Government of Karnataka organization, engaged in export infrastructure development facility, for post harvest treatment, packing and palletizing before export. These farmers also help the small growers in farm management, control of BBD and provide market information. Most of them have internet facility and active users of internet for communication and marketing their produce and information.

As a result of stringent pest control measures taken by active farmers in Koppal and Raichur districts, the BBD has been controlled to an extent and the results are encouraging. Last year, some farmers recovered huge profits up to Rs.1million per acre. During the year 2009-10 prices hit a high of Rs.200 per kg in for the export grade and Rs.90-100 per kg for the domestic variety. This has encouraged many farmers to go for fresh planting of the crop in Koppal and Chitradurga districts this year. About 300 acres has been planted for pomegranate in Chitradurga and 150 acres in Koppal.

Direct Sourcing from Farm: Exporters or contractors representing the exporter or processor approach the farm a week before the harvesting season begins and negotiate price grade and quantity. The price is fixed based on the price in the international market and the crop situation in India. Exporters / contractors take care of packing cost and transportation costs. In the case of exporters grading and packing is done at the local pack house of KAPPEC. Exporter will have his own arrangement to sell the grades that are not exportable to domestic retailers and processors. Grower has also the option to retain the non-exportable grades and sell locally to APMC/ HOPCOMS or processors. Mysore Fruits Private Limited (MFPL), a Bangalore based processor of pomegranate procures non-exportable grades and has a food park in Bagalkot with cold storage facility. Some farmers sell the non-exportable grades to MFPL. This direct sourcing is possible due to the post harvest infrastructure available at KAPPEC (discussed in the next section). This aggregation facility provided by either the exporter or the processor shortens the value chain and reduces the transaction costs.

Exporters: There are three types of exporters active in northern Karnataka districts of Koppal, Bagalkot, Belgaum, Gulbarga, and Raichur Districts.

- a. KAPPEC, Government of Karnataka organization with facility of a pack house,
- b. Private Exporters who use KAPPEC pack house facility
- c. Grower Exporters who use KAPPEC pack house facility.

APMC Market Yards: Commission Agents (CA) registered with APMC Binny Mill (F & V) in Bangalore and also at Bijapur, Bagalkot and Belgaum APMC yards procure pomegranate through local contractors. They buy packed and graded pomegranate as well as in bulk, without grading for supplying to retailers. Transportation from the farm gate or pack house as the case may be is taken care of by the CA. APMC charges 2% Commission and 1.5% Cess on Buyers. **Only < 3% of the pomegranate is traded in APMCs at present.**

Processors: Processors buy pomegranate in bulk either directly from the farm gate or non-exportable grade from the pack house. Only processor active in buying pomegranate in the region was M/s Mysore Fruits Private Limited.

Commission agent: The commission agent registered in APMC facilitates trade between the contractor or farmer and the wholesaler and for which they charge 6-10% commission from the contractor.

Wholesaler: The wholesaler is responsible for distribution of produce to various retailers. The produce is sold to retailers based on specific grades.

Corporate buyers: Corporate buyers procure pomegranate through wholesalers.

Retailers: Most retailers sell graded materials.

3.2 Analysis of Transaction Costs in the Pomegranate ValueChain

As discussed above pomegranate value chain in Koppal district and Chitradurga district are shorter because it is just grower-KAPPEC-exports or grower-KAPPEC pack house-exporter-exports or grower-pack-house-Ralliesor grower-pack house-food park, when compared with the conventional system grower-contractor-wholesaler-stockists-retailer. Kushtagi growers in the Koppal district are linked to exporters or exporting country buyer directly. A pre-cooling and cold storage with a packing facility

exists in the production belt. Chitradurga growers are directly linked to Akshay Agro Park processing facility.²³

This shorter value chain necessarily reduces the transaction costs associated with a more hierarchical (lengthier) value chain that exists for the mango value chain.

In the analysis of the transaction costs of the pomegranate value chain, it is therefore important to understand the infrastructure support and facilities that are available and hence have resulted in a governance structure that allows for a direct link between the grower and the buyer. In this context, the role played by ICTs will be complementary and have a greater impact on improving the livelihoods of the farmers than in the absence of complementary infrastructure, as was the case in mango.

3.3 Post Harvest Infrastructure

KAPPEC²⁴ by establishing a state of the art integrated cold chain complex and pack house at Bijapur and Kushtagi has opened up a new trade channel for the benefit of grape and pomegranate fruit growers of the region. The service available at the KAPPEC pack house is:

- | | | |
|------------------------|--------------------------------------|------------------|
| (a) washing and drying | (b) grading according to size/weight | (c) waxing |
| (d) packing | (e) pre-coolingand | (f) cold storage |

KAPPEC's second cold storage unit at **Kushtagi in Koppal district**, which was established at a cost of Rs. 83.3 million became operational during 2009-10. The integrated cold chain complex consists of pack house, pre-cooling units, cold storages, refrigerated transport, laboratory for the export of pomegranates and other horticulture produce mainly from Kushtagi and other taluks of Koppal and Raichur districts. It has three bulk storage units of 50 tonnes, 100 tonnes and 150 tonnes. Private export houses like Field Fresh Foods Pvt. Ltd., Seven Star Fruits Pvt. Ltd., started using the above facility for their export of fresh grapes and pomegranates to Europe and Middle East. Similar pack house and cold storage facilities are also proposed at Hiriyur for the benefit of Chitradurga farmers by Akshay Food Park Limited.

Training, Extension, Research Support and Approved Laboratories: Directorate of marketing and inspection (DMI) approved laboratories issue certificates with respect to pesticide residue, grades and other quality parameters for exporting pomegranate. The nearest DMI approved laboratory for north Karnataka farmers are located at Hyderabad, AP and Bangalore. There is a strong research support for scientific cultivation of pomegranate from the national research center for pomegranate at Solapur, Maharashtra and IIHR, Bangalore in Karnataka. All the districts have Krishi Vignana Kendra's to help growers. They provide:

- Training hall, a diagnostic lab and well furnished information centre soil, plant and water testing, plant pathology and entomology laboratory.

²³ Akshay Food Park has been providing knowledge based service to growers of pomegranate since last 2 years

²⁴ Apart from KAPPEC, facilities at Bijapur and Kushtagi, private enterprises like Tropical Foods Private Ltd. (a JV with KAPPEC) and the Hubli-based Ken Agritech Private Limited have established facilities equipped with 600 metric tonnes storage capacity, much similar to the one in Bijapur, meant for grapes, and at Kushtagi in Koppal for pomegranate. In addition, 15 agricultural marketing firms have shown interest, in setting up cold storage facilities, across the state.

- Activities include transfer of technology, popularization of technology, training and laboratory service, On farm testing, consultancy service, farm trails, service through radio and TV

University of Horticulture Sciences at Bagalkot apart from providing extension support and training has initiated National Research Centres for mango (Dharwad), banana (Arabhavi), grape (Bijapur), pomegranate (Kustagi and Hiriyur), sapota (Kaladagi) & papaya (Hiriyur). Farmers have been trained for export quality production and have registered with GLOBALGAP Certification.

Processing Facilities: Green Food Park Private Limited (GFPL) located at Bagalkot district in north Karnataka region and Akshay Food Park Limited (AFPL) will have facilities for minimal processing (aril separation, packing and frozen arils) as well as juice extraction and concentration, beverages etc. While AFPL is actively engaged in development of pomegranate cultivation in Chitradurga and Tumkur Districts and placed orders for machinery for pack house, cold storage/chain and aril separation plant, GFPL has just started constructing buildings for cold storage facility. Speedy implementation of these parks will pave the way for improved income generation for the growers. Mysore Fruits Private Limited group (Promoters of GFPL) has two juice processing, concentration and aseptic packing plants in Bangalore and are procuring their requirement in Karnataka and Maharashtra.

Transport infrastructure

Kushtagi Taluk, in Koppal District (where the export facilitation centre and post harvest facility of KAPPEC is located) is on a 4/6 lane National Highway. Broad-gauge railway line connecting Karnataka to Mumbai also passes through Koppal. There is also a container terminal located at Belgaum (Belgaum to Koppal is 257 km and takes 5 - 6 hrs by train and Belgaum to Hubli is 115 km). Belgaum and Hubli have adequate cold storage facilities).

Land for Cultivation: Land for cultivation of pomegranate is available and is not a constraint so far. Pomegranate requires irrigation facility to some extent. Minimum economic size of pomegranate orchard for a grower exporter is 8 hectares. Most growers own more than 10 hectares of land in different pockets. However, since the problem of BBD growers have switched over to mixed cropping with other tree crops and the pomegranate area is restricted to <5 hectares. Small farmers generally have been planting multiple crops to reduce the risks as well as the natural control of BBD in such plantations. A number of farmers have resorted to natural farming methods and are successful. Pomegranate growers of Kushtagi have won prizes and awards as progressive farmers.

3.4 Transaction costs associated with export markets

The western food standards such as EUREPGAP have often turned out to be too stringent for Indian producers to remain competitive given their cost of compliance. Most importantly, these standards require a high degree of information on requirements related to inputs, packaging etc. Also, the standards keep changing and the producers have to be abreast with that information. Acquiring information from buyers, getting access to post harvest infrastructure or getting certified for meeting the standards are all subject to scale economies. Certification (GLOBALGAP/EURPGAP, phytosanitary and health certificate) is compulsory for exports.

Exporters prefer Kushtagi Taluk as it allows for exploiting scale economies. It is easier to collect the pomegranate produce because of high density of high productivity farmers in this cluster and higher

certification coverage of growers in Kushtagi. Exporters select orchards with 50 per cent of the produce as export grade for export procurement. Exporter need to cover a smaller geographical area to collect a truck load in Kushtagi than in other places because of above reasons. In addition pack house for pomegranate is located in Kushtagi and Bagalkot which is within the cluster. Nearest container depot is in Belgaum is 275 km. away. The nearest rail head is in Koppal and the nearest railway junction in Raichur and Hubli is within the cluster. Thus the exporter- aggregator needs to cover shorter distances within the cluster and to export facilities like pack house, cold storage, container terminal and railhead, hence it faces lower cost/tonne.

However, there are still many factors that limit the export potential of pomegranate form these regions. We summarize them as follows:

- Export consignments for Europe require proper palletization and fumigation. Pomegranates are required to be packed in trays and usage of paper cuttings isto be discouraged. Shredded paper is used as cushioning material for packing pomegranates. Wooden pallets are used for stacking the packed CFB boxes.
- Consumer preference is changing from time to time and from country to country. Earlier, Ganesh variety with big sized fruits was the preferred one, and the fruits were exported mainly to the Gulf countries. Now, in Europe and other parts of the world, varieties such as Bhagwa (Kesar), Mridula are suitable and accepted ones. Soft seeded, coloured varieties with high per cent of juice with easy to remove arils are preferred. Fruits weighing more than 500 Gms with superior qualities have immediate and ready acceptance in the international market.
- Pomegranate farmers/traders and even exporters are not aware about the pesticide spray schedule for exports as out of common 43 chemicals under different trade name with different active ingredients are used on large scale. There is high chance of residue detection. Thus, there is a need to strengthen the residue testing system especially for fresh pomegranates for exports.
- Institutional credit facilities during pest management are inadequate for samll farmers
- Growers/traders/wholesalers/retailers are not aware about the procedures of export and HACCP/ISO certification.

3.5 Knowledge/Information flows

The range of information needs and the sources of information in the pomegranate value chain are provided in the table below:

Table 2: Flow of information in pomegranate value chain

Source of Information	Additional information provider	Type of information
Market (APMC/HOPCOMS) Market (Exporters/Importers) Market (Processors) Government and its agencies	<ul style="list-style-type: none"> • KAPPEC • Visvesvaraya Industrial Trade Centre (VITC) • APMC • EXIM BANK • APEDA • NHB • HORTICULTURE DEPT • KISAN KENDRA • UNIVERSITY EXTENSION CENTRE • Agro Industrial Parks • GROWERS ASSOCIATION 	<ul style="list-style-type: none"> • Market Arrival (Quantity) • Market price and price trends • Market Forecasts • Export market buy notifications • Buyers contact details • Policies and procedures of importing countries • Market related exhibitions and events, Seminars • Demand and price trends • Offers by processors and export Houses
Packing and processing centers	<ul style="list-style-type: none"> • KAPPEC • PRIVATE PACK HOUSE AND COLD STORAGEES • AGRO INDUSTRIAL PARK • EXPORT HOUSES • GROWERS ASSOCIATION 	<ul style="list-style-type: none"> • Contact details of pack houses, cold storages, container providers, suppliers of pallets • Tariff for packing, palletizing, containerization, cold storage charges • Procedure for exports and export packing requirements • Storage and logistics support provided by pack houses and tariffs
Aggregators/ Export houses	<ul style="list-style-type: none"> • KAPPEC • UNIVERSITY EXTENSION CENTER • GROWERS ASSOCIATION 	<ul style="list-style-type: none"> • Contact details of whole sale traders, export houses and their agents • SPECIFICATIONS REQUIRED FOR EXPORTS • QUANTITY REQUIRED (Demand)
AGMARK/BIS	<ul style="list-style-type: none"> • KAPPEC • KISAN KENDRA • UNIVERSITY EXTENSION CENTER 	<ul style="list-style-type: none"> • Specification of pomegranates for export
University of Agriculture Sciences, Raichur (UASR) University of Horticulture Sciences, Bagalkot (UHSB)	<ul style="list-style-type: none"> • Kisan Kendra • Media • KAPPEC • GROWERS ASSOCIATION • UASR/UHSB • NAIP • AGRO INDUSTRIAL PARK (HIRIYUR/BAGALKOT) 	<ul style="list-style-type: none"> • Agro technology • Orchard management • Intercropping, • Natural/Organic farming • Post Harvest Practices • Tools and Equipment (Sourcing)
Credit and insurance providers	<ul style="list-style-type: none"> • KAPPEC • HORTICULTURE DEPARTMENT • KISAN KENDRA • GROWERS ASSOCIATION 	<ul style="list-style-type: none"> • Credit Policy: Designated Banks, Credit limits, Interest Rates, Margins required, Repayments, Government Subsidies, Group Loans • Availability and Types of Insurance and contact details, Documentation details, Claim procedure, Group Covers • Kisan Card for Small & Marginal Farmers
Government	<ul style="list-style-type: none"> • KAPPEC • HORTICULTURE DEPARTMENT EXTENSION OFFICE • KISAN KENDRA • AGRO INDUSTRIAL PARK 	<ul style="list-style-type: none"> • Government schemes and Subsidies • Compensations during natural disasters and Crop Losses due to weather • Welfare schemes for Farmers and Their Families

As discussed in Section 3.3 above the lower transaction costs in the pomegranate value chain as compared to the mango value chain are possible on account of adequate post harvest infrastructure. Pomegranates reach the export market directly from the growers through the pack house-export packing operation or through a merchant exporter and the processing industry directly without middlemen. In the case of domestic market pomegranates reach the consumer either through the conventional route (APMC- PHC-commission agent- whole seller-retailer) or through HOPCOMS/Retail Chain Companies. More than 50% of pomegranate from each growers/ group of growers is generally exported.

Hence the trade related information needs of the pomegranate growers are the following:

- International price of pomegranate,
- Varieties in Demand in various importing countries,
- Export-Import trade news
- Specifications for pomegranate
- Certification requirement of importing countries and
- Certifying agencies contact details.

The physical infrastructure is complemented with “knowledge” infrastructure, which is highly institutionalised. Some of the contributions of these facilities in providing “knowledge” are as follows:

Akshay Food Park at Hiriyur in Chitradurga District is under development and pack house facilities are ready. At present the management of AFPL assists pomegranate growers to sell the produce to other exporters/processors or retail chains. AFPL is setting up an aril separation plant as well as juice extraction and concentration plant. Once these facilities are ready AFPL will start procuring pomegranate for processing within the Food Park. AFPL will be then able to offer better price to growers. AFPL will directly procure 100% of pomegranate grown in Chitradurga and Tumkur district, grade and facilitate export of pomegranate/pomegranate arils (Frozen) and also convert arils into juice and juice concentrates. **(Farm to Fork concept)**

AFPL-KCP (knowledge centre for pomegranate) being set up with the help of **The National Agricultural Innovation Project (NAIP) of ICAR** will provide information, technical and professional services to all stakeholders importantly the farmers. AFPL-KCP ensures tie-up between farmers and buyers (distributors, exporters and processing industry located in the food park).

Rallies Kisan Kendra (RKK) is an initiative of Rallies India, a Tata Group company. This facility at Chitradurga helps fig, pomegranate, papaya, sapota and guava farmers in Chitradurga district. At the Kendra there is infrastructure and trained personnel to organize agronomic advice, train the farmers, provide genuine agri inputs, provide soil and water testing facilities, assist in the availability of credit to farmers, provide post harvest management including sorting, grading, packaging, transporting and then deliver identified market. RKK helps the farmers with information on weather, agro technology, market prices, and input suppliers. Growers have the option to purchase from RKK or other suppliers.

Tata group has also taken up farm management services at Chitradurga in Karnataka to support pomegranate growers.

Growers' Associations: Pomegranate growers' associations are functioning well in Koppal area. Koppal district has produced several model farmers, for using mixed cropping with fruits like Kinows. The district has the distinction of producing highest yield pomegranate and had a stellar export performance. Medium and large growers are connected with each other and the exporters / processing industries, through mobile phones and internet. The medium and large farmers and / or KAPPEC Pack house guide small farmers.

Adoption of scientific farming and drip irrigation has resulted in many farmers getting Rs. 300,000/ha/year. This irrigation practice made it possible growing pomegranates on dry land was more profitable than any other crop or business.²⁵

However, there still exist some knowledge gaps that need to be addressed to enable the benefits of global market integration. As mentioned, exporters look for orchards that can supply at least 40-50% export quality fruits. In order to obtain big fruits of high quality, there is a need to thin fruits. There is a negative correlation between the number of fruits and their size. Even distribution of fruits on the branches is desired. About 5 fruits on a group of small branches with a good (20 cm) distance between the fruits are optimal. Fruits touching each other are an excellent breeding place for the insects.

Given their local experience, progressive farmers know how much they can load the tree without influencing fruit size. 30 tons of 500 g fruits each, he will need 150 ½ kg fruits per tree at harvest. The fruits should be well distributed in the canopy. Some farmers thin more than once. In order to obtain fruits without damage to the rind and with good colour, some farmers clean the small branches around the fruits, which might scratch the fruit. By doing this they also expose the fruit to sunlight. There is an idea to use reflective plastic sheets underneath the foliage to improve colour. (This has not yet been experimented).

The training institutions in the pomegranate belt address GMP and technologies in general. Training schemes on export packaging, natural farming, management practice for growing export quality fruits (tree pruning, fruit thinning, irrigation methods) need to be introduced. Department of Horticulture in collaboration with APEDA, is also conducting series of training programmes for the benefit of farmers to enhance export of quality produce.

Pomegranate growers also make use of the facility of agribusiness and export knowledge center at the University of Agriculture Sciences at Dharwad. Intervention of the center has lead to establishing a direct link between growers and exporters of pomegranate. KB Exporters and Farm Fresh from Mumbai are now procuring north Karnataka pomegranates for exports to Middle East and Europe.

In general information flows from growers to processors and market facilitator as well as from market facilitators, processors, importers to farmers in the information flow chain as shown. Development agencies of the government as well as universities provide information in compiled form. However, all

²⁵ Drip irrigation brought honours and money to Javerilal Kapurchand Kanaria of Nashik district when he ventured out of his cloth business and began growing pomegranates, each weighing more than a kg. Two years after Kanaria started his scientific farming in Taharabad, his balance-sheet -- Rs 6 lakh annually from a 2 ha orchard -- showed that growing pomegranates on dry land was more profitable than running a cloth store. The largest pomegranate in Kanaria's orchard weighed 1.7 kg".

the information is not stored and updated regularly at a single point that can be accessed by all the stake holders. Small growers generally bank upon progressive farmers and large farmers and are guided by them. Progressive farmers, educated and large growers have their own system of collecting information through internet, mobile and private visits and through participation in events.

In order to help the Pomegranate sector, which has the potential to become a major export earning sector a comprehensive insurance scheme to cover plant, health and productivity (either as individual or as group scheme should be introduced), subject to conditions like following GAP and GMP.

Steps should be taken to establish Agri-Export Zone (AEZ) for pomegranate together with grapes in north Karnataka region. AEZ in Karnataka for pomegranate is in the pipeline. The SEZ/AEZ agenda provides a route to include small landholders in the export consortium. APMC's in pomegranate growing districts should be provided with facility for pomegranate trading with infrastructure for grading, packing hall and cold storage, so that small and marginal growers can utilise the same.

It is also recommended to develop literature on pomegranates for distribution in international exhibitions and the exporters should be encouraged to participate in exhibitions/fair etc on horticultural crops.

There is need for backward and forward linkages by adopting contract farming in pomegranate. Contract farming based on centralized model may be adopted, where the processor buys the commodity from a large number of farmers under contract with the firm.

National research centre on Pomegranate, Solapur, Maharashtra provides information on pomegranate orchard management and bacterial blight disease control. National Pomegranate growers association also provides information on pomegranate orchard management and bacterial blight disease control and market price information to its members.

What is required now is improve the quality of information and complete the facilities (food parks) as envisaged with a time bound programme. This would require effective provision of institutional supervision and control (through university, government department's extension centres, pack houses, food parks and banks) so that growers strictly adhere to package of practices.

3.6 Role of ICTs

Most of the farmers in Koppal District are progressive and use e-mail and internet apart from mobile phones for communicating with each other as well as other stake holders along the value chain. Some growers and local traders use the internet for trading purpose also. Growers use radio and TV for knowing information on weather, success stories of others, and farm technologies and attend training programmes, workshops and seminars conducted by the university, Institute of Agriculture Technologists and others.

Given the possibility of clustering²⁶ in the presence of post harvest infrastructure in the districts of our study for the pomegranate value chain and the great potential of integrating the small farmers the role of

²⁶ However, the clusters should be institutionalized in line with the scheme of Ministry of Micro, Small & Medium Enterprises for industrial clusters. These clusters should be set up with grower participation in equity and management of facilities. The

ICTs can be enormous that can result in significant gains to the farmers. The large corporate houses and the AFPL have used innovative ICT solutions.

Tata –Rallies KisanKendras (TKK), have roped in the National Remote Sensing Agency (NRSA) for using its satellite imagery service, for 'precision farming'. The service combines the use of information technology along with satellite mapping techniques to advise farms to adopt farming practices that maximizes agricultural yields. NRSA will supply to TKK satellite images for soil patterns and crop distribution while the TKK's will in turn interpret the data and superimpose it on the digitized image of the village maps. In Chitradurga District Apart from Akshay Agro Food Park, Rallies KisanKendras helps pomegranate growers (similar to ITC's e-Choupal)

Visweshwariah Industrial Trade Centre (VITC) at Bangalore and VITC-NCTI (National Center for Trade Information – NCTI started on August 2010), a computerised trade information centre at Dharwad that provides information on trade enquiries, international trade process, export requirements, certification requirements for exports, contact details of agencies connected with export trade and certification, and national and international events on trade and technology. One can register with VITC for inclusion in importer / exporter database at <http://www.vitcblr.org/vitcregistrationform.htm> or for availing specialised trade related service at <http://vitcblr.org/vitctradekarnatakaform.htm>. Exporters can also have a hyper link created in the database of VITC portal by paying Rs 500 as onetime fee. Pomegranate growers of Kushtagi/Koppal can register for such services through VITC-NCTI, Dharwad/VITC Bangalore.

Out of 32 growers contacted for the study (including progressive growers, natural/organic growers) 26 of them reported having access to internet own/or cybercafé and the others get information through mobile/land phone contact from various agencies and progressive growers in the neighbourhood. A Gangavati (Koppal District) based pomegranate trader/exporter has been using trade portals like alibaba.com for export of pomegranate.

Anarnet:²⁷ Traceability solution has been developed and implemented by Logic soft for Agriculture & Processed Food Products Export Development Authority (APEDA). This is an end-to-end system for monitoring pesticide residue, achieve product standardization and facilitate tracing back from retail shelves to the farm of the Indian grower, through the various stages of sampling, testing, certification and packing. The implementation has successfully begun last season (2010). Anarnet covers all stakeholders in the pomegranate export supply chain including farmers, exporters, state government horticulture/agriculture departments, accredited laboratories, Agmark, Pack houses, Phyto-sanitary certification departments, National Referral Laboratory (NRL), APEDA, etc., through a centralized web-based monitoring software.

facilities that can be promoted should include storage, Postharvest facility (Washing drying, Waxing, packing, pre-cooling, cold storage), collection vehicles, farm equipment on hire etc.

²⁷ Registration of farms through Anarnet has to be done every year and registration process closes by April for the subsequent years' exporters. During 2009 in Maharashtra 800 Pomegranate growers were registered as against around 60 growers from Karnataka (of which 51 from Kushtagi Taluk of Koppal district Farm Registration certificate is issued by the respective State Horticulture departments after clearance from Anarnet/APEDA).

4. Conclusions

These two value chain studies²⁸ provide interesting insights into the transaction costs of agriculture production especially in the context of (a) scale economies (b) market access and (c) information access especially prices. In particular, the presence of physical transport costs and information frictions, tend to limit farmers' choices of where to sell their produce in the case of mango. High transport costs, the lack of reliable price information, the inability to verify the quality of produce, poor post harvest infrastructure restricting the possibility of exploiting scale economies all make it difficult to breakaway from the traditional structure of transactions, where the farmer is heavily dependent on the trader/intermediary/PHC/contractor. The traders have a role to play and one cannot wish them away till some of the major infrastructure bottlenecks are removed.²⁹ They make up for a lack of infrastructure, such as transport and storage facilities in rural areas, they are also well informed about prices prevailing in different markets and the price offered. Institutional buying and supervision that can allow for the farmers to be directly linked to the buyers can only be possible if problems related to certification and traceability are resolved in the case of mango. SAFAL is seeing a modicum of success and is addressing various aspects of the supply chain, but in the absence of full fledged post harvest facility and the absence of scale economies for small growers the benefits are not widespread. From a buyer's perspective, a key problem in procuring from smallholders relates to their generally high transaction-cost implications – the costs of monitoring and co-ordinating many small producers. In chains where traceability requirements are paramount, these costs are heightened considerably (as the evidence of the mango value chain study shows).

Hence, there is some potential role of ICTs but to say that ICTs will be the game changers for mango growers will be oversimplifying the problems of Indian agrarian economy.

Organised retail and supermarkets are thought to be a panacea and are expected to integrate the small farmers in the supply chain. Here too, it is seen that until the entire supply chain issues are resolved their success will be limited.³⁰ The inadequacy of the value chain is a severe constraint as documented in the mango value chain study. Pritchard et.al. study (2010)³¹ done in rural Karnataka confirms our findings and suggests that farmers do not generally possess strong loyalties one way or the other among traders, or between traders and supermarketbuyers. Moreover, the expectations that these retail chains will operate as an agri-input supplier and, through this influence, provide the inputs, technologies and practices which would help farmers to meet the superior quality required for domestic (and potentially international) supermarket standards have been still born in India, at least till now. The retail chains presence remains rather narrowly anchored on the role of its collection centres as institutions for procurement. This study also shows that facilitated by the advent of mobilephones, farmers are acutely aware of price conditions

²⁸ See Annex 2 for the comparison of the two value chains on various dimensions

²⁹ While intermediaries deliver critical services to rural producers, they are also often exploitative and there can be large efficiency gains from their removal.

³⁰ In terms of shelf-space composition, Indian supermarkets tend to be dominated by household goods (cleaning products, etc.) and dry items (packaged products such as cooking mixes, tea and coffee, confectionery and toiletries). Compared with supermarket retailing in other countries, there is a relatively low proportion of shelf space given to fresh fruit and vegetables Bill Pritchard, C. P. Gracy and Michelle Godwin, (2010). The Impacts of Supermarket Procurement on Farming Communities in India: Evidence from Rural

³¹ Bill Pritchard, C. P. Gracy and Michelle Godwin, (2010). The Impacts of Supermarket Procurement on Farming Communities in India: Evidence from Rural Karnataka. Development Policy Review

across different markets, and the price realisation obtained by their neighbours, hence supermarkets are competing with local traders. This study confirms our findings that the traditional agrarian axioms of 'past experience' and 'advice from neighbours' remain the key determinants in farmer decision-making in rural Karnataka. This was even true for the pomegranate growers where knowledge dissemination from neighbours is a very crucial aspect of knowledge dissemination.³²

While the pomegranate growers enjoy adequate post harvest infrastructure due to the common facility provided by KAPPEC and possess the capabilities to meet the increasingly exacting standards of product quality, assurance and timeliness in export markets; they have to enhance these capabilities. Some of these skill development issues and knowledge gaps can be addressed by ICT interventions and can thereby help in integrating the farmers in the global value chains, but as it happens breaking away from established practices (for instance reluctance of farmers to thin fruits and hence an inability to get the required exportable grade) is difficult. "Past experience" dictates farm practices and given the volatility of the export market risk adverse farmers are slow in being pure exporters.

In general, our study does not provide overwhelming evidence, as some earlier studies, (Jensen, 2007 and Goyal 2010) of the tremendous impact of ICT on the agrarian economy. It is not that ICTs have not helped in improving information (as was seen in the case of mango farmers in the SMS alert) or seen in the case of progressive pomegranate farmers accessing the internet for export related information, but to effectively integrate ICTs into the agricultural development process in India would require major institutional and policy changes and also supporting infrastructure. This is available for pomegranate and not for mango. Given the evidence on the diffusion of supermarkets and the failed expectations of them as being centers of knowledge dissemination, indigenous institutional solutions like food parks, development centres, Kisan Kendras, ITC e-choupal, and AEZs may provide the necessary institutional milieu for the effective integration of ICTs in the agrarian economy. Once that happens, the role of ICTs in shifting the frontier of Indian agriculture will be tremendous, as there is no argument about its role. The only contention of this study is that small and occasional ICT interventions will not have a transforming potential.

³² Farmer respondents do not regard supermarket chains as important sources of advice, a finding which corresponds to the basic reality that these firms have been content to buy produce from their 'registered' (known and preferred) suppliers without interfering too much at the farm level.

Annex 1

Methodology for the Study of Mango and Pomegranate Value Chain

Mango

Data for the study was collected through telephonic interviews and few field visits to the project area (Srinivaspur-Kolar District, Bangalore Rural and Ramanagar Districts). Total Sample size was 62 farmers representing various land holding size groups, viz. 26 small (below 2 hectares) 22 medium (2-5 hectares) and 14 large (more than 5 hectares). In addition 36 growers were interviewed in other Mango growing States like Krishnagiri in Tamil Nadu State, Anantpur /Madanapalli in Andhra Pradesh and Ratnagiri and Devgad in Maharashtra State.

Discussions were also held with officials from Horticulture Department, Development and Infrastructure agencies like VITC, HOPCOMS, SAFAL, Reliance Fresh, KAPPEC, Innova Biotech Park, RORES (NGO) and scientists from University of Agriculture Sciences, Indian Institute of Horticulture Research and CFTRI; APMC, traders and mango processing Industries.

Available literature and past studies conducted by (including as part of Postgraduate research by M.Sc. and Ph.D. Students) by Universities and Research Institutions and articles and news published by various news papers, various commercial project documents of banks and International agencies like FAO and Asian Development Bank were also used in the present study.

Visit to Orchards

Few mango orchards in Srinivaspur, Ramanagar and Nelamangala in Bangalore Rural District (Mr. Alex – 3.25 hectare and Mr. Manjunath-11.35 hectare, Dr. Chandrashekhar- 1.6 hectares, and C. R Shivashankar- 10.2 hectares, Srinivasa Reddy- 8.4 hectares) were visited during April / May (flowering-fruited season). A discussion was also held with officials of RORES, an NGO engaged in helping farmers in Srinivaspur and Chintamani Taluks of Kolar District.

General Observations on land use

It is observed that mango growers allocate their land for mango, vegetables and other crops. In the case of small farmers the per cent age of land allocation to cereal, oil seed, groundnuts for use as roasted groundnut and seasonal horticulture crops like vegetables (Avare, water melon, cabbage, brinjal and beans) is more than medium and large farmers, since food grains for home consumption is their top priority. Small growers have very few mango trees (10-40 nos.) of different varieties like, Sendura, Banganpalli, Badami and Neelum.

Sample size (mango growers)

District-Taluk	No of Growers interviewed				Percentage of total land holding allocated for mango
	Small	Medium	Large	Total	
Kolar - Srinivaspur	6	14	8	28	25-40
Ramanagar District	12	5	7	24	40-60
Bangalore Rural District	2	4	4	10	20-30
Total	26	22	14	62	--
Other Places*	2	19	15	36	--
Grand Total	28	41	29	160	--

Note:*Kollegala- Mysore district, Yellur and Kundapur-Udupi District, Yellapur and Sirsi- Uttara Kannada District of Karnataka State and Krishnagiri-Tamil Nadu State and, Anantpur and Madanapalli-Andhra Pradesh State, Ratnagiri and Devgad – Maharashtra State.

Pomegranate

Data for the study was collected through telephonic interview and one to one discussions with few progressive pomegranate growers and officials connected with Pomegranate Growers Association (G RudraGowda and DevendrappaBalutagi) and officials of Akshay Food Parks Limited, KAPPEC, and VITC.

Available literature and past studies conducted by (including as part of Postgraduate research by M Sc and PhD Students) by Universities and Research Institutions and articles and news published by various news papers, Various commercial project documents of banks and international agencies like FAO and Asian Development Bank were also used in the present study.

Kushtagi-Koppal District: It all started some nine years ago. Fed up with regular crop failures due to recurring droughts, many farmers of Kushtagi were thinking of selling their ancestral land and taking up some other profession. Then they read an article published in a Kannada newspaper which stated that regions of Koppal, Bijapur, Bagalkot and Gulbarga districts of North Karnataka can produce good quality fruits such as grapes, pomegranates, lemon, plantains, etc.

While thinking over this piece of information, a private company came to their aid (Key Bee Exports), assuring required technical aid and possible export to foreign countries, provided the yield was of good quality. With their help, many farmers of Kushtagi, including DevendrappaBalutagi (Now Vice president of National Pomegranate growers Federation) and G RudraGowda (Dr. Mariappa Memorial State Award winner), switched over to pomegranate, which was suitable to their land and weather condition. First two years, nothing much happened. By the third year, they started getting good yield and along with it came the first taste of success. Their pomegranates immediately attracted the markets of cities like Bangalore, Goa, Mumbai, Chennai and Hyderabad. This enthused the private company to send them to foreign markets like Dubai, London, Paris and Berlin. The market responded well. With the introduction of internet and the improvement of highways, farmers of Kushtagi formed their own society, which directly communicated with foreign markets and reaped rich dividends.

Area under pomegranate increased from 11500 hectares to over 16500 hectares in Northern Karnataka Districts (Koppal, Raichur, Gadag, Bagalkot, Gulbarga and Belgaum). Age of the pomegranate orchards

in Northern Karnataka (mainly Koppal) is between 5-14 years. Nearly 80% of the Orchards have reached the age of producing to their full potential yields.

Hiriyur-Challakere- Chitradurga district: Pomegranate cultivation is grown throughout the Chitradurga district. However, the large scale cultivation of pomegranate is concentrated mainly in Challakere and Hiriyurtaluk, where Akshay Food Park is located. The area under pomegranate in Chitradurga district increased from 1297 hectares in 2008-09 to almost 2500 hectares 2010-11)

Land holdings and use

Majority of the Pomegranate growers in Kushtagi Taluk of Koppal District has medium size farms with land holdings of between 2-5 hectares on pomegranate (62.50 per cent) 31.25% of the growers are large growers with a holding size of > 5 hectares. (31.25 per cent) Only 6.25 per cent had low land holding (0.4 hectares – 2 hectares). Most large growers have their orchards distributed in separate packets. Few medium and large Growers have resorted to natural farming methods and were successful in controlling Bacterial Blight Problem.

The average size of holding of sample farmers was 2.30 and 2.89 ha and the average size of the pomegranate orchards was 1.58 and 1.47 ha in Challakere and Hiriyurtaluks respectively. The varieties of pomegranate grown in the study area were Ganesh or Bhagwa type. The range of age of bearing orchards was 4 to 15 years. The expected productive life span of pomegranate orchard as estimated by the respondents was 25 years. On an average plant population per ha was 375. [The cost of establishment per ha was Rs. 1,90,888.41 and Rs 1,89,644.33 of which material cost constituted 56.87 and 58.15 per cent and maintenance cost 43.13 and 41.85 per cent in Challakere and Hiriyurtaluks respectively. The average per ha yield in Challakeretaluk and Hiriyurtaluk were 4.68 tonnes and 4.60 tonnes respectively according to AFPL]

Sample Size (pomegranate growers)

District-taluk	No. of growers interviewed				Percentage of total land holding allocated for pomegranate
	Small	Medium	Large	Total	
Koppal-Kushtagi	4	18	2	24	85
AFPL assisted Area Chitradurga-Hiriyur/Challakere Tumkur-Kora	3	10	1	14	40
Other North Karnataka Districts Gulbarga- Gulbarga Haveri-Herekerur Bijapur-Muddebihal Hagaribommanahalli-Bellary Bagalkot-Mudhol Bidar-Humnabad	4	18	0	22	--
Total	11	46	3	60	

Annex 2

Comparison of the Mango and Pomegranate Value chain on various dimensions

Study area	Kushtagitaluk- Koppal District	SrinivaspurTaluk-Kolar District Bangalore Rural District RamanagarTaluk- Ramanagar District
Characteristic	Pomegranate	Mango
Age of Orchards in the study Area	4-14 years in Kushtagi Taluk of Koppal District and 4-7 years in Hiriyur-Challakere of Chitradurga District (Potential life: 25 years)	5-50 years (potential life 40 years)
Average Productivity per hectare achieved in Study area	Stable productivity at 11-12 Tones/hectare in Koppal and 4.5 -6 Tones/hectare in Chitradurga district	Productivity varies since mango is a biennial crop and in good year the productivity is 7-10 Tons/hectare and Bad year productivity may be 3-5 tons/hectare
Effect of Climate Change on production	Marginally effected by climate change	Severely affected by climate change resulting in sudden change in flowering, fruiting seasons as well as crop damage due to hail storms and fruit falls effecting productivity
Altering Harvesting season	Pomegranate can be trained to flower and produce fruits at appropriate period of time as per market requirement by Bahar fertilization, irrigation and pruning treatment. Koppal Growers have successfully achieved this and are able to supply pomegranate when the market for Indian pomegranate is good	Even though technology for altering the flowering season for mango is appeared to have been developed only a handful of growers are successful in achieving this for Exportable Indian Varieties. Field experiments are going on in Pune region Maharashtra to grow African varieties that are flowering during off seasons.
Controlling Fruit weight	It is possible to control fruit weight easily by thinning the fruits so that single fruit remains in each stem and removing fruits are hidden under leaves and not exposed to adequate sunlight. Pomegranate tree is pruned and trained to facilitate thinning easily	Fruit weight is not controlled in case of mango since tree is larger and difficult to reach the fruits when the tree grows big. Controlling the fruit weight by thinning is not successful commercially in case of mango
Harvesting	Easy and a hand held cutting tool can be used. A worker can harvest 400-500 fruits in a day	Since the tree grows tall a cutting tool attached to a pole is used fruit is caught in a net attached to the pole and cutting tool to avoid damage to the fruit during harvesting. Even with the best tool a worker can harvest a maximum of 200-250 fruits in a day.
Treatment required immediately after harvesting	No treatment required immediately	Fruit needs to be placed stem down in rows on bamboo table- or metallic tubular device for de-sapping and washed with water and dried to avoid sap burning of fruit skin
Other Post harvest treatments	Washing, drying, waxing grading, packing in cardboard boxes in paper mash trays or using shred paper as filler, palletising and cold storing for export purpose. Packing in Baskets after grading for local market	WHT extended WHT or VHT treatment for Middle east markets and additional irradiation treatment for US and Japanese markets
Export grades	Graded according to Size/weight of fruit and fruit should be free of cracks and black spots. A fruit weight of 500 Gram and above is preferred in EU countries and >350gram Middle east and 220-350 gram fruit weight for other South East Asian Countries	In addition to size grades fruits should have been properly harvested at right maturity and using harvesting tools. Certification is necessary.

Study area	Kushtagitaluk- Koppal District	SrinivaspurTaluk-Kolar District Bangalore Rural District RamanagarTaluk- Ramanagar District
Characteristic	Pomegranate	Mango
Traceability of source	Traceability solution available through ANARNET and even a medium size grower or aggregator or trader can become exporter	Only individual efforts on traceability makes it expensive for individual exporters
Post Harvest infrastructure	Post harvest infrastructure within the cluster is available. High density clusters and Steady and high (12 Tons/ha) productivity makes the infrastructure economically viable	Post harvest Infrastructure is being implemented and will be ready only during 2012. Mango being biennial crop and productivity heavily dependent on good weather without any variations during the season results in poor crop and makes the infrastructure unviable. For most of the existing current Infrastructure in Maharashtra and under implementation in Karnataka are through public sector initiatives and PPP model with bulk of the capital investment as Grants from Government.
Market Infrastructure	Growers are able to market the produce directly to processor or exporter avoiding middlemen. However lower grades are marketed through conventional methods in some cases.	Market infrastructure even though exists Only initiative of SAFAL appears to be successful. Corporate buyer (Retail chains) as well as Processors continue to exploit the grower, in the absence of post harvest infrastructure
Transport facilities	Only private transport facility exists between Orchard to Market and market to other destinations. However for container transportation form grower to Ports Rail and container terminal facility is available	Only Road transport facility is available and is expensive. In Maharashtra Mango train has been started last season (2010), bringing down the transport cost to almost 1/6 th of Road transport cost. Such facility can be extended to together parts of the mango growing areas.
ICT	<p>ICT can bring in transparency and speed up information flow to reach the needy grower in time. Pomegranate growers from Kushtagi are well connected with computer and internet facility and are net worked within the cluster effectively though mobile phone connectivity and help each other. They have also formed their own Associations to help each other</p> <p>However in order that ICT to be effective and successful in reducing costs and wastages only when post harvest infrastructure is in place and information available is accurate. In case of Pomegranate Growers are connected to various markets through internet facility and are not dependant on local information networks and their dependency on local market is limited to on exportable grades</p>	<p>Mango growers in the study cluster may be able to utilise the benefit of ICT when the post harvest infrastructure is ready during 2012 season. Unless certain information on weather (Forecast for the flowering and fruiting season or information on climate changes in advance) can be accurately predicted and in time ICT can play little role in the event of weather changes. Similarly Market information grade wise and variety wise on real time basis and lot –to- lot basis should be available to make ICT useful. Such information is not available at present.</p> <p>SNX exchange which provided a online platform for trading as well as for market information dissemination had to shut down and suspend its activities in the absence of pool proof methods on traceability, quality and adequate post harvest and transport infrastructure. However individual online facility is available for home consumers though entirely private B2B portals at present.</p>