



Issues, Challenges, and Scope of Supply Chain Management in Fruits and Vegetables in Pakistan

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ABSTRACT

Pakistan is the leading producer of a large number of fruits and vegetables, but there is still a significant gap between market dynamics per capita due to huge loss in the post-harvest storing and handling of hazardous containers, shortage of temperature controlled equipment, inadequate cold chain systems in several parts of the country to maintain the products and significant factors. There are many challenges and issues to the whole supply chain of fruit and vegetables throughout Pakistan. To identify future problems and provide a way forward, the fruit and vegetable supply chain in Pakistan has to be analyzed. The purpose of the paper is, therefore, to address the scope and clarify the issues and challenges that are affecting the supply chain of fruit and vegetable sectors in Pakistan.

Keywords : Pakistan; Supply Chain Management; Fruits and Vegetables; Post-harvest

INTRODUCTION

Like every other sector of Pakistan, the fruit and vegetable industry is suffering from the absence of adequate stockpiling, packaging, lack of logistic support and limited fruit and vegetable yield. People do not know modern, advanced technology for advertisement, post-harvest operations, and supply chain management. As a result, Pakistan has restricted exportability of its fruit and vegetables and this sector does not expand as steadily as it should. There is a tremendous demand on the international market for Pakistani fruit and vegetables. However, Pakistan exports just 10 to 15 percent of its total fruit production.

In Pakistan's agricultural sector, fruit and vegetables are the significant sub-sectors. In 2017, the demand for fruit and vegetables in Pakistan amounts to USD 8.0 billion, with CAGR estimated to be 5.6%. Pakistan's agronomic conditions allow Pakistan to grow a large variety of fruits and vegetables from tropical and sub-tropical regions. Mangoes, oranges, apples, onions, tomatoes, carrots and sweet melons are some of the most valuable fruit and vegetables are grown. In Pakistan, onions, tomatoes and carrots make up approximately 58% of the total output of vegetables while mangoes and oranges make up about 45% of the fruit harvest. In turn, the government should plan to spend more in the farming industry to satisfy export and economic growth for fruits and vegetables (Zafar et al., 2018). Figure 1 shows the value of the Pakistani fruits and vegetable sector in USD billion from 2014-2023.

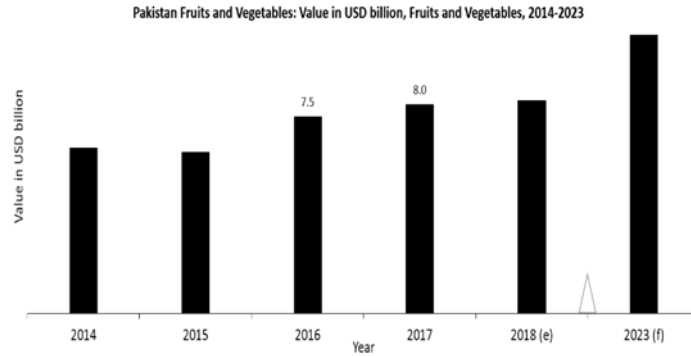


Figure 1: Pakistan Fruits and Vegetables; value in USD billion, Fruits and Vegetables, 2014-2023

Production of Fruits and Vegetables in Pakistan

In the agricultural economy of Pakistan, fruits and vegetables play an important role, as they make up 12% of agricultural GDP. Fruit and vegetable region is about 1.24 million hectares or approximately six percent of the country's planted land. The region below the field is 0.85 million hectares and 0.39 million hectares of vegetables. Overall fruit and vegetable production is projected at 13.13 million tonnes, of which around 6.9 million tonnes, and 6.2 million tonnes (Shafique, 2017).

Citrus, mango, guava, and apple are the main fruit grown in Pakistan. Citrus is Pakistan's main fruit variety. The total production of orange, mango and Guava was 31%, 27%, and 7% respectively (Khan & Bae, 2017). Table 1 describes the development of different fruit and their inclusion in overall fruit production.

Table 1: Production of Fresh Fruits and Share of different Fruits in Total Fruit Production in Pakistan, 2009-10 (Production in tonnes)

	2005-06	2006-07	2007-08	2008-09	2009-10	% share 2009-10
Citrus	2458400	1472400	2294500	2132200	2150000	31
Mango	1753900	1719200	1753700	1727900	1845500	27
Banana	163500	150500	158000	157300	154800	2
Apple	351300	348300	441600	441000	366400	5
Guava	552200	555300	538900	512300	509200	7
Apricot	197200	177200	240200	237900	193900	3
Peach	70300	71200	82400	83700	54000	1
Plum	60000	60400	73000	66900	57500	1
Grapes	48800	46500	75300	76100	64700	1
Pomegranate	50100	48100	56600	61100	52400	1
Other fruits	1441900	1362200	1464600	1555100	1492900	22
Total Fruits	7147600	6011300	7178800	7051500	6941300	100

Source: Agriculture Statistics of Pakistan, 2009-10 and Fruits, Vegetables and Condiments Statistics of Pakistan, 2009-10

Similarly, key vegetables (excluding potatoes) produced in Pakistan in tomato and turnip, radish, spinach, and cauliflower. The share of tomato production is 16%, with spinach and carrot and cauliflower at 9% each responsible for approximately 7% (Channa & Asim, 2019). Table 2 describes the development and share of various vegetables in the overall vegetable production of 2009–10.

Table 2: Production of vegetables and Share of different vegetables in Total Vegetable Production in Pakistan, 2009-10 (Production in tonnes)

Vegetables	2005-06	2006-07	2007-08	2008-09	2009-10	% share in Total production 2009-10
Lady Finger	112154	111565	103659	114657	116096	4
Squash (Tinda)	94438	98032	98116	97686	100627	3
Brinjal	88434	86528	87434	88148	89972	3
Bitter gourd	54246	53966	52732	56239	56994	2
Bottle gourd	59296	59192	59153	60824	63173	2
Tomatoes	468146	502292	536217	561891	476826	16
Radish	163420	164359	161464	163806	156422	5
Turnip	270249	266855	270784	265600	259837	9
Carrot	244279	236869	236590	245531	219339	7
Spinach	244279	236869	236590	245531	219339	7
Cauliflower	208548	212228	215629	234664	213414	7
Cabbage	74649	75695	71731	71988	69080	2
Others	1042625	1033523	1006774	998913	1003739	33
Total Vegetables	3124763	3137973	3136873	3205478	3044858	100

Source: Agriculture Statistics of Pakistan, 2009-10 and Fruits, Vegetables and Condiments Statistics of Pakistan, 2009-10

Fruit and vegetables at various phases of Pakistan's supply chains are subjected to various challenges and issues. Weak development and post-harvest management practices, poor distribution processes, insufficient logistics, high losses in post-harvest, no or little adherence to SPS requirements, inadequate information flow and weak technological acceptance, with a small proportion of manufacturing and export, are some of the major issues (Zakir et al., 2016). Considering the scenario, the country's present study on the chain of supply and marketing of fruit and vegetables has the following goals.

OBJECTIVES

1. To study the current production level, distribution method, market infrastructure, post-harvest management practices and the supply chain of fruit and vegetables.
2. The stakeholders and their position in the supply chain of fruit and vegetables in Pakistan are defined to examine the current supply chain.
3. To emphasize the latest post-harvest technology, the added value, food safety, and information management growth.
4. Evaluation of the quality assurance scheme, including regulatory measures (certification) in the supply chain of fruit and vegetables and food safety issues that pose a risk to health and the environment.
5. To assess the costs of production, the rates, added value and the efficiency of the main supply chain participants of high-value goods and evaluate how their value-added activities could be improved.
6. Determine the best logistics chain standards in the region.

METHODOLOGY

This research has been done using qualitative studies. It has clarified the supply chain of the fruit and vegetable sector and tried to identify the factors which affect the supply chain of the sector. The present study undertakes an in-depth review of existing specific and current literature and discusses problems affecting the agricultural supply chain, in particular fruit and vegetables. Authors also compiled research from peer reviews, seminar meetings, white papers, and business publications. Papers, using the words "fruit and vegetables" and the "agricultural supply chain," were obtained using an organized quest. Also included were subsequent supply chain fruits, the supply chain for vegetables, mango, apple, tomato, etc. Also, the study is centered on literature review and secondary evidence from numerous national and international research and development agencies, including several agricultural statistics topics in Pakistan, the Pakistan Economic Survey, different PHDEB, and PARC surveys, as well as several research reports and papers. Secondary data was further complemented by field visits and consultations with different supply chain stakeholders including farmers, contractors, commission intermediaries, wholesalers, retailers, fruit and vegetable manufacturers and exporters from major Pakistani growing areas.

LITERATURE REVIEW

The agriculture sector is a key part of Pakistan's economy. This makes up 21% of its GDP and offers productive jobs for 45% of the country's workers, and 60% of the rural population rely on this industry for their livelihoods. It plays a critical role in maintaining food security, stimulating overall economic growth, poverty reduction and industrialization (GOP State, 2012).

Pakistan's agro-climatic conditions from tropical to temperate enable the cultivation of 40 different vegetables and 21 fruit varieties. Mango, apple, banana, raisins, and raisins are the most important fruits cultivated in Pakistan and mainly tomato, carrot, cabbage, radish, turnips, and spinach. For the government in recent decades, horticulture has become a priority. Total region of 0.85 and 0.39 million hectares under fruit and vegetables with approximately 69% of the fruit and 31% of the vegetable production. The country produced 6.9 million tonnes, with a fruit share of 53% and vegetables of 47%, of fruits and vegetables of 6.2 million tonnes (GOP, 2010). With the creation of the Pakistan Horticulture Development and Export Board (PHDEB), the state is now turning into a stand-alone firm instead of the board, pays attention to the promotion of the horticulture industry. It facilitates the growth and exportation of farmers and industry for better profit by promoting technologies and developing export-driven strategies to attract local and foreign investments and develop links and networks with relevant local and international research and development institutions (GOP, 2008).

The low productivity and yield difference between small and large and world levels are among the major issues that affect fruit and vegetable production in Pakistan. Due to poor farm management, perishability, cold chain, stockpiles, the traditional advertising mechanism resulting in losses of post-harvest and quality issues, the nation has not yet attained quality levels and marketing efficiency. The cold storage and under-developed manufacturing market lead to large swings in costs. Therefore, problems arise in terms of enforcement, legal registration and traceability to reach the international market (Vorley et al., 2016).

The supply chain defines the whole range of activities needed to bring the product or service through the various phases of manufacturing (including physical distribution and the feedback of the specific supplier services).

FINDINGS

Current production level, distribution method, market infrastructure, post-harvest management practices and the supplychain of fruit and vegetables

Cost-effective marketing involves sustainable agricultural production because it influences both the income of farmers and the welfare of customers. The productivity of agricultural markets is not only dictated by agricultural production costs and outputs, but also by what exists with agricultural commodities from the farm to the client. The success of fruit and vegetable marketing is determined by several variables, which include perishability, seasonality, consistency, price, and place, besides supply and demand (Aujla et al. 2007).

On the grounds of market price and the essence of trading practices, Pakistan's current marketing network may be differentiated. There are three main categories of industries, including assembly, wholesale market and terminal business, including farmer, dealer, commission agent, wholesaler, seller, distributor, and exporter. Generally, the mechanism is regulated by intermediaries on the market and farmers, especially small farmers, have little direct market involvement.

Pakistan has a population of 180 million and a big domestic fresh food industry. However, fruit and vegetables are very complicated in domestic marketing programs. All controlled and non-regulated markets operate in this state. In Pakistan, there are more than 203 uncontrolled markets under the regulated markets, because there are more non-documented industries.

The supply chain management lacks appropriate cold storage with no built-in cold chains, resulting in major post-harvest losses (20-40 percent) with a reduced shelf life and fresh product quality. The need for cold storage in processing areas causes farmers to dispose of the goods directly after harvest, which often leads to the formation of surplus and lower prices. The pre-harvest method is controlled in fruit trees, hampering sustainable fruit production as contractors are involved solely in existing seasonal performance and income.

The scarcity of price information is a barrier to increasing producers' returns. The recent establishment in Pakistan of major international grocery chains such as Makro and Metro can strengthen the profits to domestic farmers. In addition to the growth of the modern chain, the increased revenue and demonstration impact also shift the habits of consumption and move towards added value, thereupon creating good market opportunities especially for fruits and vegetables.

Study of the current supply chain, identify the participants and their position in the fruit and vegetable supply chain in Pakistan

The supply chain management of other fruits and vegetables is approximately in line with the same trend as market players of product transition except for a difference in the volumetric distribution of various fruits and vegetables between the supply chain players.

Nearly similar patterns were found in fruit marketing, with the exception that most farmers (70 to 90%) go to pre-harvest contracts mainly to reduce risks and accomplish household and farmer expenses. The majority of the farmers pursue the self-marketing cycle in which farmers themselves sell their products after packaging and shipped to local markets by wholesale Commissioners or a few farmers selling fruits to

processors. Even though the processing and exporter sector is well established in fruit-growing areas of Pakistan, supplies to the sector are managed by contractors and few producers are also supplying their products directly to the manufacturing sector.

Present Supply Chains

The path from suppliers to customers is clarified. They are companies and individuals who engage in the delivery process of horticultural goods from suppliers to consumers.

Pakistan's Fruit Supply Chain – Mango Case

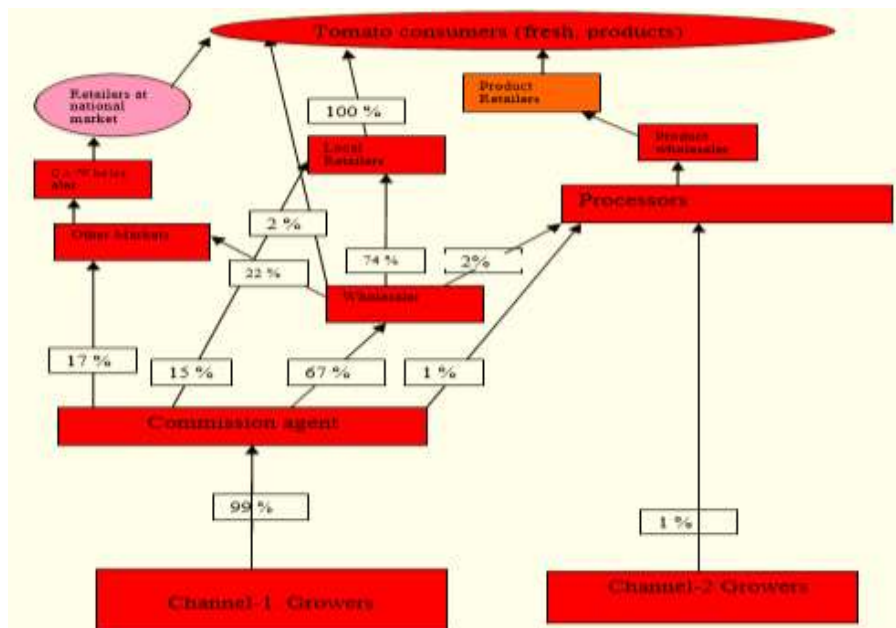
One of the two fundamental channels is the supply chain of mango from Pakistan.

Channel 1 includes contractors between farmers and agents/exporters/processors in Commission pre-harvest operations, whole-sellers, etc. Many growers sell their gardens in their entirety before harvesting to contractors. The deal depends entirely on confidence and these companies tend to buy certain supply bags or certain classes of producers regularly. Contractors carry out transactional activities including buying, processing, arranging, marking, labeling and retail transportation of produce, etc. Because of its risk-taking roles, contractors generally benefit, but also sometimes suffer a loss due to market uncertainty. In negotiations with various parties involved, 71% of the farmers marketed their produce to contractors and obtained certain advance payments (20-25%) in pre-harvest times.

Channel 2 is the shortest, whereby farmers themselves market their products after packaging and are shipped by contract representatives to local markets. It was noticed that 29% of mango growers sold on the wholesale market through consultations with farmers and contractors.

Pakistan's vegetable supply chain – Tomato Case

The vegetable supply chain is slightly different as vegetables are mostly supplied by farmers to themselves. The farmers supply the vegetables every day from major vegetable growing areas to the wholesale markets. The advanced farming of some farm families often provides a small-scale vegetable in other regions. Depending on the size of production, they sold both on the local and wholesale markets. 99% of producers sell their products on the commodities market through Commission agents and 1% by Tomato processors. Other vegetables except for potato are even less processed than tomatoes.



Source: Tomato supply chain based on discussion with stakeholders

Figure 2: Fruits Supply Chains in Pakistan (tomato)

Stakeholders and their position in fruit and vegetable supply chains

A supply chain map showing a visual image of the chain is given in this segment to demonstrate a vivid image of the performers and their position. This covers a range of interconnections among manufacturers, suppliers, transport providers, contractor firms, commission officers, wholesalers, retailers, and exporters. For the presentation of a true image, two field studies on mango fruit and one on vegetables are listed briefly and based on recent knowledge through contacting directly various stakeholders.

List of fruit market players

The chain map shows the business product movement, operations at every point of the supply chain, stakeholder organization and help in the value-added cycle (Figures 3). There are three things on this map: functions, operators and creators. The managers (also known as actors) are the individuals or organizations conducting the essential functions of a supply chain. They are the holders of the (unprocessed, semi-processed or completed) commodity at some stage in the supply chain. The performers of the fruit supply chain can be organized according to this concept by the following tasks:

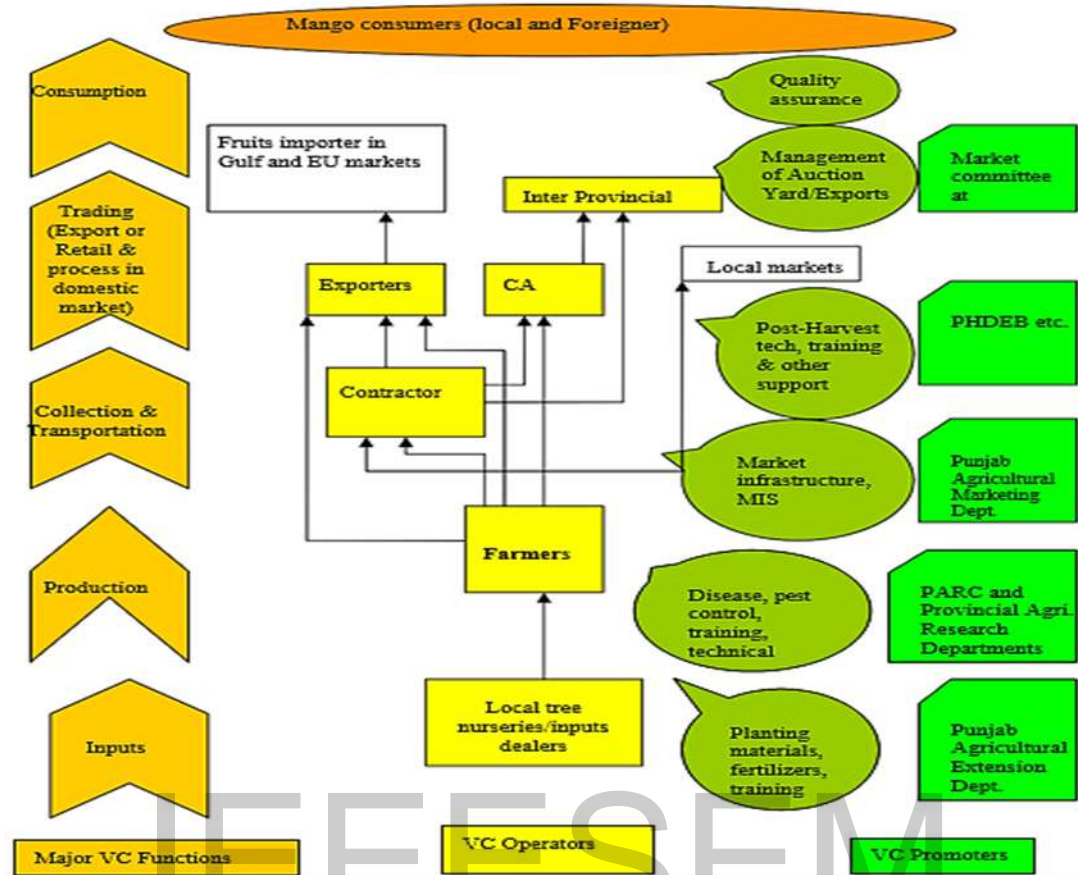
Production: performers with roles that are linked directly to the specific fruit of production, like pre-crop, planting, processing or mining.

Handling and storage after harvest: performers whose function is directly related to the management of fruit after harvest (cleaning, arranging, wrapping, etc.) or the care of basic commodities as added value.

Trading: performers with roles linked to fruit purchase and sale.

Promoters/funders of SC: Promoters/funders are groups, networks or organizations, which provide community services, and serve SC operators' mutual interests. They stay outside the typical business cycle to promote a chain management plan briefly. Awareness, policy development and coordination of supportive events require traditional coordinating roles. While the services provided by specific customers, organizations or corporations for the supply chain are classified as PHDEB, measurable (transportation, equipment, storage, among others).

IEEESEM



Source: the inventory of fruits' market performers, based on literature review and discussion with stakeholders

Figure 3: list of fruits (mango) market performers

As shown in the above map, several mango growers in Pakistan perform two or several roles as an optimized supply chain operator. They also control orchards, select fruits, rate them, and bag them up and transport them into the wholesale market in the event of self-address. They also handle agricultural supplies (chemical fertilizer, pesticide, FYM, etc.).

List of vegetable market players

In terms of the market players and their position, the supply chain is essentially identical, as stakeholders play similar specialist positions for different vegetables during each season of growth. To explain this clearly defined picture, the supply chain mapping of tomato reflecting the market movement of tomatoes and the activities conducted at each point of the supply chain is shown in.

Upon discussion with the stakeholders, it was found that there are different types of players and trade positions in the fruit and vegetable supply chains. There are two types of performers. One is about market managers who have given locations, controlled exchange, and operated fruit and vegetable traffic markets, and the other corresponds to market traders participating in the distribution of fruit and vegetables from growers to customers.

Managers and organizers of the market

Wholesale industries are regulated by the Association of Commissioners, including president and secretary-general, who hold offices. In the wholesale markets, there are the Market Committee and Regulations. The products are marketed to local shoppers and the distributors often purchase the items from those markets to bring them down to the region. Sometimes even customers can buy directly from such marketplaces (Sharif, 2011).

Prime players in fruits and vegetables' supply chain

The key participants are market traders who are engaged directly in the business. The principal characters, including providers of products, manufacturers, contractor firms, commission officers, wholesalers, dealers, and clients, are six different market intermediaries. The table below includes a summary of the prime players, their roles and functions, and their issues, based on the interview sessions (see appendix 1).

PRIME PLAYERS	ROLES	DESCRIPTION	ISSUES
Suppliers of input	Supply farm products and consulting services	Providers of inputs such as seed, pesticide, weedicide, and fertilizer are valuable collaborators for fruit and vegetable farmers as they lead to their output performance. It allows them to define the agri-input items most appropriate for such crops. Such dealers advise farmers whenever possible. Seed and fertilizer are also provided by Commission agents to the growers.	Cheap quality, timely non-accessibility, and costly supplies are major challenges.
Developers of nursery/seed	Generate seedlings for fruits and vegetables	In the nursery market, the public (restricted level) and private corporations are engaged. Many farmers often work in the nursery to harvest fruit and vegetables.	Many confidential-sector nurseries and farmers' nurseries are walk-up or accredited which results in poor fruit (mango) quality and low productivity crops. Similarly, weak tomato quality results in low production and reduced profitability.
Manufacturers	Manufacture and also harvest, rates, pack, stock (wholesale market) if soul-marketing exists.	Two major small- and large-scale farmers are involved. Manufacturers lack knowledge and information for planting and management of fruit trees/vegetables. Large and small farmers generally work under poor circumstances.	Farmers are therefore confronted with underprivileged quality and minimal fruit and vegetable productivity, which culminated in low marginal productivity.
Servicers	Harvest, store, sale, and transport	Until processing, more than 90% of the fruit groves are purchased by the farmers. In some instances, beopari even bought vegetables from farmers. The effort involved in fruit and vegetable processing is in poor working conditions. Absence of professional harvesters, growers, fruit and vegetable packers and transporters.	Farmers are reducing their share of the low-income benefit. Worse working conditions of workers in fruit mango production contribute to stagnant wages of labor. Heavy losses of fruits and vegetables following harvest.
Agent for the Commission	On behalf of manufacturers and vendors, market products, etc.	Nearly all fresh fruits and vegetables were reached by the Commission Agent to consumers. Throughout Pakistan's entire marketing network, the Commission Manager plays a key role. These funds suppliers, manufacturers, wholesalers, and even machine distributors. He exploits producers and distributors owing to his solid financial and enterprising power. Now, following the statute, the commission agents pay at least twice the commission rate. He operates like that as a broker. He markets himself the products of farmers. Thus it arranges bogus sales and harms farmers' rights.	High turnover cost, farmers and wholesalers exploitation, bogus auction, interest on farmers' profit.
Retailers	Bulk, retail, transport, and grade.	Throughout major cities, retailers focus on the fruit market. Bulk traders are retailers. They buy from the wholesale, label it and split it into small lots that are bought by dealers, sometimes by customers.	Long-chain delivery contributes to income cutting that reduces farmers' market rupees and high consumer prices.

Processors	Grade, process, and distribution	25 processing units for mangoes and 120 processing units for citrus are used for the procurement, shipping, drying, waxing, marking, packing and export of fruit. The mango processing work is in a bad state of operation. A small investment in new processing technologies by processors. Sometimes there is a lack of supply on the market of goods. It is very little in the tomato production sector. A small fruit sharing and processing are underway.	Failure to spend money on new manufacturing technologies. Low mango and tomato growth and their low-cost pulp and paste from abroad have led to a poor part of the processing of these products. The consequence is a lack of professional labor and youth jobs in food markets.
Shippers/Exporters	They link and bulk.	In Multan, there are 6 exporters of mangoes and in Karachi, there are 20 mango exporters. In Sargodha, there are 25 exporters of citrus and in Karachi, there are ten. In Sargodha, there is an association of 3 citrus manufacturing companies that have bought, manufactured and shipped from producers together. Poor quality of the substance and low wrapping is noted. There is no care except for processing and marking of fresh vegetables from Peshawar, Lahore, and Karachi.	Impoverished quality of the product and poor conditioning led to low export prices.

Secondary players in fruits and vegetables supply chain

There are different measures of secondary service providers and different kinds of governmental support in fruit and vegetable supply chains that characterize Pakistan's business climate. Among those, some of the highlighted institutes and organizations are Ministry of National Food Security and Research (NFS&R), Mango Research Institutions Multan, Small and Medium Enterprises Development Authority (SMEDA), Pakistan Horticultural Development and Export Board (PHDEB), and Punjab Agriculture Department (Marketing Wing).

They offer a variety of fruit and vegetable chains assistance, including seed propagation, analysis, private sector sponsorship, lobby, legislative roles, district/community learning, and extension facilities. Secondly, NGOs, corporate sector horticultural organizations and donor assistance programs that offer agricultural to market chain facilitators and integrators are part of the second category (MMA Ltd., 2011). Some of these governmental and private-sector organizations play an important role in improving Pakistani chain capability and chain management skills. Based on the interview conducted with the secondary market layers, the following problems have been observed:

SECONDARY PLAYERS	DESCRIPTION	ISSUES AND CHALLENGES
Research and development	Most research facilities in areas of study of Punjab are covered by a horticultural section. Their main activities include mango and tomato varieties selection, crop experiments, fruit nurseries, vegetables (including pumpkin) planting. Although there are various R&D institutions in the field of study, very few current high-yielding cultivars were produced.	Minor horticultural research and development operation in the area of research. Improper method of expansion.
Conveyance	Almost all the areas of the country are privileged with the facility of transportation of fruits and vegetables from the farm to the market.	The roads infrastructure in some areas is so poor that companies have started setting up plants in near-by areas to store, save, and sell the bulk of some fruits, for example, apricots grown in Skardu.
Communication and Market	Regular markets are conducted for fruit and vegetables across the region, which is connected to other regions and central markets in Karachi. In the case of connectivity, all these markets are well linked.	Due to a lack of knowledge for farmers, Commission representatives, dealers, wholesalers, and distributors exploit horticultural con-

		sumers and producers.
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Current post-harvest technologies, added value, food security, and information management development

It was discovered that focus has increased on research and development of post-harvest and the added value of horticultural goods. Several agencies now participate in value-adding and post-harvest. A strong post-harvest help is needed for the increase in the value of vegetable commodities. The formation of research centers and cooperative organizations for growth, demonstration, and transition of technology to stakeholders is one of several steps in this direction. Infrastructure development, such as farm to market route, storage facilities, cool supply chain, ease of freight and shipping, and marketing and export documents are among the different measures taken. Over 80% of farmers in Pakistan are small. Fruits and vegetables are traditionally marketed without trial and classification in Pakistan. In Pakistan, the growth of fruit and vegetables is a lucrative and viable resource for the industry which needs to be explored completely. Producers currently do not know of the latest processing methods, which can provide added value to the products and export a great deal of foreign exchange. Therefore, the potential for the implementation of raising facilities focused on agri-food is massive, which will reduce losses following harvest. The implementation of this facility will raise farmers' incomes as well as nation exports.

Quality assurance program, involving qualification in the supply chain and food security issues that are detrimental to public health and the climate quality assurance scheme

FGD resulted that the short service life of fresh products spoilages frequently leads to rapid decline and thus to loss of products for human use. The reduction of these losses is therefore of great importance for producers and consumers, especially if they can be avoided economically. Safety problems require procedures for the post-harvest control of quality and safety, as well as practices for the on-farm activities. In international markets, export prices are based on their scale, color, and imperfections as well as internal consistency standards, which are usually based on their business ranking. As Pakistan does not have sufficient packaging, grading or cold storage, inadequate and unreliable quality is often given, leading to low exporting prices. There are several ties between the supply chain for fresh fruits and vegetables: cultivation, growing, post-harvest procedures, packing, storage and transport, each with their contamination threats and with its respective scale of service, distribution or processing facilities in use. Such risks are defined throughout the whole manufacturing and management chain through Security Assurance Programs. Cold storage efficiency is hardly feasible and exporters had to do so during transit, reducing export capacity and increasing costs. Branding and traceability are also fields of significant concern. Today, the most popular packs and exports of fruits and vegetables are the wood crates barred from many of the import sectors. To implement the new export regulation, adequate labeling systems with a digital barcoding system are also required to ensure product traceability.

Contribution

In the current study, the factors that influence the fruit and vegetable supply chain throughout Pakistan are established. The key factors found in the study relate to facilities, care & added value, financial and knowledge. Among the main challenges found were the lack of infrastructures, weak production and added value, small farmers' wages, the ineffectiveness of supply chain, a significant number of intermediaries / divided supply chains, inadequate safety and quality requirements.

RECOMMENDATIONS

Deliya et al. proposed the following initiatives: systemic changes should be made at various levels, including producers, intermediaries, and customers. A deciding position can be played by government, corporate, public-private collaboration, cooperatives, infrastructure suppliers and even media. Infrastructures such as roads, transit, ICT and cold storage are critical criteria for the supply chain's better results. Cooperation of farmers utilizing enterprises, contracts and retail chains would facilitate improved production delivery, minimize market risks, provide better roads, attract greater public interests, acquire better expansion services, and build awareness of the new and existing innovations (Xing et al., 2016).

The significant need for logistical productivity is personalized logistics. It reduces costs, promotes the preservation of product quality and satisfies consumers' requirements.

Limitations

The current study is limited to the basic challenges and scope of SCM of fruits and vegetables in Pakistan. Further research can be done on the pricing strategy of fruits and vegetable supply in Pakistan that will make the supply chain management much effective and reliable.

CONCLUSION

The analysis and report on the fruit and vegetable supply chain in Pakistan has shown that the supply chain, the shortage of cold chain storage and food processing units contribute to high inefficiencies and losses and pollution of vegetables and fruit. F&V's overall supply chain has to deal with the issue of post-harvest losses and waste due to the long, broken chain, intermediaries' reliance, poor road networks, unreliable commuting systems, insufficient facilities in the cold chain, high packaging costs, low delivery efficiency, a weak link in the supply chain, etc. The biggest hindrance to a fast-growing farming sector in Pakistan is the extremely inefficient supply chain and the cold chain network. The Pakistani fruit and vegetable industry is a very rising market, with a good supply chain providing a great opportunity for agri-business and community development. Nonetheless, the above listed many factors affecting the supply chain represent major challenges and impact the growth of Pakistan's production for the fruit and vegetable market. Some need urgent attention, which can alleviate future difficulties and provide support for the fruit and vegetables business supply chain.

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APPENDIX

The following are the questions that were asked from different stakeholders in focused group discussion and their responses are analyzed in the "findings" section.

1. What are the current production level, distribution method, market infrastructure, post-harvest management practices and the supply chain of fruit and vegetables in Pakistan?
2. Identify the participants and their position in the fruit and vegetable supply chain in Pakistan?
3. What are the positions of stakeholders in the supply chain management of Fruits and Vegetables in Pakistan?
4. Who are the primary and secondary market players in SCM of fruits and vegetables and what challenges/issues do they face?
5. How credible are the recent technologies on Post-Harvest, Value Addition, Food Safety, and Development of Information Management?
6. What is the Quality Assurance System including Regulatory Measures (Certification) in Fruits and Vegetables Supply Chain and Food Safety issues that can cause risk for Public Health and the Environment?