

The Environmental Perspectives of Apple Fruit Supply Chain Management in Chitral, Northern Pakistan

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Abstract- With increasing population the demand for fresh fruits is on the rise in Pakistan. Because of perishing nature and short shelf life, fruits require proper and effective supply chain management (SCM) for securing them to be wasted. Fruits of Chitral, Northern Area of Pakistan face supply chain (SC) issues and challenges. The main purpose is to conduct a detailed insight of the present apple fruit SCM system in Chitral for identifying the related environmental perspective of apple. That small subsistence farming should be view as a business. As compare to the producers' income with others intermediaries, (27% to 73%) it is significantly lower. Focus should be given that the distribution of the marketing margin across the players can be measured fairly. The anticipated research work is exploratory in nature using secondary data, undertakes a meticulous review of basic and up to date literature available and tried to explain the factors affect the supply chain of Apple Fruit sector in Chitral, Northern Area of Pakistan. Thus, the purpose of this study is to develop a research framework that improves understanding of SCM, stimulates, and facilitates researchers to undertake both theoretical and empirical investigation on the critical constructs of SCM, and the exploration of their impacts on supply chain performance. This is the first study to examine the environmental perspectives of apple fruit SCM in Chitral, northern Pakistan. This study could provide a lesson for many developing countries.

Keywords- Supply Chain (SC), Supply Chain Management (SCM), Constraint, Apple Fruit, Cold Chain, Pakistan

1. Introduction

Apple is a sign of health and attractiveness. Apple has worldwide growing and consuming fruit. Apple is a highly nutritive fruit having necessary food elements such as carbohydrates 14.9% sugar 11%, fat 0.4%, protein 0.3%, and in a balanced condition vitamins A, B & C. After citrus and banana, it position third in consumption and is approximately available in every season [5].

Commercially worldwide, about 75 billion tonnes of Apples produced in 2012. Out of these 10% are traded internationally in their fresh state. In 2012, there was a quantity of 8.2 million tonnes with a net value of \$ 8 billion. China is the largest Apple producer, produced 37 million tonnes, followed by United States of America (USA) (4.1), Turkey (2.9), Poland (2.9), India (2.2), Italy (2.4) and France (1.9) [5].

1.1 World Fresh Apple Fruit Forecast

Apple fruit production in year 2017 worldwide are forecasted to go up 1.2 million metric tonnes to 77.6 million metric tonnes as Chile recovers and China continues its increasing trend. Global trade forecast up to 6.6 million tonnes as higher exports for Chile, China, and the US [31].

China's production is expected to go up about 900,000 tonnes to 43.5 million tonnes, due to cultivation of more trees and recovering from weather related losses. EU's production forecasted is to decrease faintly to 12.6 million tonnes as considerable weather-related losses in Central and East European especially in Poland.

Unchanged exports are expected at 1.6 million tonnes. Slowly recovery of imports is expected. USA’s production is forecasted to go up 147,000 tons to 4.6 millions. Chile’s production is forecasted to recover from

previous year’s weather-related wastages. Excellent growing conditions Turkey’s production is expected at 2.7 million tonnes. Exports are anticipated from 16,000 tonnes to 125,000 on higher exports to Iraq [31].

Apple Producing Countries (000 Tonnes)			
Country	2010	2011	2012
China	33,265	35,898	3700
United States	4,210	4,272	4,110
Turkey	2,600	2,680	2,889
Poland	1,877	2,493	2,877
India	1,777	2,891	2,203
Italy	2,204	2,411	1,991
Iran	1,662	1,651	1,700
Chile	1,100	1,169	1,625
Russia	992	1,200	1,403
France	1,788	1,858	1,382

Table 1: Apple Producing Countries [5]

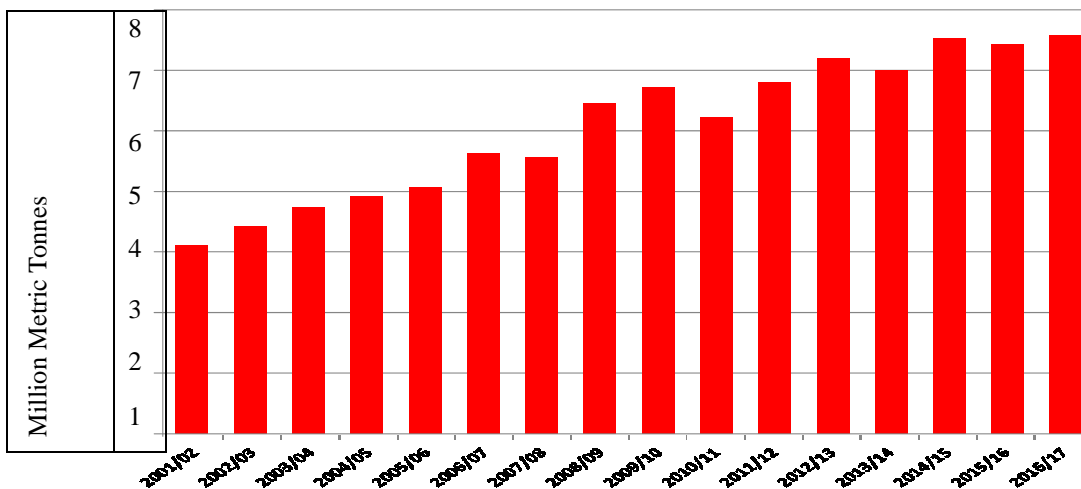


Figure 1: Global Apple Export Table [31]

Pakistan is having great diversity in its soil structure. The range of Ecological and climatic conditions are from very warm to extreme cold. Pakistan has perfect climate for growing a wide range of luscious fruits, which enables the country to grow many kinds of fruits [21].

Agriculture is the largest economic sector of the country, which accounts for 21.4% of Gross Domestic Product (GDP) [8]. More than 62% of the country's population lives in rural areas directly or indirectly involved in agriculture, which is the main contributor to GDP [9].

Pakistan exported 218,203 tonnes of fruits worth \$143.4 million in 2013 as compared to 191,739 tons worth \$103 million in the previous year [26].

In Pakistan along with provinces of Punjab,

Sind, Baluchistan, Gilgit Baltistan and FATA, apple is also produced in some districts of Khyber Pakhtunkhwa (KPK) province. In which Swat is the leading district in KPK in apple production followed by district Chitral, Mansehra, Dir and Abbottabad [4]

Production of Apples in Pakistan('000' Tonnes)					
Year	Punjab	Sindh	KPK	Baluchistan	Pakistan
2000-01	2.8	0.2	117.5	318.4	438.9
2001-02	2.5	0.2	117.4	247.0	367.1
2002-03	3.6	0.1	110.1	201.6	315.4
2003-04	3.6	0.1	106.3	223.8	333.8
2004-05	3.6	0.1	127.9	220.3	351.9
5 -Years' Average	3.2	0.1	115.8	242.2	361.4
2005-06	3.6	(NA)*	126.7	220.9	351.3
2006-07	3.6	(NA)	125.2	219.5	348.3
2007-08	3.5	(NA)	124.5	313.6	441.6
2008-09	3.7	(NA)	130.8	306.5	441.0
2009-10	3.4	(NA)	112.1	250.9	366.4
5 -Years' Average	3.6	(NA)	123.9	262.3	389.7
2010-11	3.5	(NA)	95.6	426.8	525.9
2011-12	3.4	(NA)	120.2	428.3	551.9
2012-13	3.6	(NA)	125.1	438.0	566.7
* Not Available					

Table 2: Production of Apples in Pakistan [5]

Chitral is the largest (area wise) and least developed district of Province Khyber Pakhtunkhwa. 90% of population is engaged in farming. The total cultivated area is 22,552 hectares. The total area under apple cultivation is 107 hectare and its production is only 656 tons [22]. Due to lack of facility, proper guidance, packaging and marketing, over 60 per cent of fresh fruit goes to waste in Chitral. Poverty in Chitral could be eliminated considerably if the fresh fruit produced in the valley is utilized on commercial lines. Apple is grown by almost all of the households in the sub valleys of upper Chitral such as Mulkhow, Torkhow, Mastuj and Lotkoh. Due to lack of marketing facilities only 1% of the fruit is dried by the household. Quality of fruit is not inferior to that of Gilgit and Afghanistan but due to improper and unscientific dehydration facilities in Chitral, dry fruit lose their pleasant charm, taste and brittleness [2].

Due to lack of funds and well-qualified labour, and lesser marketing information, majority of the apple growers in the study area, sell their apple to pre harvest contractors. Contractors purchased apple from the growers at the lowest cost and sell it in the market on high price [2]. Small farmers are getting fewer margins than bigger farmers [25]. Study suggests that wholesale trade in agriculture, must be done by the government department to buy directly from farmers and distribute it to the retailers on reasonable price. Cost increases in SCM decreases the margin of producers [38].

The advantage of district Chitral for certain agriculture products has an ecological niche, which has high value in the markets. Second the product is grow in off-season at district Chitral and are sold at high prices in the local markets [24]. The overall margin, for all apple varieties 27% goes to producers and the rest 73% is receiving by various marketing intermediaries. It highlights that marketing margins for all kinds of apple are very high at the province of Khyber Pakhtunkhwa especially in district Chitral [24]. Lack of processing facilities and capacity to preserve fresh food causes high food losses in world, which is more than 40% [8].

1.2 Problem Statement

Due to improper marketing, the growers do not receive desirable process hence negatively relate to production of apple/pome fruits. Furthermore, reforming this can have diverse positive effects on poverty reduction and social harmony. The study aims to suggest a well-organized supply chain, which is inevitable to efficiently utilize and allocate these rich conditions for apple fruit production.

The study is carried out under the following objectives.

1.3 Objectives of the study

1. To identify the related environmental perspective of apple fruit and is to view small subsistence farming as a business.
2. To find out the present apple fruit marketing channels and margins and measure ways to improve the producer's share and to reduce wastages of apple fruit.
3. To develop policy recommendations for production and efficient marketing of apple in the concerned district based on study findings.

1.4 Significance of the study

In district Chitral of Province Khyber Pakhtunkhwa little or no attention has been given to supply chain by the fruit industry, therefore over 60 per cent of fresh fruit goes to waste in Chitral [2]. This study will also provide ground to eliminate or decrease wastage of produce fruits and through improved marketing facility and SC could increase the area under cultivation of such fruits. Research in this area may enable the government and other authority to enhance specialization and hence growth and development to such remote and backward area, yet important places on archeological, culture and tourist perspective.

Findings arising from this research study could be reliable enough to attract small and medium investors to further improve the quantities produce and accelerate the overall economic activities as such information are inevitable for

increase inefficiency, awareness and productivity. The analysis of this study will help in strategic and tactical decisions particular for the apple producers in Chitral for sustainability in the apple fruit SC, apart from this small subsistence farming can avail the opportunity as a business.

2. THEORETICAL BACKGROUND AND METHODOLOGY

The anticipated research work is explanatory in nature using secondary data, undertakes a thorough review of basic and up to date literature available and tries to explain the factors affecting the SC of Apple Fruit sector in Chitral, Northern Area of Pakistan. The SC of Fruits is explained and identified the factor which affecting the SC of the area. This paper provides a review of a study that is done on the issues and challenges in the SC of fruits & vegetables in India. The current study analyses a careful overview of basic and up to date literature available and identified the issues, affecting the SC of agricultural products, especially fruits. The secondary data related to the issue has been taken from already existing literature, published documents, books, thesis, journals and newspapers.

The literature has identified at least two key components of the study, apple fruit and cold supply chain management. Each component has their definition issues that need to be explained before one reaches to know about the objectives of the study.

2.1 Apple Fruit

Agriculture is the prime source of every country GDP and provides raw materials to many industries. Due to its fresh able in nature, agri fresh produce has fluctuation in demand and prices, consumer gives more attention to safety of food, therefore fresh produce needs more and carefully caution. In order to vary in cultivar, pre and post harvest factors and environment apple fruits have a different colors, shapes and potential physiological disorders. [8]. Physiological disorders and the method used for production, harvesting, packing, handling and marketing practice during the supply chain,

texture and flavor directly influence the apple quality consequently profits.

2.1.1 Apple quality

According to the USA apple industry standards, the apple that has no physically damage, no pathological and physiological disorder could be considered as high quality.

2.1.2 Practices on apples at-harvest

Apples are a climacteric fruit must be harvested at the optimal time for high quality flavor, color and greater size. Different changes, related to ripening, occur a month before harvest, through harvest and in cold chain [10].

The most important for apple is the temperature during harvest and consumption, for high quality, high result and for long time, the apple must be kept in lowest safe temperature [16].

Alvarado Herrera, Mildred L (2014) suggests to maintain high quality of apple and to increase customer confidence, trained worker must be hire, to be careful about separation of similar quality of apple, keep each lot according to picking date, orchard block and to considered uniformity and consistency among each box [3].

2.1.3 Post-harvest waste

The post-harvest wastage is major concern for apple fruit, wasted in different phases of the SC [31]. The overall post-harvest waste of the total production around the world is from 20% to 60% [31]. To increase farmer margin and return waste reduction is the way to do it [16]. Waste occurs due to inefficiencies in warehouse, transferring and handling. Furthermore, due to the heterogeneity in crops, countries and climates, prediction and estimation of waste are difficult. Another major reason for this waste is the shortage of satisfactory infrastructure, cold storage and transportation in developing countries such as Pakistan. Per unit cost is also increasing in order to increase the number of intermediaries, lack of suitable planning and management practice in the SCM [31]. Mostly the small subsistence farmers have little knowledge of market demand, technology, and

financial incentives. The waste problem becomes more severe due to lack of estimation about produce, region and climate. Except other issues and problem, post-harvest waste decreases the share of the farmer, lesser availability of the produce and options consequently in a loss of revenue and higher price.

2.1.4 Natural and social cultural factors

Natural disaster plays a great negative role to destroy infrastructure, living standard of the locality, agriculture. Bad weather conditions, affect the SC in addition its hurdle in harvesting and packing [23]. The rural literate but unemployed survive below the poverty line trying to meet their most fundamental requirements. Due to socio-cultural values, they are not selling their fruits in the market [11]. Living in extreme poverty, often at the clemency of associations, robs them of their self-esteem and their freedom to make their own choices and to buy the expensive and new invented seeds and fertilizers or sell their own apples to the markets [24]. Quality directly relates to the health of the people. Quality inputs like seeds and fertilizers are important for SC to deliver the fresh goods in a timely manner and in a proper quality to the customer. Quality has a strong impact on the SC, so it leads to efficiency and less rejection [30].

2.1.5 Standardization

Developing countries supply chain lacks of standardization in Packaging, no cold storages and proper logistics vehicles are available. Standardization is important for building degree in any operation. Relatively high logistics cost & non-reliability of delivery time lead to lack of standardization [22]. Due to lack of agricultural research, lack of funds and well-qualified labor, and lesser marketing information majority of the growers sell their fruits to pre harvest contractors [12].

2.1.6 Margin

Mostly farmers do not get appropriate margin for their agricultural produce. The contractors, commission agents (intermediaries) eat all the

share of farmer's income. Contractors purchased apple from the growers at the lowest cost and sell it in the market on high price. The overall margin, for all apple varieties 27% goes to producers and the rest 73% is receiving by various marketing intermediaries [2]. SC is dominated by agents. The trader gets complete power over the price of production, because of traders funding the producers, mostly they get financial problem for initial investment of production [30].

2.1.7 Technology

Lack of processing facilities and capacity to preserve fresh food causes high food losses in world, is more than 40% [20]. In developing countries transportation, associated challenges are very high because of improper roads, unavailability and high cost of transportation, lack of temperature controlled vehicle for the supply of goods etc [11]. Accurate information is the root of proficient SC. Inadequate information leads to poor understanding of prices, high quantity of losses, and late supply of goods in to the destination [12]. Linkage and integration between the various players in the SC plays a vital role to make the whole SC effective and profitable [29]. Without proper packaging, it is very difficult to maintain fresh fruit shelf life. Cost should be considered for packaging [11].

2.1.8 Market

Market security is vital issues for the farmer as well for the intermediaries. Agents buy on higher prices before harvesting. If the contractors do not receive the proper, amount of profit or face loss. Consequently, they are trying to buy on lower price as much as possible in the coming season. As a result, the margin of the farmers becomes very low [17]. In rural area, the farmers and other intermediaries faces issues to use an appropriate technologies and techniques to reduce the pre & post harvest wastages and time in operational activities [6].

2.2 Cold chain

A well-organized cold chain from producer to the consumer can only guarantee if the supply is

in good and proper quality to satisfy customer. Complete cold chain decrease spoilage, maintains the quality of the products and guarantees a low cost delivery to the consumer given suitable attention to customer service. The most problematic areas in cold supply chain are the transferring points, which are buying center, hub, store and distribution vehicle [4].

2.2.1 Freezing and Chilling

Clarence Birdseye in 1928 is the inventor of contact refrigeration systems of the modern frozen food industry. In 2004 Tomlin, R created cryogenic and mechanical air blast systems using solid carbon dioxide and liquid nitrogen. In today world, food must be available to consumer with high quality, low price, different varieties, convenience and time saving during preparation. Therefore, food supply must be well organized especially freezing in order to cryogenic freezer can be personalized especially to each food product. Ingredients, shapes, food types, supply, temperature and safety of the product are all should focus to achieve the highest product quality. A rapid, consistent chill all over the product decreases revise, returns and rejections. As with significant cold supply chain, whether the product is vegetables, meat, seafood or raw poultry improve quality, increased shelf life and reduced cost, improving product managing and safety and look fresh throughout their distribution chain [4].

2.2.2 Transportation

According to Alvarado Herrera and Mildred L (2014), that temperature management should consider lowest temperature, cooling handling airflow and storage humidity [3]. Furthermore, Kitinoja and Kader (2002) recommends proper load inside of the trailer and should be avoid transporting during warm hours [31].

2.2.3 Retailers and Distributors

Temperature between 2 °C and 4 °C and humidity between 90 and 100% is strictly important during all stages of the supply chain.

Furthermore, during retailers and distributions it is recommended that maximum 7 boxes of 42 ponds should be over lapped to avoid compression bruising. Loading must be done by hand. The damage apples should be kept off away not to spray water over the apples to maintain quality, color, flavor, crunchy texture and others [3].

2.2.4 Consumers

Along with retailers the same recommendation is for the consumer, the apple should be kept in refrigerator, if the refrigerator is not available at least it should be kept in cold place [3].

Five types of Model are used for this review i.e. the fresh fruit export supply chain model, traditional supply chain model, hub and spoke model, value chain model, the value chain & supply chain model and supply chain related constraints model.

2.3 Supply Chain Management

The importance of SCM increases day by day [15]. To do proper sales and meeting the

Customer, demands a proper SCM framework is important [33]. SCM as the planning, management, coordination and collaboration of all activities related to procurement, conversion and logistics, a well set of technique to get raw materials and to transform them into finished goods for final consumptions [15].

There are different role players in SCM [29]. SCM starts with order of a customer and end when the customer pays after satisfaction of the purchase [18]. The key success factors in SCM are delivered the right product at the right quality and quantity, at the right place and time for the right price [13].

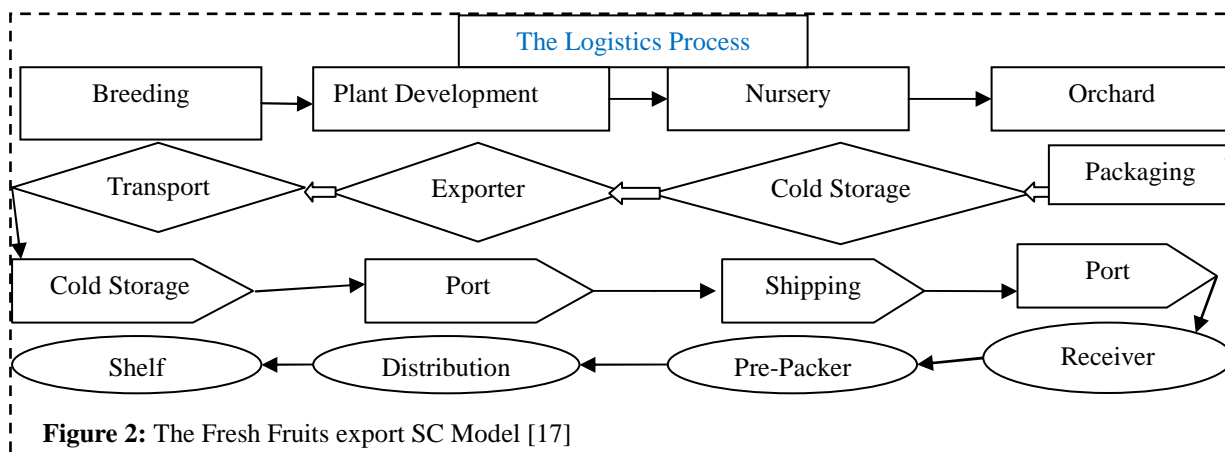


Figure 2: The Fresh Fruits export SC Model [17]

2.3.1 Marketing Channel of Apple in Chitral

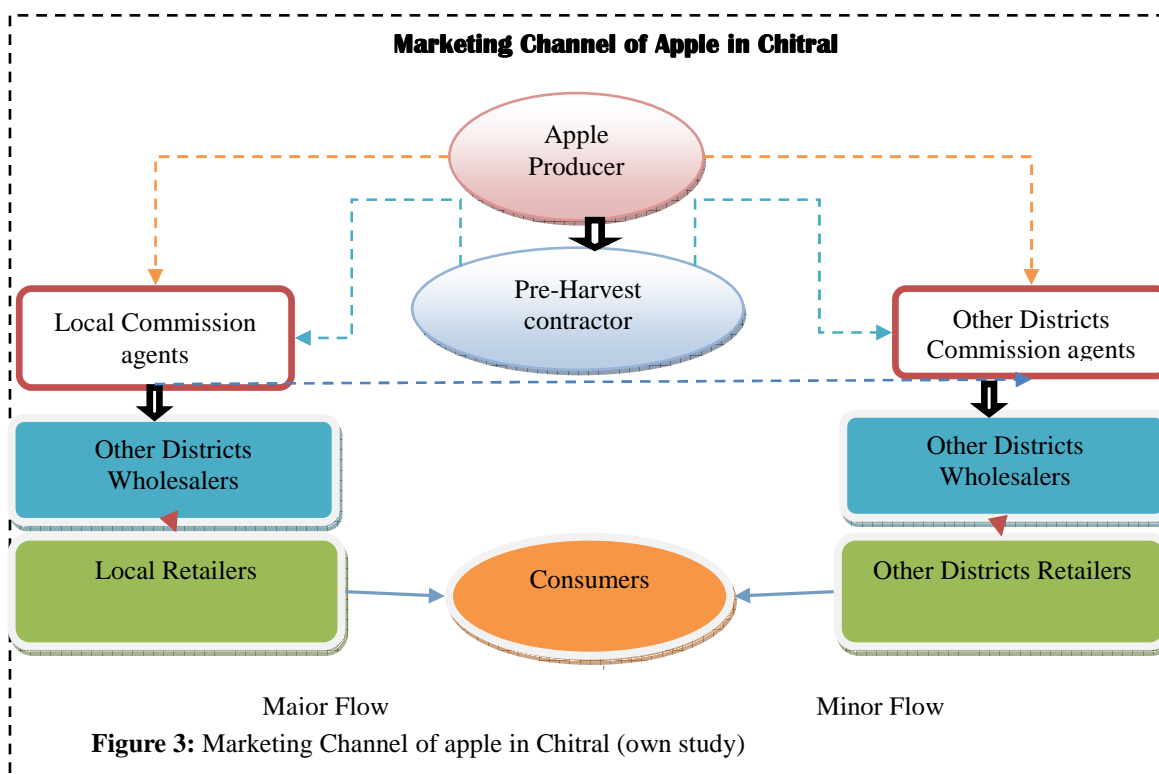


Figure 3: Marketing Channel of apple in Chitral (own study)

The marketing channel is for the logistical flow of fruits, followed at this time in conventional retail marketing. Apart from producers and customers players involved in this model are pre Harvest contractors, commission agents, wholesalers, all type of traditional retailers i.e. family run 'mom and pop' stores, convince stores and cart vendors. Agents, auctioneers, and wholesalers are traders in fruits marketing. Farmers (growers) sell their apple fruits to customers and/or to agents (intermediaries).

Fruits logistics in Chitral have four stages, producers (farmers) to agents, agents to wholesalers, from wholesalers to retailers and from traditional retailers to customers. In the first stage, vegetables are transported from farmland to agents. Generally, it is the farmers, responsibilities to bring the fruits to agent's premises. The second stage of fruits logistic form agents to wholesalers. The last stage, retailers buy apple and sell to final consumers on retail price.

2.3.2 Hub and Spoke Model

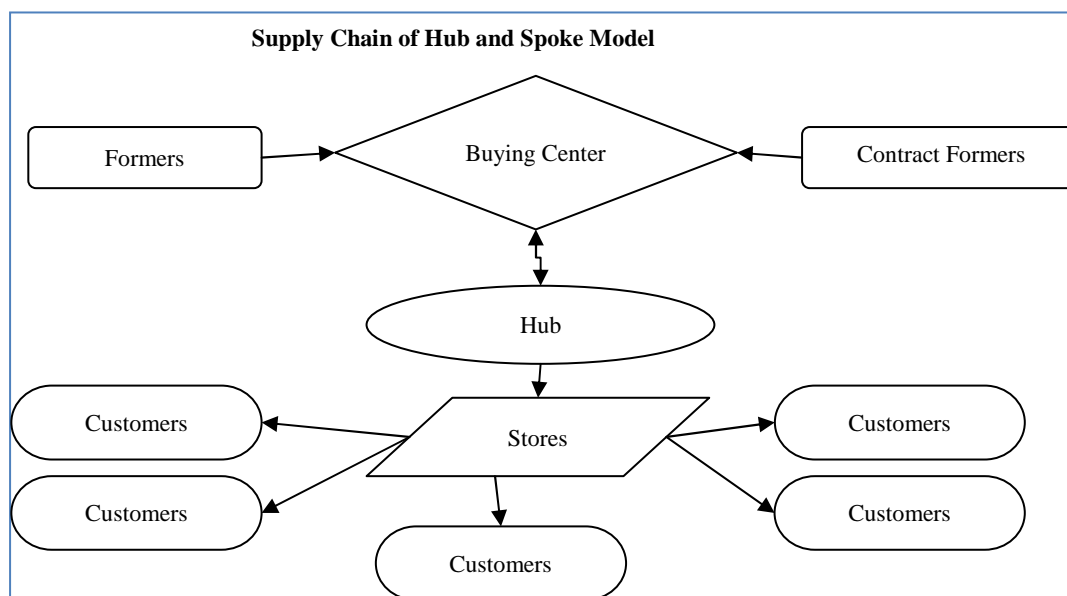


Figure 4: Supply Chain of Hub and Spoke Model [25] [11]

In contrast to the TRM in this model, fewer players (farmers, organized retailers, wholesalers and customers) are involved Supply Chain of Hub and Spoke Model. Buying center, hub and stores are functional entities of the structured retailers. Supply of fruits to the organized retailers is made possible by small and contract farmers.

Fruits logistic are in four phases. Farmers transport fruits from farming place to the buying centers. In the second phase of logistic is arranged by buying centre from buying centers to hub. In the third, phase of logistic from hub to stores. In the last phase customers pick & pay fruits from the organized retail stores.

2.4 Analysis of the Models

In the light of above models the following model is developed, shows both value chain & supply chain of apple fruit. Value chain & supply chain model is simply based on backward integration starts from raw material suppliers to the final consumers. The players in the model are raw material suppliers, consolidation centers, (whole sellers), distribution centers (hub) and stores (organized retailers), and customers but the main players who make possible the whole

structure are farmers, organized retailers, and final consumers.

Producers of apple fruit are the primary source to the organized retailers. Apple fruit logistic take place from farm locations to customers in four steps, farmers to consolidation centers or directly to hub depend on the producers and their approaches, consolidation centers to hub, hub to retail outlets (stores) and stores to customers (final consumers). Different kind of crates, boxes and open vehicles are used for logistic of fruits among different intermediaries. Mostly manually they are doing loading and unloading. At the hub, fruits are cleaned and washed. While first round arrangement and grading is the responsibility of consolidation center. However the weight and size sorting is done at the hub [25].

Value Chain & Supply Chain Model

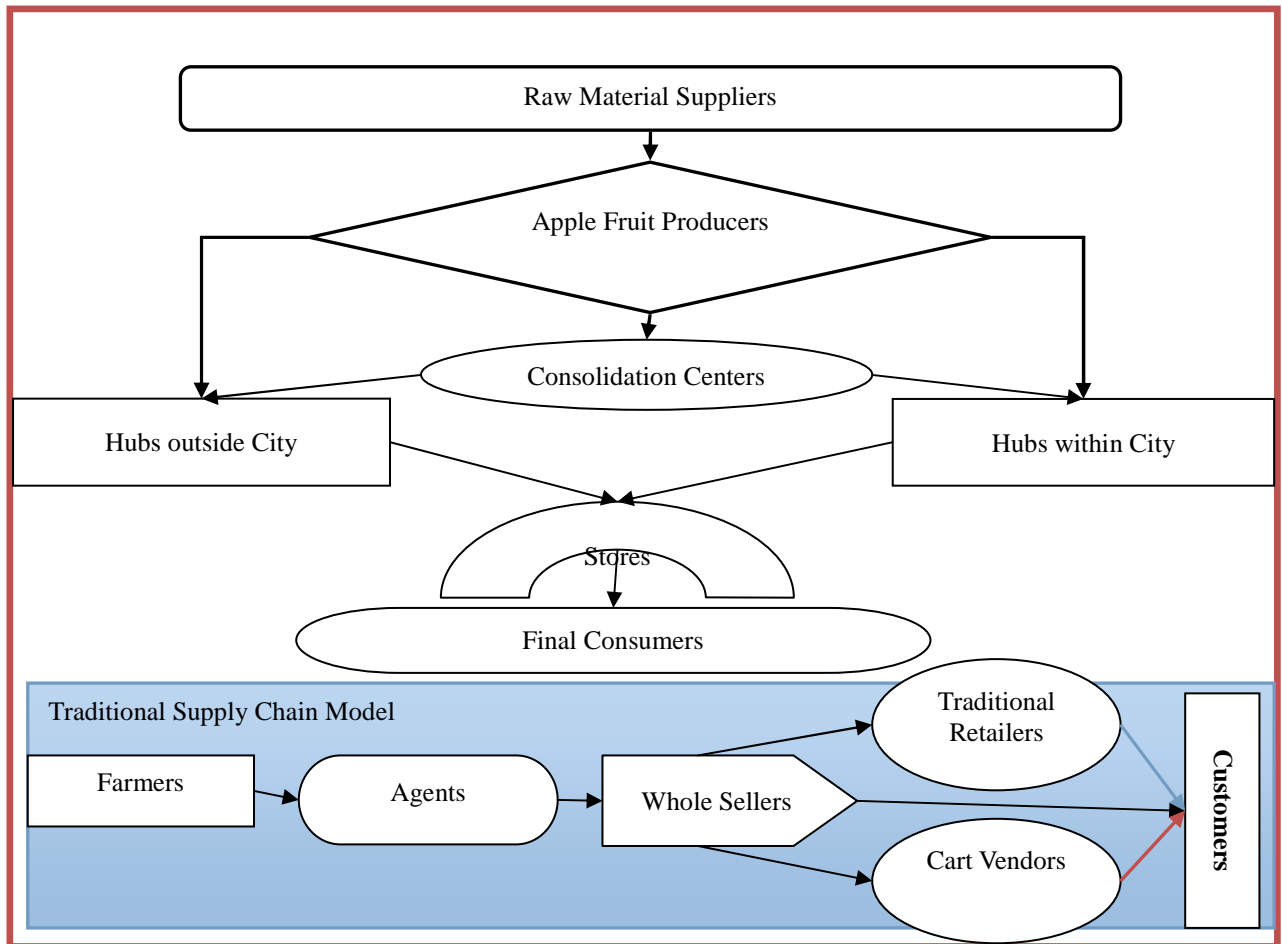


Figure 5: Value Chain & Supply Chain Model, *Source: own study based on [11] [25]*

The value chain & supply chain of apple fruit model describes all the players that perform negotiation functions at the product flow i.e. Raw material suppliers (pesticide, fertilizers, seeding machinery, energy/water and others companies), fruit producers (farmers, contract farmers and lease farmers), consolidation centers (packinghouse, fruit branded companies etc), hubs (distribution centers), stores (retailers, markets, fruit stores, juice bar, restaurants etc.), and lastly reach to the final consumers. Specifically, for fruit chain coordination, it becomes very important to have this complete picture of the whole chain. The model becomes an appropriate solution to incorporate reliance amongst the SC players. This method should be systemic in order to meet the need for each

player actually coordinates which each other for every movement and process in the SC.

As for the method for SC, coordination should focus the knowledge and skills of professionals in multiple functional areas to overcome its internal and external complexity. The model is to understand the main drivers that lead to necessity of management and to design strategies to reduce complexity negative consequences by identifying basic performance indicators, appropriate metrics, evaluating performance, identifying causes and taking corrective actions. The SC coordination could also perceive as an innovative way to increase transactional value for apple fruit being sold coordinating the SC, it becomes easier to link economic actors with organizations and

technologies to offer services that can even increases the product value.

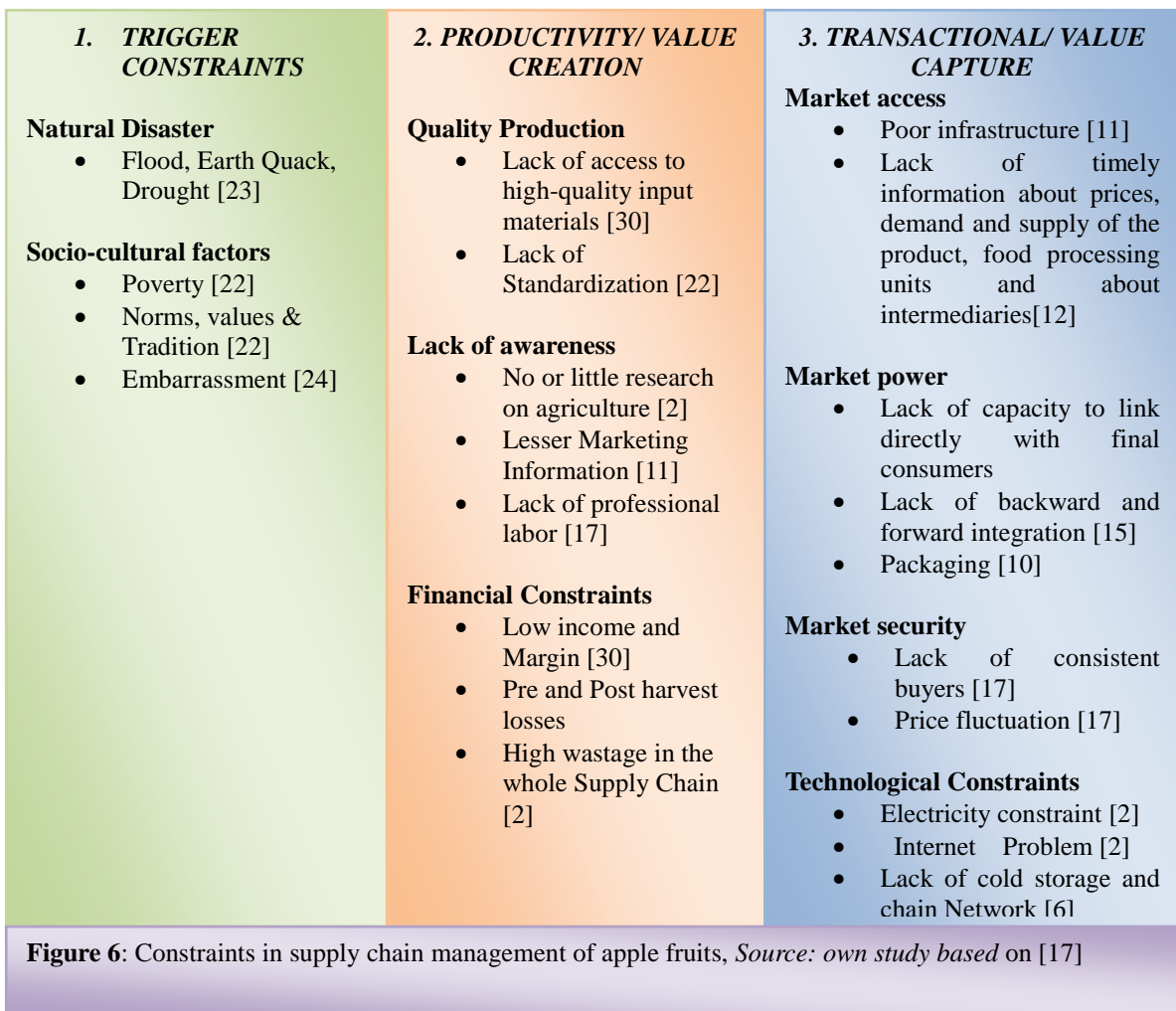
In this study, the traditional supply chain is described followed by a discussion of the emerging alternative supply chains observed in the fresh fruit industry. This study indicate that structured retailers offer considerably higher prices for the apple fruit than their conventional retailers to the farmers and payments is sooner and/or during the time of delivery. The overview of the study found that major constraints are poor transportation, non-availability of proper warehouses, no clear rules and regulations from the government, and disjointed and small

farmers.

With their short life cycles, fresh foods generate unique SC challenges. Foods i.e. fruits, vegetables, and meats must be nurtured to make sure the rest of intact and in excellent quality. This contains the time that this valuable shipment spends moving during the links of the SC the most significant time for all types of fresh foods.

Even several companies do not concentrate on their fresh food SC, leading to substandard products and unsatisfied customers. The solution is to know current challenges and to execute a SC transformation strategy

3. CONSTRAINTS IN SCM OF APPLE FRUIT IN CHITRAL



This study addressed the environmental constraints faced to the farmers of apple fruit in SCM. The focus has been given that the farmer of apple fruit should

be able not only to do farming but to have a strong concept of business too. So constraints are identified which are hurdle in the way of farmers toward

businesses. The model below divided into three parts, which shows all the constraints faced to the study area collected from the existing relevant literature, published documents, books, thesis, journals and newspapers. Part first is the trigger constraints, which illustrate all those constraints facing society, community, entrepreneurs of a particular locality as a whole. These constraints can be linked with problem solving capabilities. Second compare to trigger constraints, productivity level constraints occur after a product is already set up, either operational or value creation process, like input materials, financial and/or production resources. The third one is transitional value capture constraints is the external environmental limitations that affects the value capture process which is market access, market power, and/or market security. Our findings are those dimensions explained in introduction and literature review.

3.1 Socio-cultural factors

The apple fruit SCM system not only consists of the four key players: producers, agents, traders and wholesalers; but is in reality much more complicated and includes actors such as packers, checkers and farm workers, and is often organized around a network of friendship and kinship relations. These social networks consisting of largely informal relationships with friends, neighbors, colleagues and relatives, are vital for the functioning of the total chain. In most cases, the rural literate but unemployed survive below the poverty line trying to meet their most fundamental requirements. Due to socio-cultural values, they are not selling their fruits in the market. Living in extreme poverty, often at the clemency of associations, robs them of their self-esteem and their freedom to make their own choices and to buy the expensive and new invented seeds and fertilizers or sell their own apples to the markets.

3.2 Quality Production

Quality is very important factor in food industry/sector, because it directly relates to the health of the people. It is very important to have quality inputs like seeds and fertilizers for SC to deliver the fresh goods in a timely manner and in a proper quality to the customer. Proper SC helps to maintains the shelf life of produce and prevent from deteriorating the quality. Quality has a strong impact on the SC, so it leads to efficiency and

less rejection by the customer. In the study area due to unskilled farmers, conventional agriculture system and tools, farmers own techniques of crops cultivating, irrigation and applying pesticides represent a huge discrepancy in quality of produce. Uncontrolled profit making among intermediaries create constraints for producers.

3.3 Lack of Standardization

Chitral's fresh produces supply chain lacks of standardization in Packaging, no cold storages and proper logistics vehicles are available. Standardization is important for building degree in any operation. Relatively high logistics cost & non-reliability of delivery time lead to lack of standardization.

3.4 Lack of awareness

Farmers, in Chitral have lake of knowledge about the use of latest technologies, methods etc. for effective and efficient work. They have less knowledge regarding the management of post-harvest produce, quality of seed etc. Without appropriate knowledge and awareness, level of the farmer the SC of apple fruit cannot be capable, because farmers are the main source of the fresh apple produce. Due to lack of agricultural research, lack of funds and well-qualified labor, and lesser marketing information majority of the apple growers in the study area, sell their apple to pre harvest contractors.

3.5 Financial Constraints

In District Chitral, the income of farmers is very low. They do not get appropriate margin for their agricultural produce. One of the main issues in the SC of Apple fruit in Chitral are the contractors, commission agents (intermediaries) who eat all the share of farmer's income. Contractors purchased apple from the growers at the lowest cost and sell it in the market on high price. The overall margin, for all apple varieties 27% goes to producers and the rest 73% is receiving by various marketing intermediaries [2]. The whole supply chain is dominated by agents. Another negative factor for the producers are the traders funding them, mostly they get financial problem for initial investment of production. Therefore, the trader gets complete power over the price of production.

3.6 Market Access

Market access is the more interesting dimension appeared on the value capture side of the figure [20]. Due to long distance, cost is not advantage for Chitral. Proper and adequate infrastructure helps farmers and agriculture executives to run their businesses successfully and helps to deliver the goods in the right time with right condition. Lack of processing facilities and capacity to preserve fresh food causes high food losses in world, is more than 40% [20]. In SC, the most important is transportation especially for apple fruit, which is perishable in nature. Without appropriate transportation, the goods cannot be reached to the customer in proper time and quality. Transportation associated challenges are very high in the targeted area because of improper roads, unavailability and high cost of transportation, lack of temperature controlled vehicle for the supply of goods etc. In Chitral, Infrastructure is the main obstacle in the SC of agricultural products, which leads to high amount of losses.

Accurate information is the root of proficient SC. Without accurate information about demand & supply, the SC cannot be successfully. In Chitral, farmers have less and/or no such information about the price, demand & supply, food-processing units etc. inadequate information leads to poor understanding of prices, high quantity of losses, late supply of goods in to the destination etc.

3.7 Market power

Linkage and integration between the various players in the SC plays a vital role to make the whole SC effective and profitable. However, in the SC of apple fruit in Chitral there is a lack of forward and backward integration between the farmers and the other partners. Packaging is a great constrain for the targeted area, Packaging is very important for fruit as they are highly perishable goods and it needs proper packaging for the handling of these fresh produce. Without proper packaging, it is very difficult to maintain their shelf life. Cost is very important factor for this issue. High cost of packaging material and transportation and lack of professional labors and farmers are the main barriers.

3.8 Market Security

Market security is vital issues for the farmer as well

for the intermediaries. Some time it is happen that, the intermediaries buy on higher prices or before harvesting, they are doing contract with farmer. If the contractors do not receive the proper amount of profit or face loss in this situation, they are trying to buy on lower price as much as possible in the coming season, therefore the margin of the farmers become very low.

3.9 Technological Constraints

The technology is encircled by many technical concerned. Such as advancement issues, inefficient technology, obsolete techniques, and old machineries. Due to these issues, it has become difficult for the farmers and other intermediaries to use an appropriate technologies and techniques to reduce the pre & post harvest wastages and time in operational activities. The study area has technological constraints, such as loud shading of electricity and some areas even electricity is not available which is primer for cold chain, so electricity is a constraint for the targeted area. Second due to road condition and hilly area, very less or no vehicles available, which have the cold chain facilities for supply of fruits. Third internet is very important for getting up to date information about market, demand and supply prices ordering etc, in some areas internet is not available, if the internet is available the first it is not speedy and second very expensive. Due to these issues, it has become difficult for the farmers and businesspersons to do their business effectively and get proper knowledge about the market. These are the factors affecting the SC of Fruits.

4. DISCUSSION AND ANALYSIS

District Chitral Northern Pakistan economy is based on agriculture. Therefore, it is necessary to develop proper SC models. This may cooperate to increase the shelf life of apple. In order to reduce the losses and wastages, small subsistence farming may be viewed as a business, create employments opportunities for the locality, and improve the income of the farmers, which leads to the development of Pakistan economy as a whole. As discussed there are various factors affecting the SC, which represent serious challenges for apple fruit and is affecting the growth of the sector. Most of them require urgent consideration for the development and growth of the apple fruit.

The first strategy should be to increase the yield. The best produce comes from the best seed, the best

management, and the interaction of both with the environment. The second strategy is to produce the best quality product. Quality describes not only the physical characteristics of the product but also the quantity of the product potentially available. Therefore, if we want to produce a lot of product, we need to have many farmers. Thus, the SCM for apple fruit has to be concerned with all, activities concerning to right quality of market demand & supply which fit with timing distribution.

In Chitral agriculture department, government and some non-government organizations assists small farmers. Along with their own mission and objectives they should focus on: (1) to develop the performance of the farmers in order to improve production, sanitation, post harvest procedures, packaging, and technical competence and to reduce wastages (2) to build up a sense of business approach to realize risk, opportunities and threats (3) to nurture social values. The values or the character of the people involved will either make or break the business practices.

As compare to the producers' income to that of others intermediaries, (27% to 73%) it is significantly lower. Even farmers work hard into obtaining this income compared to others. Focus should be given that the distribution of the marketing margin across the actors can be measured fairly. Taking the efficiency of the system, it is concluded that the producers can make good margin if they are able to create business-minded attitude.

Another negative factor for the producer, traders funding them, mostly growers get financial problem for initial investment of production. Therefore, the trader gets complete power over the price of production. This practice leads to; first, the grower is totally disconnected from the market system, affecting his working ability. Second the farmer has no control over his production, income and investment, in order to his dependency on the trader for fund, and third at the end the worth of apple for farmer is very low even the price for final consumer may be very high which lead to disappoint the farmer. Finding the suggestion for these constraints, the price should be fixed for the whole season, the fair mark up should be ensured, and this approach is good compare to the price uncertainty, the attitude and approach of the farmers must be changed from farming to business.

It is derived that there are well-built interdependency among intermediaries especially producers and buyers. The producers depend on the traders for the marketing of his produce while the traders depend on the producers for a regular supply to secure his income. To get power and improve fairness in the chain it is often analyzed that farmers should organize themselves in marketing cooperatives.

The main constraint rural farmers face compared to urban farmer is high information and transportation costs, it is suggested to form, clusters of five to ten farmers in order to coordinate production, harvest and marketing activities. Consolidation gave them better access to markets and resource providers and lower transportation costs. If one farmer does not obey with the commitment, this farmer can be removed from the cluster. A cluster leader should be from among the members, with good farming skills and the ability, to conduct regular meetings, to evaluate the cluster performance. The cluster can also solve the constraint of technology by sharing internet and other latest technology (tools & equipments) among group members. Because of climate change and more extreme weather events, farmers have to come up with supply contingencies. Climate change is really influencing upon apple fruit. The stakeholders should take this issue more seriously.

District Chitral Apple Fruit sector is a very growing sector. Presently has an enormous opportunity for the small substantial farmers, intermediaries and the development of the rural areas through a well-established SC. Lawari Tunnel will fully operate in 2017. Therefore, the businesses will grow further and will be easy to connect with down districts even in winter, can create a huge opportunity for those who are involved in SCM of apple fruit.

5. CONCLUSION

The study and research conducted on the SCM of apple fruit identify inappropriate SCM. The entire SC of apple fruit has environmental constraints i.e. trigger constraints (Natural disasters, Socio cultural factors), Productivity/Value Creation constraints (Quality product, lack of awareness and financial constraints) and Transactional/value capture constraints (Market power, Market access, Market Security and Technological Constraints) leading to maximum inefficiencies and resulting to losses and wastages of

apple fruit. The study also included with the possible solutions of the constraints.

5.1. Contribution and Future Directions for Research

Even though researchers interests in and the significance of SCM are increasing, scholarly materials remain fragmented and scattered, and no research has been done on a logical identification of the constraints of apple fruit SCM at District Chitral, Northern Pakistan.

As a result, the reason of this study is to build up a research structure that develops understanding of SCM of apple fruit and to motivate and assist researchers to carry out both empirical and theoretical research on the vital constructs of SCM within the same sector and area, and the investigation of their impacts on SC performance.

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References

- [1] Agricultural Statistics Board, U.S. Department of Agriculture. Non-citrus Fruits and Nuts 2013 Summary. *National Agricultural Statistics Service (NASS), 2013*
- [2] Ahmed, N. (June 19 2011). 60pc of fruit produced in Chitral goes waste : *Dawn News Interviewer*.
- [3] Alvarado Herrera, Mildred L (2014), "Production, marketing, and handling practices to export McIntosh apples to Central American Markets".
- [4] Chowdhury, H. M. (2012). Cold Chain Business in Bangladesh to Enhance the Economic Growth of the Country, *1(3)*, 54–62.
- [5] Dr. Memon, A. N. (2014). *Apple is a symbol of health*. 34-36.
- [6] FAO (2011). Global food losses and food waste – Extent, causes and prevention. Rome, *Federal Bureau of Statistics, Government of Pakistan*.
- [7] Gibson J, 2004, Perishable Products Export Control Board, Personal Communication.
- [8] Golias, J., P. Mylova and A. Nemcova. (2008). A comparison of apple cultivars regarding ethylene production and physicochemical changes during cold storage. *Hort. Sci. 35(4): 137–144*.
- [9] Government of Pakistan (GOP). (2010). Economic Survey of Pakistan (2009-10). Economic Advisor's Wing, *Finance Division, Islamabad*.
- [10] Greene, D. (2010). *Plsoilin 300-Decidiuos Orchard Sciences*. Amherst: Class Notes - *University of Massachusetts*.
- [11] Halder, P., & Pati, S. (2011). A Need for Paradigm Shift to Improve Supply Chain Management of Fruits & Vegetables in India. *Asian Journal of Agriculture and Rural Development, 1 (1), 1-20*.
- [12] Herrera, M. I. (2014). Production, Marketing, and Handling Practices to export mcintosh apples to Central American Markets. *University of Massachusetts - Amherst, 1-135*.
- [13] Jan, I., A. Rab, M. Sajid, A. Ali and S.T. Shah. 2012. Response of apple cultivars to different storage durations. *Sarhad J. Agric. 28(2):219-225*.
- [14] Janick, J. 2005. The origin of fruit growing, fruit growing, and fruit breeding. *Plan breeding Rev. 25:255-320*.
- [15] Joel D. Wisner, Keah-Choon Tan and G. Keong Leong (2012). Principles of Supply Chain Management, A Balanced Approach. USA: *South-Western Cengage Learning. Third Edition*.
- [16] Kader, A. A. (2002). Postharvest technology of Horticultural crops. 3rd. ed. *University of California Press*.
- [17] London, T., Anupindi, R., & Sheth, S. (2010). Creating mutual value: Lessons learned from ventures serving base of the pyramid producers. *Journal of Business Research, 63(6), 582–594*.
- [18] Maspero, F. v. (2004). An analysis of the South African fruit logistics. *ORiON*, 68.
- [19] Nix, J. S. (1979). Farm Management: The State of the Art (or Science). *Journal of Agricultural Economics. 3: 1, 277-292*.
- [20] Noemi Sinkovics, R. R. (2014). The role of social value creation in business model formulation at the bottom of the pyramid – Implications for MNEs? *International Business Review , 692-707*.
- [21] Pakistan Horticulture Development and Export Company - *Ministry of Commerce, Government of Pakistan*.
- [22] Perviz, K (2014). District Profile, BOS collaborative efforts P&DD and

- UNICEF-Peshawar*
- [23] Provincial Disaster Management Authority, G. o. (2015). Overview of Natural Disasters 2015 Impact, Response and Managing Risks. Provincial Disaster Management Authority, *Government of Khyber Pakhtunkhwa*.
- [24] Sadiq, S. (2007, January 15). Chitral — the potential hub of temperate fruits. (*D. News, Interviewer*)
- [25] Saurav, A. N. (2, June 2015). Issues and challenges in the supply chain of fruits & vegetables sector in India: a review. *International Journal of Managing Value and Supply Chains (IJMVSC)*, 47-60.
- [26] Scheaffer, R. (1979). Elementary Survey Sampling, Massachusetts, USA, *Duxbury Press*.
- [27] Shafaaqat Khan, A. (2013, December 22). Exports of fruit & vegetables increase since July. (*Dawn, Interviewer*)
- [28] Shah, A.N., M. Afzal and S.M. Khair (2000). Drought effect assessment of major fruits in Baluchistan. *Tech. Transfer Instt. Staff Paper 1*.
- [29] Shah, N. A., M. Afzal, M. Ahmed, Q. B. Ahmad, A. Farooq and F. U. Rehman. (2011). Marketing of apple in northern Baluchistan. *Sarhad J. Agric.* 27(4): 617-624.
- [30] Shah, N.A., S. Khan, M.A. Kasi and S.M. Khair. (2002). Post harvest and cold storage losses in apple of Baluchistan. *Asian J. Plant Sci.* 1(1): 65-66. 54
- [31] Shukla, M., & Jharkharia, S. (2013). Agri-fresh, produce supply chain management: a state-of-the-art literature review. <https://doi.org/10.1108/01443571311295608>
- [32] Usman, M., Sabir, P.N. Hamid, N, and M.Z.Anwer. (1994) Agricultural production constraints in Baluchistan, Pakistan. *A paper presented at SAARC Conference on Identification of Socio-economic constraints of Agricultural production, May 29-31, 1994.*
- [33] Vishal Sharma, D. S. (2013). Supply chain management of rice in india: A rice processing company's perspective. *International Journal of Managing Value and Supply Chains (IJMVSC) Vol. 4, No. 1, March 2013, P 26.*
- [34] Watkins, C. B. (2006). The use of 1-methylcyclopropene (1-MCP) on fruits and vegetables. *Biotechnology Advances*, Volume 24, Issue 4, July–August 2006, Pages 389-409, ISSN 0734-9750. Retrieved from (<http://www.sciencedirect.com/science/article/pii/S073497500600022X>)
- [35] Watkins, C. B., & Miller. W. B. (2004). A summary of physiological processes or disorders in fruits, vegetables and ornamental products that are delayed or decreased, or affected by application of 1-methylcyclopropane (1-MCP). <http://www.hort.cornell.edu/mcp/>.