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DYNAMICS OF MANGO VALUE CHAINS IN PAKISTAN

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The study examines the dynamics of mango value chains in Pakistan in terms of chain types and flows. In Pakistan, mango is the second largest fruit crop after citrus that makes a significant socio-economic contribution to the economy. However, the performance of mango industry is regarded to be suboptimal and requires upgrading to reach its full potential. The starting point for any upgrading strategy should be an examination of the industry's value chains. This paper reports the results of such an examination. Data were gathered through 140 in-depth interviews of industry actors from retailers backwards to suppliers of inputs. The respondents belonged to the main mango growing areas from the provinces of Punjab and Sindh. Thematic content analysis identified three types of value chains operating simultaneously in the industry. Based on their characteristics, these chains could be termed traditional, modern and export mango value chains. These chains, however, differed in their dynamics such as product, financial and inflows flows and chain governance. Traditional chains carried the major mango flows of all quality grades to consumers belonging to all income classes. They were relatively long, unorganized and governed by spot market transactions. Modern chains were found supplying better quality mangoes to middle and high-income consumers. Export chains mainly targeted foreign consumers. Results suggest that chain performance can be improved by better information flows and more effective chain governance through building collaborative relationships between actors doing business at various stages of mango value chains.

Keywords: Agri-food sector, product flows, information flows, financial flows, chain governance, chain performance.

INTRODUCTION

In the agri-food sector, various chains of businesses operate through which products moves from producers to consumers. From the perspective of a value addition or value creation, such chains are referred to as agri-food value chains (Gagnon, 2012; McCullough *et al.*, 2008). These chains are critical to human society as providers of food and income to the majority of the world's population (Collins, 2009; Gagnon, 2012; Neven, 2014). A typical agri-food value chain operates as a complex technical-social-economic system based on an array of interrelated and interdependent activities (Pimbert *et al.*, 2001; Silva and Filho, 2007).

The businesses in this system, as can be seen from Figure 1, ranging from input suppliers to primary producers to processors, distributors and retailers, endeavour to meet each other's needs and ultimately to fulfil consumer requirements for making profit (Bertazzoli *et al.*, 2011; Gómez *et al.*, 2011). In this way, chain actors do not work independent of each other but are connected with each other (Forsman-Hugg *et al.*, 2013). Through these linkages each actor adds value by transforming inputs into outputs and transferring them to the next actor who adds further value to the product (Batt, 2009). Thus, chains of actors are developed through which product moves towards consumers and money is transferred back to chain members.

Figure 1. Typical structure of a generic agri-food value chain.

An examination of these chains to ascertain how effectively and efficiently value is created and delivered to their members, and ultimately to the final consumer, will highlight bottlenecks and barriers to performance and therefore help to develop chain improvement strategies (Ahmad *et. al.*, 2018; Hotegni *et al.*, 2014). Thus, this study aims to determine the nature and dynamics of value chains operating in the mango industry of Pakistan by focussing on types of chains, flows of product and information, and governance. In terms of area and production, mango is the second most important fruit tree in Pakistan after citrus. Mangoes in Pakistan are grown mainly in Punjab and Sindh provinces and are known around the world for their flavour and sweetness (Ghafoor *et al.*, 2009; Hussain *et al.*, 2010; Mehdi *et al.*, 2016). Domestic demand for mangoes in the summer season is very high as mangoes enjoy prominent place in the food culture of the country (Badar *et al.*, 2015).

Although the mango area, production and exports have notably increased over time, the mango industry performance is sub-optimal. For instance, the industry faces many technical challenges including low productivity, poor

production and post-harvest techniques, lack of modern cold storage and pack-house infrastructure, and poor diseases and pest management (Collins and Iqbal, 2011; Mazhar *et al.*, 2010: Nafees *et al*., 2013). In addition to these challenges, little is known about how value chain actors are linked with each other and how information flows within chains. Because chain performance is linked to industry performance (Aramyan *et al.*, 2007; Kannegiesser *et al.*, 2008), the objective of this study is to examine the types and dynamics of mango industry value chains so that upgrading measures can be suggested for improving the performance of chains and ultimately the performance of the industry as a whole.

MATERIALS AND METHODS

The study is qualitative in nature, adopting a case study methodology to address its objective. Case study participants represented mango value chain businesses from input suppliers to growers through to retailers. They were drawn from Punjab and Sindh provinces where almost all mango production takes places (Government of Pakistan, 2012). Participants were identified through snowball sampling because of unavailability of statistics pertaining to the exact number of mango value chain actors in Pakistan. In case of snowball sampling technique, initial contact with one respondent identifies the next respondent and the process ends when all prospective respondents are contacted (Saunders *et al.*, 2009). Snowball sampling technique was employed for identification of respondent actors from retailers backwards to input suppliers to growers. Retailers helped to identify commission agents; commission agents helped in identifying contractors and growers, and growers spotted input suppliers. Data were collected through in-depth interviews of a total of 140 value chain actors. Table 1 presents the composition of the study sample.

Table 1. Composition and size of the study sample.

Chain Participants	Punjab	Sindh	Total
Retailers	30	10	40
Wholesalers	12	03	15
Exporters	03	02	05
Commission Agents	12	03	15
Pre-harvest Contractors	12	03	15
Growers	30	10	40
Input Suppliers	08	02	10
Total	107	33	140

Topic guides were prepared after reviewing relevant literature for conducting personal interviews of the respondents. These topic guides contained unstructured questions and were pilot tested before conducting field work. First, retailers were interviewed in Lahore, Faisalabad, Multan and Karachi, each city representing a major domestic market. Then in the wholesale markets of these four cities, wholesalers, commission agents and exporters were interviewed. The growers and contractors included in the study belonged to the districts of Multan, Khanewal, Muzafargarh and Rahim Yar Khan in Punjab province and Tandoallahyar and Mirpurkhas districts in Sindh province.

Each interview was audio recorded in local language such as Urdu and Punjabi then all data were translated verbatim into English. To aid the process of mapping value chains and their flows, thematic content analysis was used to identify and group data according to sub-themes and major themes. This approach, which is widely used in qualitative research, was applied using NVivo 10 software. For this purpose, the study data comprising the transcribed data, together with personal diaries, photographic images and personal notes were imported into the software. Data were first scrutinized for correction of possible mistakes due to transcription and organization processes and then categorized, organized and prepared for analysis by giving codes (from 1 to n) to hide participants' identity.

Through the NVivo software, data were dissected and reduced for generating more manageable and meaningful information. This was done through data coding which in the words of Bazeley and Jackson (2013) can be referred to as "a way of tagging text with codes, of indexing it, in order to facilitate later retrieval". To this end, the transcribed data were deeply examined several times for in-depth understanding of the true contextual meanings and extraction of meaningful concepts from the textual data. In the NVivo software, these extracted concepts were coded at various primary nodes. In a second stage of coding, the coded text was thoroughly reread and related concepts were merged to coherent sub-themes. These sub-themes were coded at secondary nodes in the NVivo software and their in-depth reading at next stage led to deduce major themes which were then coded at tertiary nodes. Thus, this hierarchy of concept, sub-themes and themes to describe patterns and interrelationships in the qualitative data which are given in the map and tabular form in the following sections.

RESULTS AND DISCUSSION

Table 2 presents the demographic profiles of interviewees according to age, education and length of mango business experience. All respondents included in the study were male because female involvement in agribusiness along the chain are not common in Pakistan. Among 40 retailers and 15 wholesalers, the majority were young with lower levels of education and more than 10 years of mango business experience. Exporters were older, had more than 20 years' business experience and were mostly either graduates or postgraduates. In terms of age and business experience, the fifteen pre-harvest contractors resembled the exporters, but they had lower education levels. Growers represented a wider spread of ages and mostly they had lower levels of education.

Table 2. Demographic profile of interviewed mango value chain actors (%).

Variable	Categories	Input Suppliers (n=10)	Growers (n=40)	Pre-harvest contractors (n=15)	Commission agents (n=15)	Exporters (n=5)	Wholesalers (n=15)	Retailers (n=40)
Age (years)	Up to 30	10.0	7.5	-	6.7	-	26.7	40.0
	31-40	10.0	20.0	20.0	13.3	-	26.7	32.5
	41 to 50	50.0	20.0	40.0	20.0	20.0	13.3	12.5
	51 to 60	20.0	25.0	20.0	40.0	20.0	26.7	7.5
	Over 60	10.0	27.5	20.0	20.0	60.0	6.6	7.5
Education	No education	20.0	12.5	60.0	20.0	20.0	53.3	47.5
	Primary[1]	10.0	10.0	26.7	6.7	-	20.0	27.5
	Secondary[2]	10.0	22.5	-	6.7	-	13.3	12.5
	Intermediate[3]	20.0	10.0	-	46.7	-	6.7	5.0
	Graduate	30.0	30.0	13.3	13.3	40.0	6.7	5.0
	Post-graduate	10.0	15.0	-	6.6	40.0	-	2.5
Experience (years)	Up to 5	40.0	2.5	-	6.7	-	-	15.0
	6 to 10	10.0	20.0	20.0	6.6	20.0	20.0	22.5
	11 to 15	-	12.5	26.7	-	-	26.7	20.0
	16 to 20	10.0	25.0	6.6	6.7	-	13.3	12.5
	More than 20	40.0	40.0	46.7	80.0	80.0	40.0	30.0

Note: [1]Grade 5 equivalent; [2]Grade 10 equivalent; [3]Grade 12 equivalent.

Around 65 per cent growers possessed more than 15 years' experience of working in the mango industry. Nearly fifty per cent input suppliers were aged between 41 and 50 years, with quite diverse education levels and years of business experience.

In the absence of reliable published data on the profiles of mango value chain actors, it is assumed that these results reflect typical profiles at the time of the study. However, further studies would build a bigger database and add to reliability of these findings.

***Typology of mango value chains*:** The study's findings reveal that mango industry, like other Pakistan's agri-food industries, is comprised of diverse groups of actors forming chains that link input suppliers through to final consumers. The businesses within each group make profits by linking businesses upstream of them with businesses downstream of them. Through this linking process, these businesses impact the flows of product, information and money in the value chain. Broadly as depicted in Figure 1, these value chains can be termed as traditional, modern or export chains based on the types of retailers and target market served.

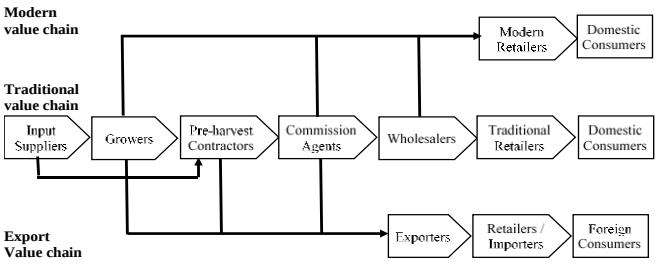

Figure 2. Structure of value chains in Pakistan's mango industry.

Although traditional, modern and export value chains operate independent of each other to serve the needs of their target markets, they also need to co-exist, for example to obtain mangoes from each other to fulfil demand and supply gaps. In developing countries, as indicated by Ruben *et al*. (2007) and Trienekens (2011), such three types of chains are common. Table 3 summarises the specific features of each chain type. Traditional value chains dominate the mango industry in Pakistan because most production flows through these chains. Like other developing countries, they are unorganised, fragmented and relatively long chains, with mangoes often passing through more than five middlemen before reaching consumers. They are characterised by traditional retailers such as street vendors and roadside sellers who fulfil the needs of most consumers.

Value chain actors operating in traditional chains lack adequate infrastructure. Resultantly, their fruit handling and management practices are often poor and value creation across various value chain stages is low to medium. Mango grading is based on simple visual assessment of size. Fruit quality in terms of size, shape, colour, cleanliness and freedom from blemishes and damages varies across a wide range from poor to good. Prices are determined daily on demand and supply of fruit and are lower than the mangoes passing through the modern and export chains. Spot market transactions govern theses chains and they are characterised by lower levels of coordination and poor information sharing among actors (Table 3). Gómez and Ricketts (2013) also highlighted similar characteristics of traditional value chains in agri-food industries in developing countries.

Table 3. Features of Pakistan mango industry value chains.

Features	Traditional	Modern	Export
Retailer Type	Traditional	Modern	Foreign
Product flows	Major	Minor	Minor
Quality	Mixed	Medium to good	High
Value creation	Low to medium	Medium to high	High
Grading	Basic	Good	Good
Information flows	Weak	Strong	Strong
Governance	Market	Hybrid	Market
Consumer	Domestic (all income classes)	Domestic (middle & high income)	Foreign
Price (per kg)	Low to medium (PKR 40-80)	High (PKR 80-130)	High
Infrastructure	Inadequate	Adequate	Sufficient

The emergence of modern retail formats such as supermarkets in Pakistan have given rise to modern value chains in agri-food industries (Ghani, 2005; Shah *et al.*, 2007). The results of the study point out that these modern value chains have also started operating in the Pakistan mango industry. Modern retailers such as mega store, supermarkets and speciality fruit shops fulfil the needs of middle- and high-income consumers. Currently, a smaller proportion of mangoes pass through these chains. However, their share is expected to increase as more consumers shop there because of their better-quality produce and cleaner environment. Modern retailers mostly have refrigerators and storage facilities for maintaining fruit quality.

Supermarkets maintain separate departments for procurement, display and selling of higher quality fruit and vegetables. Value creation is relatively high and medium to good quality graded mangoes are sold at higher prices than in traditional chains. Although supermarkets and specialist retailers may have put in place systems for ensuring supplies of good quality fruit, modern retail chains are still mostly governed by spot market transactions. There is emerging evidence that some supermarkets are endeavouring to build better co-ordinated and relationship-based chains by buying mangoes directly from large growers who can supply them required quantity and quality. Thus, the governance structure of modern mango chains can be described as 'hybrid' which according to Ebers and Oerlemans (2016) and Sousa and Marques (2002) includes features of both market or hierarchy forms of governance structures.

Export value chains focus on export market and are driven by the demands of buyers from other countries. Relatively graded high-quality mangoes in packing of different sizes pass through these chains. Value creation compared to other two chains is high. Nevertheless, Pakistan mangoes receive among the lowest prices in world markets, usually because of their short shelf life related to poor postharvest practices and inability to consistently meet international standards (Dunne and Johnson, 2011; Sun *et al.*, 2011). Most exports are targeted at Asian, communities, particularly Pakistanis, living abroad. Although spot market transactions mainly govern these chains, relatively higher level of coordination exists among export chain members because of the need to meet quarantine requirements of the importing country and the importers' quality standards. Exporters share this information with pre-harvest contractors and growers so that they can procure mangoes of the desired quality.

***Value chain flows*:** Thematic content analysis of data collected from the interviews with chain members also led to identify product, finance and information flows across the chains. For all three chains, product flows begin in the orchards where growers from nursery seedling raise mango trees which they either raise themselves or obtain from fellow growers or buy from private nurseries. Other input supplies to growers include fertilisers, pesticides and water. Growers mostly sell their standing mango crops to pre-harvest contractors at the flowering stage so they are not responsible for further operations such as harvesting and marketing. Contractors harvest, pack in wooden boxes and transport mature unripe mangoes to commission agents in different wholesale markets of the country. Larger growers may manage harvesting and marketing themselves.

In fruit and vegetable wholesale markets, commission agents auction mangoes to wholesalers in large lots, locally known as '*Challan'*. In general, these lots comprise 30 to 50 crates each weighing 10 to 12 kg. Wholesalers unpack the crates and apply calcium carbide on mangoes to initiate ripening. When the mangoes are ripe after three to four days, they sell them in smaller lots or single crates retailer who then transport mango crates from the market to their outlets. After re-grading, retailers sell mangoes to consumers.

Through modern value chains, from growers the flow of mangoes to retail outlets is the same as for traditional chains except that they buy better quality graded fruit. Some supermarkets do procure directly from larger growers but most supermarkets also procure mangoes from wholesale markets to meet demand and supply gaps. In case of export value chains, mangoes are passed on directly from growers and contractors to exporters. Exporters take responsibility for transporting mangoes from orchards to their export premises in plastic bins where good quality graded mangoes are

separated. Lower quality mangoes are either discarded or sold at lower prices in local markets. Exporters after grading, processing and packing export these mangoes by sea in containers to nearby markets such as the Middle East, or by air to more distant markets such as the UK.

Financial flows can be traced from the point of sale to the consumer – which is where a mango's actual value is realised – back up the value chain. Financial flows in all three value chains are characterised by the use of advance, spot and credit payments. Consumers pay on spot to retailers. Retailers may use both credit and spot payments to wholesalers. In case of credit payments, retailer's payback the money in one or two weeks to wholesalers. From wholesalers, the money left after deducting profit is passed on to commission agents either through credit or spot payments. In wholesale markets, commission agents arrange auction where in wholesalers participate to buy their supplies brought either by pre-harvest contractor or growers. Commission agents receive the sale proceeds and transfer this to pre-harvest contractor or grower after charging his commission and adjusting their advance payments and other charges.

Because most growers produce many varieties of mangoes, pre-harvest contractors usually pay money to growers in three instalments. The first instalment is paid in advance before the start of harvesting, the second is given before starting the harvest of the next variety and the third is paid before starting the harvest of the last variety in the orchard. From this money, growers purchase farm inputs such as pesticides, fertilisers and fuel on both a cash and credit basis. In case of modern value chains, financial flows are similar except that supermarkets usually transfer the due amount to the bank accounts of growers and commission agents generally a few days after delivery. In export value chains, exporters make credit payments to contractors and spot payments to commission agents and growers.

The findings of the study reveal that information flows at most stages are weak and unbalanced. In traditional chains, the information flow between retailers and consumers is weak and unbalanced because although consumers implicitly or explicitly inform retailers about fruit quality preferences. However, retailers often do not give proper information to consumers and do not always provide fruit that meets their needs. Concerns expressed by consumers about various retailer malpractices such as topping, quality mixing and high price provide further evidence of this weak and unbalanced information sharing.

In markets, the information sharing among traditional retailers, wholesalers and commission agents is weak because of lack of standardisation and unavailability of mechanisms for making information available. They personally search for product which meets their requirements. Wholesalers participate in mango auctions which is organised by commission agents. In the auction proceeding, typically two mango crates are opened from a particular lot of crates as a sample so that prospective buyers can assess the quality of mangoes. They must trust that the quality of the rest of the batch matches the quality of the sample crates.

In wholesale markets, generally commission agents are the gatekeepers of information flows. They are well-informed about market supply and demand and likely prices because of their forward and backward linkages in the chain. For securing their supplies, they maintain regular contacts with pre-harvest contractors who are well informed about mango supplies and can prepare and dispatch mangoes to commission agents when informed to do so. In contrast, the flow of information from commission agents and pre-harvest contractors to growers is very weak. Pre-harvest contractors do not share true information with growers pertaining to mango market prices, demand and sales. Using this power in bargaining lower prices with growers. Growers may also not always receive adequate information pertaining to quality and prices of farm inputs which they purchase from suppliers of inputs.

In case of modern value chains, supermarkets provide adequate information to growers and commission agents. Most supermarkets have developed their own quality standards and extend training to growers for meeting these requirements. Since other modern retailers such as modern stores and speciality shops also sell better quality fruit, they transmit back information to wholesalers and commission agents. Likewise, in export value chains, information sharing chain actors is strong because of much higher quality standards and the need to meet formal phytosanitary and other market access requirements.

The findings of this study reveal that the Pakistan mango industry is heterogeneous and diversified in its structure. In general, the value chains linking producers and consumers of mangoes involve many actors and lack organisation. Adhikari *et al.* (2012) also consider longer chains inefficient because losses are increased when the product passes through several hands. Traditional Pakistan mango value chains fall into this category, with product passing through up to five or six sets of actors before reaching consumers.

The obvious need for changes in governance structures of mango value chains has started taking place through the activities of modern and export chains, for example through vertical coordination where mangoes are procured directly from growers. However, there is need to facilitate and promote such a shift in traditional mango value chains through which most mango production flows in Pakistan. In particular, if actors in the middle parts of the chain understood consumers' preferences for mango quality attributes and their willingness to pay for these attributes, there may be motivation to engage in more collaborative behaviours so as to acquire and deliver mangoes that better meet consumers' needs. The present situation of transactional, arm's length relationships between sellers and buyers may deliver benefits to a few middlemen, but it also highlights opportunities for

chains to operate differently. Modern retailers and exporters are beginning to demonstrate how value chains can be reconfigured to deliver greater benefits to consumers and to distribute rewards more equitably.

As part of this change, growers must develop closer links with their markets. Commission agents currently secure their supplies through pre-harvest contractors. However, direct relationships with growers could mean that pre-harvest contractors become service providers, or some growers may take full responsibility for harvesting their mangoes. This would improve chain efficiency by reducing unnecessary transaction costs, improving the flows of information and subsequent decision-making, and reducing pre- and post-harvest losses. Ultimately consumers could benefit from having access to better quality fruit, improved availability, and even lower prices relative to product quality, i.e. better value for money. Each of these benefits to consumers can represent a benefit to chain actors who engage in more collaborative behaviours.

In addition to vertical relationships where downstream actors deal directly with growers, there is also need to develop horizontal relationships between small growers and middlemen in mango value chains. Research has shown that small growers who form groups can benefit from focused training efforts such as those dealing with harvesting practices, cost savings by bulk purchase of inputs, and greater bargaining power with buyers of their fruit (Davis *et al.*, 2012; Fischer and Qaim, 2012).

A key success factor for modern agri-food value chains is how responsive they are to consumer needs (Trienekens, 2011). However, consumer responsiveness requires adequate knowledge of consumer value, which most of value chain actors lack in Pakistan's mango industry. As result, their practices are not aligned with the desired consumer value. Thus, there is a need to increase consumer responsiveness of value chains by identifying the components of consumer value and ensuring that better information systems deliver it to chain actors responsible for creating and delivering those product value attributes. In this regard, retailers can play an important role because of their direct interaction with consumers. In most chains, retailers are the gatekeepers of information pertaining to fruit quality and safety requirements of consumers.

Information plays a key role in improving value chain performance (Ariyawardana and Collins, 2013). Overall, if it were possible to identify, collect and share the right information in a timely manner, actors in Pakistan mango value chains could significantly improve the chain's performance, and thereby the performance of their own businesses, by reducing costs and waste, better targeting consumers' needs and willingness to pay, and ultimately increasing the profitability of each business in the chain. In the respect, the role of provincial agricultural departments is very important as they can become sources of relevant and reliable information, provide training and support, help to source funding for demonstration projects and even engage in generic promotional activities on behalf of the industry in a region or province. The use of modern communication channels such as the internet, social media and mobile technologies and applications will be an important dimension of accomplishing these changes.

CONCLUSIONS

It can be concluded from the findings of the study that mango industry in Pakistan comprises numerous value chain actors who differ in their business volume and production and management practices. Similar to other developing countries, traditional, modern and export mango value chains co-exist and serve the needs of consumers belonging to different income strata. These chains significantly differ in their dynamics in terms of product, financial and information flows. Currently, traditional value chains carry the major flow of mango consumers. However, modern value chains are also attracting consumers due to rapid expansion of modern retail formats. Compared to traditional chains, modern value chains are more efficient and their trying to develop linkages with grower (backward integration) for delivering better quality. Resultantly, their share in domestic mango sale is expected to increase in future. Furthermore, consumer preferences for fruit quality have also enhanced which calls for gradual change in the governance structure of mango value chains. There is need to build coordinated relationships and promote sharing of information among value chain actors. Value chains are required to be more responsive to consumer needs. They need to upgrade their practices and align them with changing consumer needs. In sum, there is need to change the dynamics of mango industry through gradual transformation from traditional to modern value chains so that the industry potential in its contribution in socio-economic development of the country can be realised.

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