ASSESSMENT OF SUPPLY CHAIN FROM FARM GATE TO RETAIL

PILOT STUDY

TOMATO & ONION

Competition Commission of Pakistan
Creating a level playing field

Contents

1. Acknowledgements

The pilot study “Assessment of Supply Chain from Farm gate to Retail-(Tomato & Onion)” in Pakistan 2021 was successfully completed with the efforts and support of numerous organizations and individuals at different stages of the study. The Competition Commission of Pakistan (hereinafter “Commission”) would like to thank everyone who participated and made this study a success.

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Chairperson
Competition Commission of Pakistan

2. Executive Summary

Introduction

Agriculture constitutes the largest sector of Pakistan's economy in terms of employment. The vast majority is dependent on this sector, either directly or indirectly. During multiple meetings of the NPMC, concerns have been expressed regarding the erratic price increases of essential commodities. The Competition Commission of Pakistan is of the considered view that certain policy measures can contribute towards enhancing economic efficiency and eliminating distortions in the supply chain of essential commodities. Given the foregoing, the Commission conducted a pilot study to better understand supply chain distortions, pricing mechanisms, potential anticompetitive practices, and other factors influencing prices throughout the supply chain. Tomato and onion were the chosen commodities for the pilot study.

Methodology

A mapping exercise was completed in collaboration with provincial agriculture extension departments. The purpose of this activity was to identify high production districts subject to the availability of tomato and onion.

The study area includes the districts of Bhakkar and Muzzafargarh in Punjab, Swat and Mardan in Khyber Pakhtunkhwa, and Hyderabad in Sindh. Specifically, 70 growers/farmers, 256 retailers, 45 wholesalers, 10 commission agents, and 10 market committee/district administration representatives were interviewed. Farmers were interviewed in five randomly selected villages in each district, and retailers in five randomly selected markets. In addition, the research team observed 131 auctions in study districts. 18 stakeholders at the national and provincial levels were interviewed. Section 4 of this report contains a summary of the methodology.

Key Findings and Issues

The study's key findings revealed that a variety of factors are disrupting supply chains, distorting competition, exploiting farmers, and adding inefficiencies to the economy. The key findings are summarised below.

- Significant price variations have been observed from farm gate to retail across all study districts. The actual retail prices are significantly higher than the prices which were obtained after adding overheads, transportation, and profit margins to the auction price, as per assumptions by the provincial governments.
- The major factors which influence availability and pricing include supply gaps, perishability and shorter shelf life, lack of grading and packaging, manipulation by commission agent, level of enforcement of price regulations and inadequate awareness about prices and availability.
- A variety of factors influence tomato and onion supply. Inadequate availability of quality seeds and other inputs reduce yield. The non-institutional financing by the commission agents exploit farmers and is one of the barrier to entry in other markets. High post-harvest losses and absence of grading, packaging, and branding regulations also limit ability of the farmers and market players to compete.

- At any given time, the commission agent could be an investor, non-institutional financer, auctioneer, or wholesaler. The flow of commodities from one market to others is mainly controlled by the commission agents.
- Retailers in general have expressed concerns about the pricing mechanism established by provincial governments, which may be one of the reasons behind the wedge between that actual retail prices and those set by the district administration.

Recommendations

The proposed recommendations are divided into three categories: short-term, medium-term, and long-term solutions. The major recommendations include;

Short Term (6 months to 1 year)

- Better coordination between federal and provincial governments can help prevent distortions in price and supply chain. For instance, timely sharing of data can prevent price manipulation. Consequently, increased awareness among market players about availability of produce and its prices will foster competition.

Medium Term (2 to 3 years)

- In medium term solutions, provincial governments may consider farmers training on harvesting, grading, and packaging, and availability of easy and interest free loans to farmers which will enhance their ability to compete in different markets.
- The expansion of the kitchen gardening club, as well as the enhancement of capacity through the introduction of technological advancements in crop reporting may help in reducing supply chain disruptions.
- Price controls may be a primary barrier to investment from the private sector to bring advancements in the value chain. The removal of price controls by provincial government may be politically sensitive. However, a piloting could be done to test this theory on one commodity like tomato which could potentially foster competition and attract private sector investment. Based on the results of the pilot, further strategies could be decided.

Long Term (4 to 10 years)

- Ensuring the availability of quality seeds compatible with the climatic conditions of Pakistan, initially as a medium-term solution through import and later through domestic R&D, will aid in increasing yield and growers' ability to compete in domestic and international markets.
- Reduction of postharvest losses by encouraging private sector investment in cold storage facilities. Similarly, the use of new generation packing materials to reduce losses during transportation may be a worthwhile intervention to consider. [1]
- Although a long-term strategy, improving the value addition and processing industry of tomato and onion can significantly help reducing the postharvest losses, helping deal with the glut and stress situations in the country.

[1] https://reports.weforum.org/enabling-trade-from-valuation-to-action/enabling-trade-from-farm-to-fork/a6-case-studies-f2f/indian-tomatoes-adding-value-and-reducing-losses-through-processing/?doing_wp_cron=1625850638.5701670646667480468750

3. Background

Agriculture constitutes the largest sector of Pakistan's economy in terms of employability. The vast majority is dependent on this sector, either directly or indirectly. It accounts for 19.2 percent of the GDP and employs 38.5 percent of the labour force.[2]

Due to its significance, policymakers are constantly on the lookout for reliable evidence about agricultural crops. Given, Policymakers primarily require accurate and timely statistics for critical crops such as wheat, cotton, rice, sugarcane, maize, etc. Nonetheless, persistent price increases in other essential commodities such as pulses, onions, potatoes, chilies, and tomatoes, have exacerbated the situation. For instance in the recent past the prices of tomatoes, wheat flour, pulses, and vegetables have volatile due to seasonal variations, demand-supply gaps alongside other factors.

The Commission is a member of the National Price Monitoring Committee (NPMC). During multiple meetings of the NPMC, concerns have been expressed regarding the erratic price increases of essential commodities. It has been noted that the prices of certain essential commodities vary greatly from farm-gate to mandis and finally, retail shops. There is a firm view that the presence of a large number of players in the supply chain, particularly the role of middlemen, is the primary cause of these large variations. Therefore, the availability of real-time data will aid in preventing middlemen manipulation. Currently, there is no uniform pricing mechanism that would allow for accurate estimation of price changes and seasonal variation.

The Commission is of the considered view that certain policy measures can contribute in enhancing economic efficiency and eliminating distortions in the supply chain of essential commodities. In light of the aforementioned, the Commission conducted a pilot study to better understand the supply chain distortions, pricing mechanisms, possible anticompetitive practices, and other factors influencing prices across the supply chain.

4. Methodology

A mapping exercise was completed in collaboration with provincial agriculture extension departments. The purpose of this activity was to identify high production districts subject to the availability of tomato and onion during the study.

The study area includes the districts of Bhakkar and Muzzafargarh in Punjab, Swat and Mardan in Khyber Pakhtunkhwa, and Hyderabad in Sindh. In addition, the study covered the large Mandis of Islamabad, Karachi, and Faisalabad.

The research team gathered both primary and secondary data. Secondary data was comprised of numerous documents, existing publications, journals, and online pieces. For collection of primary data, a semi-structured questionnaire was designed to collect information from the

[2] Ministry of Finance. (2021). *Pakistan Economic Survey 2020-21.*

key informants including growers/farmers, agriculture sector experts, academicians, researchers, policy makers, market committees, rationally sampled wholesale shops in mandi, special markets and rationally sampled retail shops. The team of 8 data enumerators was constituted. One day training of data enumerators was conducted on 8 June 2021. A questionnaire was tested at Rawalpindi and Islamabad and adjustments made based on the findings from the field. The data collection from districts was done from 10 – 19 June, 2021. In addition the auctions were also observed at Faisalabad, Karachi and Islamabad. The number and the type of key informants interviewed are mentioned below.

Table 1: Details of Interview Informants

S#	District	District Admin	Market Committee	Middleman/Commission agents	Whole Sellers	Retailers	Farmer/ Growers	Auctions Observed
1	Muzzafargarh	1	1	2	10	36	21	23
	Hyderabad*	1	1	2	10	82	10	34
2	Bhakkar	1	1	2	2	36	12	28
3	Mardan	1	1	3	10	48	9	09
4	Swat	1	1	4	13	54	18	37
	Total	**5**	**5**	**10**	**45**	**256**	**70**	**131****

*farmers includes from Tando Allayar **Additional auctions also observed at Faisalabad, Karachi and Islamabad Mandis.

In addition, provincial/national level stakeholders were also interviewed. The consultation with provincial and national stakeholders was completed between June 14th and July 7th, 2021. The detailed list is attached in the annexure.

Table 2: Key stakeholders

S#	Key Informants	Number
1	Provincial Stakeholders from Punjab	5
2	Provincial Stakeholders from Sindh	3
3	Provincial Stakeholders from Khyber Pakhtunkhwa	3
4	Academia and Research	6
5	Pakistan Agriculture Research Council (PARC)	1
Total		**18**

5. Supply of commodities

a) Flow sheet of supply chain

There are two streams of the supply chain of tomato and onion. The first is the traditional vegetable stream, in which farmers grow the crop and sell it to the village Beopari or directly to mandi via a commission agent. The commission agent's role is multifaceted, beginning with the organisation of auctions in government or privately owned mandis. However, the commission agent at the same time could be a buyer from the grower, auctioneer or a wholesaler. The commission agents and village beoparis or middle men also act as non-institutional financers for the grower. The various roles of the commission agent reflects its importance in the overall supply chain and how he could influence or distort the supply chain activities of essential commodities.

The auction is usually open to the public, and anyone can participate and purchase the commodity. During field surveys, however, it was discovered that Pharya and Wholesalers typically attend the auction, buy

the commodity, sometimes grade it, and sell to retailers while maintaining their margins. The direct participation of retailers in the auctions is mainly limited to small mandis and are rare in the major mandis, due to amount of investment required and risk associated with it. The retailers usually prefer to buy the commodity from the Pharya/Mashakhor or Wholesaler, as they could buy at a time multiple items, save time, and also reduce risk of quality due to their day to day business relationships with them. Figure 1 reflects the pictorial flow sheet of tomato and onion.

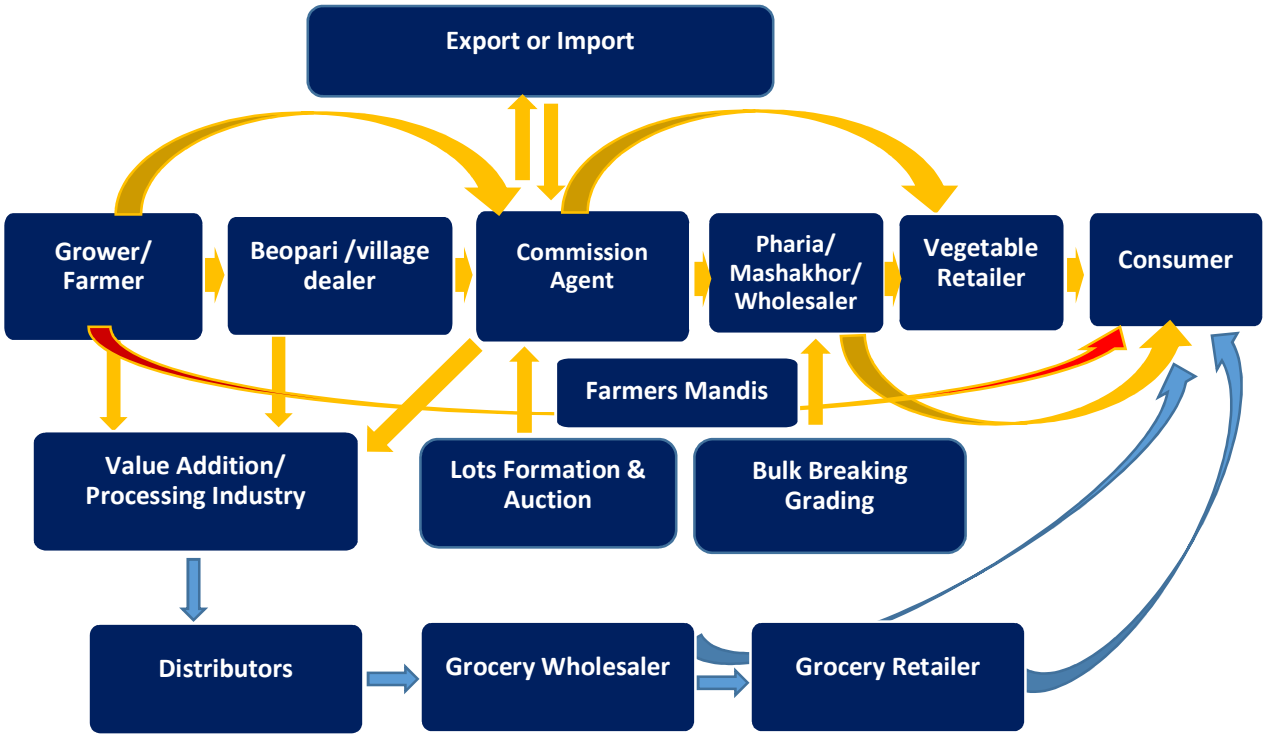


Figure 1: Supply chain flow sheet of tomato and onion

The value addition or processing industry is the second supply chain stream. This industry is not well-established in Pakistan, and it is limited to a few products such as tomato ketchup and paste, as well as processed/fried onions, which are rarely available. This industry relies on its traditional distribution channels, wholesalers, and retailers to distribute its products. The industry has significant growth potential and can aid in supply chain optimization.

b) Country Production Estimates of Tomato and Onion

I. Tomato

Tomatoes are in high demand globally. The tomato crop has a very short growing season and produces a large yield; it is economically appealing and consequently, the area under cultivation is expanding. Due to

varying ecological and weather circumstances, tomatoes are grown in various provinces of Pakistan at different times/periods.

The provisionally forecasted[3] crop hectarage in 2020-21 decreased by 0.35% with major change in Punjab of about 4.5%. The area in Baluchistan increased by 5.26% over the same period. Similarly, production in Pakistan fell by 5.07 percent overall, with a significant drop of over 19 percent in Punjab. However, the production has increased significantly, in Khyber Pakhtunkhwa (6.80%) and Baluchistan (5.66%). Importantly, approximately 5% of the country's yield has decreased.

Table 3: Province wise area, production and yield of tomato

Country/Province	Area			Production			Yield		
	2019-20 (000 ha)	2020-21 (000 ha)	Change %age	2019-20 (000 Tons)	2020-21 (000 Tons)	Change %age	2019-20 (kg/ha)	2020-21 (kg/ha)	Change %age
Punjab	8.90	8.50	-4.49	164.00	133.00	-18.9	18427	15647	-15.09
Sindh	22.52	22.52	0	164.66	164.66	0	7312	7312	0.00
Khyber Pakhtunkhwa	13.58	13.50	-0.56	121.35	129.60	6.80	8938	9600	7.40
Baluchistan	5.70	6.00	5.26	88.77	93.80	5.66	15574	15633	0.38
Pakistan	50.70	50.52	-0.35	445.90	423.28	-5.07	8796	8378	-4.74

Source: Ministry of National Food Security and Research

II. Onion

Onion is an important staple, widely used in households yearly. Onion cultivation takes up almost one-third of Pakistan's total vegetable land (excluding potato). The table below shows the production trends of the last two years.

As per estimates[4] provided by the Crop Reporting Departments and DG Agriculture Extension, both area and production of the onion crop is forecasted to grow in year 2020-21. The area of crop is expected to grow by 9.5% and production will grow by 8.61%. See the below table 1 for more details and provincial contributions. However, the crop shall remain under stress in KP province in term of area, production and yield.

Table 4: Province wise area, production, and yield of onion

Country/ Province	Area			Production			Yield		
	2019-20 (000 ha)	2020-21 (000 ha)	Change %age	2019-20 (000 Tons)	2020-21 (000 Tons)	Change %age	2019-20 (kg/ ha)	2020-21 (kg/ ha)	Change %age
Punjab	42.00	52.00	23.81	436.00	570.00	30.73	10381	10962	5.59
Sindh	57.90	61.21	5.72	782.14	826.55	5.68	13508	13504	-0.04
Khyber Pakhtunkhwa	11.90	11.82	-0.77	209.11	197.27	-5.66	17575	16697	-5.00
Balochistan	36.10	36.90	2.22	694.30	710.30	2.3	19233	19249	0.09
Pakistan	147.90	161.93	9.48	2121.55	2304.12	8.61	14345	14230	-0.08

c) Price variation from farm gate to retail

I. Tomato

There are no consistent trends in pricing variation among provinces and districts. Significant pricing differences have been noted in several districts from farmgate to mandi and most conspicuously at retail level. In Bhakkar, the average auction price of a tomato was nearly double that of the farmgate price. The

[3] Working Paper, Federal Committee of Agriculture by Ministry of National Food Security and Research, 8th April 2021. The estimates for 2020-21 were provisional.

[4] Working Paper, Federal Committee of Agriculture by Ministry of National Food Security and Research, 8th April 2021. The estimates for 2020-21 were provisional.

Pharya price was 23% higher than the auction price. Similarly, the average retail price of tomato was 83% higher than the auction price.

In Muzzafargarh, the auction price was roughly double that of the farmgate price. The Pharya price was 19% higher than the auction price. The retail price in Muzzafargarh was more than double the auction price.

The price volatility was relatively low in Mardan and Swat districts. The retail price of the tomato in Hyderabad was more than double (112 percent) of the auction price, the greatest price variation among the study districts. This calls into question the pricing model and its implementation from Mandi to retail. Figure 2 reflects the average, maximum and minimum price of tomato from farmgate to Mandi and then retail.

Figure 2: Real time price variation of Tomato from farm-gate to retail during June 2021

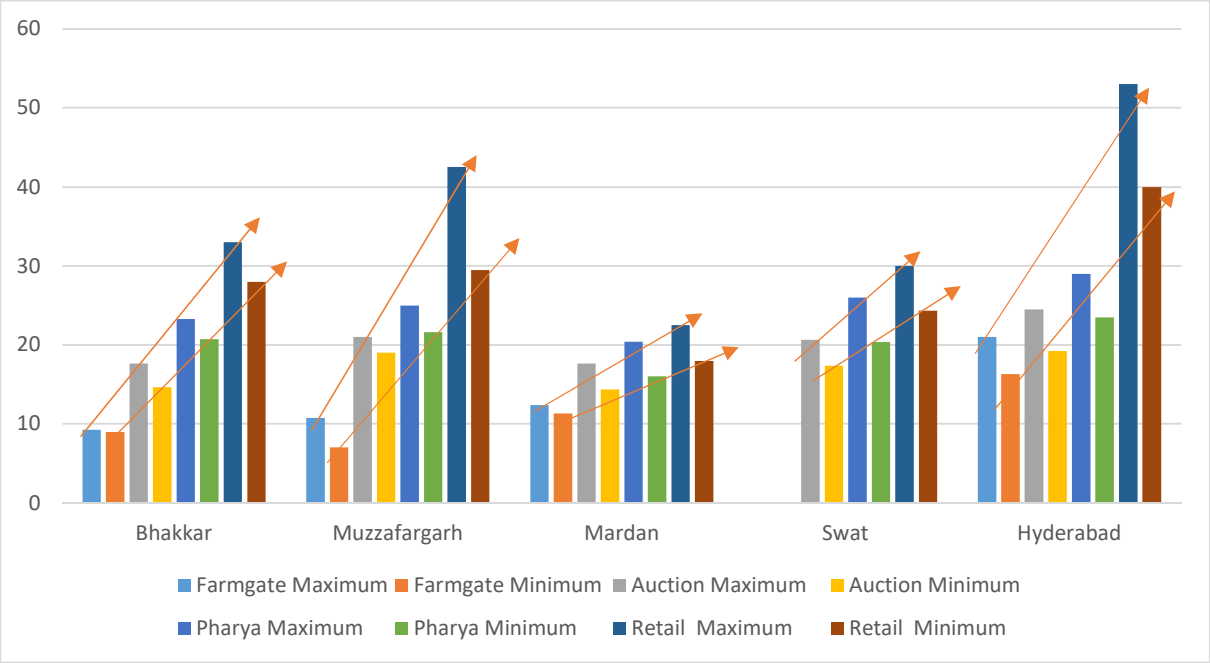


Table 5: Real time price variation of tomato from farmgate to retail during June 2021.

Districts	Tomato Price Per Kg in Rs. (One Week Average)							
	Farm-gate		Auction		Pharya/Mashakhor		Retail	
	Max	Min	Max	Min	Max	Min	Max	Min
Bhakkar	9	9	18	15	23	21	33	28
Muzzafargarh	11	7	21	19	25	22	43	30
Mardan	12	11	18	14	20	16	23	18
Swat	N/A	N/A	21	17	26	20	30	24
Hyderabad	21	16	25	19	29	24	53	40

The Punjab Government has recently adopted a pricing mechanism which includes different costs, like wastage, transportation and overhead cost etc. associated at whole sale and retail level and also the margins for wholesale and retail. Real time prices of retail and whole sale have been compared with that obtained through use of pricing mechanism. It has been observed that real time prices at retail were significantly higher than those which were set by the district administration of the study districts. The

pricing based on the price mechanism and the actual real-time price at whole sale and retail have been compared in the example below.

Table 6: Grade A Tomato price comparison

Grade A Tomato price comparison						
Pricing Factor	Bhakkar			Muzzafargarh		
	A Grade Tomato Per Kg			A Grade Tomato Per Kg		
	As per mechanism	In actual	Variation	As per mechanism	In actual	Variation
Average Auction Price	18			21		
Wastage 6%	1.08			1.26		
Margin for Pharya 7.5%	1.35			1.58		
Overhead Cost of Pharya 1/Kg	1			1		
Pharya Price	21.43	23	7%	25	25	0%
Retailer margin 7.5%	1.35			1.58		
Overhead cost Retailer 1/Kg	1			1		
Retailer price	**24**	**33**	38%	**27**	**43**	**59%**

The above example shows that the average retail price variation of tomato in Bhakkar and Muzzafargarh were 38% and 59% higher, respectively than the price calculated based on the pricing mechanism being applied.

Based on the cost assumptions of the Sindh Government, In Hyderabad, when the pricing mechanism was applied, there was no difference in actual and price as per mechanism at wholesale level for Grade A tomatoes. However, the actual retail price of grade A tomato was 56% higher than the retail price calculated by applying the pricing mechanism used by the district administration. Similarly, the actual price of the grade B tomato was 43% higher than price calculated by applying the formula used by the district administration. The below example will elaborate the price difference for tomato.

Table 7: Grade A Tomato price comparison - Hyderabad

Grade A Tomato price comparison - Hyderabad							
S#	Description	As per mechanism	Actual	Variation %	As per Mechanism	Actual	Variation %
1	Auction Price	25			19		
2	Mashkhor/WholeSale cost and profit margin	4			4		
3	Mashakhor/Wholesale price	29	29	0%	23	24	4%
4	Retailers cost and profit margin	5			5		
5	Retail price	**34**	**53**	**56%**	**28**	**40**	**43%**

II. Onion

There was comparatively less price volatility in onions across the provinces and districts surveyed. The farm-gate price data was available only from Muzzafargarh. In other districts, most of the farmers were transporting their crop directly to mandis and selling through Commission Agents. The stability in the price of onion from farmgate to retail may be attributed to its relatively longer shelf life and ability of the produce to be stored for nearly three months at warehouse level. However, in spite of this stability across district, there were significant variations nonetheless. In Bhakkar, the Pharya price was 30% higher than the auction price. Similarly the retail price was 55% higher than the auction price.

In Muzzafargarh, the Pharya price was 23% higher than the auction price and retail price was nearly 76% higher than the auction price.

In Mardan, Pharya price was 12% higher than the auction price and the retail price was 52% higher than the auction price. In Hyderabad, the Pharya price was 27% higher than the auction price and retail price was 83% higher than the auction price.

Figure 3: Real time price variation of Onion from formgate to retail during June 2021

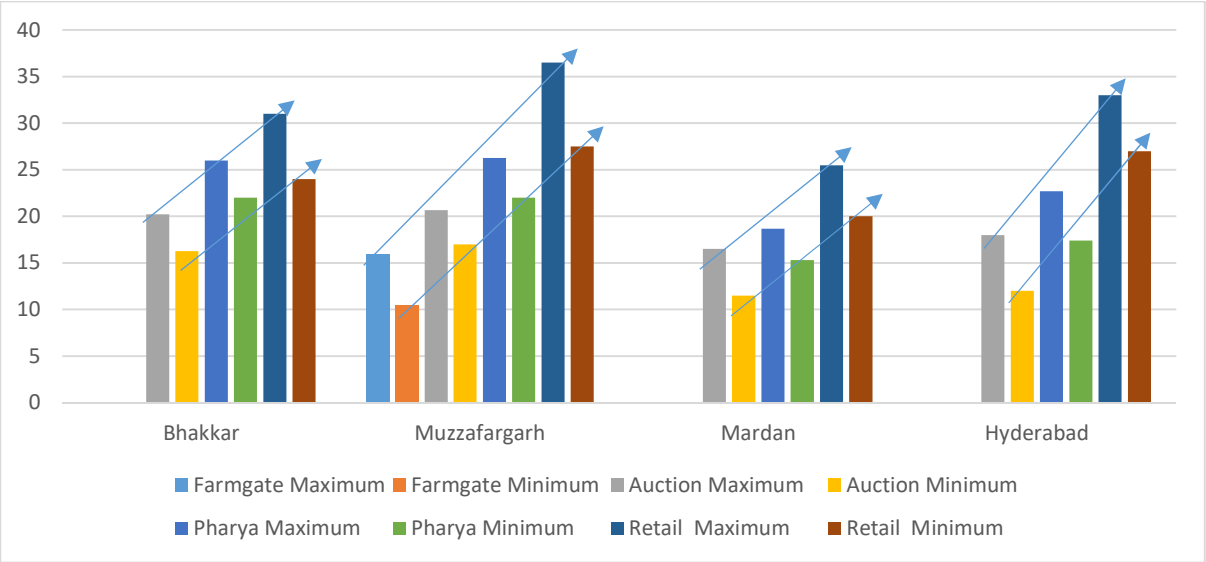


Table 8: Real time price variation of Onion from form-gate to retail during June 2021

Districts	Grade A Onion Price Per Kg in Rs. (One Week Average)							
	Farmgate		Auction		Pharya/Mashakhor		Retail	
	Max	Min	Max	Min	Max	Min	Max	Min
Bhakkar			20	16	26	22	31	24
Muzzafargarh	16	11	21	17	26	22	37	28
Mardan			17	12	19	15	26	20
Hyderabad			18	12	23	17	33	27

Real time prices of onion at retail and wholesale have been compared with that obtained through use of pricing mechanism. It has been observed that real time prices at retail were significantly higher than those which were set by the district administration of the study districts. In the below example, the pricing based on the price mechanism and the actual real time price at wholesale and retail have been compared. According to the example, the actual retail prices in Bhakkar and Muzzafargarh were 24% and 42% higher than the prices determined using the pricing mechanism.

Table 9: Price comparison of onion in Bhakkar and Muzaffargarh

Price Comparisons – Grade A Onion						
Pricing Factor	Bhakkar			Muzzafargarh		
	A Grade Tomato Per Kg			A Grade Tomato Per Kg		
	As per mechanism	In actual	Variation	As per mechanism	In actual	Variation
Average Auction Price	20			21		
Wastage 4%	0.8			0.84		
Margin for Pharya 5%	1			1.05		
Overhead Cost of Pharya 1/Kg	1			1		
Pharya Price	23	23	0%	24	26	8%
Retailer margin 5%	1			1.05		
Overhead cost Retailer 1/Kg	1			1		
Retailer price	**25**	**31**	24%	**26**	**37**	42%

Similarly, the average real-time price of onion grade A in Hyderabad was 18% higher and grade B 17% higher than the price estimated using the district administration's algorithm. The below example will further elaborate the pricing difference.

Table 10: Grade A Onion price comparison- Hyderabad

Grade A Onion price comparison- Hyderabad							
S#	Description	As per mechanism	Actual	Variation %	As per Mechanism	Actual	Variation %
1	Auction Price	18			12		
2	Mashkhor/Wholesale cost and profit margin	5			5		
3	Mashakhor/Wholesale price	23	23	0%	17	17	0%
4	Retailers cost and profit margin	5			5		
5	Retail price	28	33	18%	23	27	17%

d) Factors influencing markets

Pakistan has various ecological and climatic zones which favour production of both onion and tomato throughout the year in the country. Therefore, Pakistan has the availability of both tomato and onion domestically across the year. Figure 2 depicts the availability calendar of both tomato and onion in the country across all provinces. There are, however, variations in the total quantity available across the year geographically and it has a significant impact on the prices. The main factors determining prices are listed below.

Figure 4: Availability calendar of Tomato and Onion in Pakistan

Province	Contribution %age	Tomato Production Calendar											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Punjab	19												
Sindh	37												
KP	18												
Baluchistan	26												
Province	Contribution %age	Onion Production Calendar											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Punjab	25.50												
Sindh	36.50												
KP	9.80												
Baluchistan	33.20												

- **Supply Gaps & Seasonality:** The primary factor that influences pricing is the inconsistent supply of the tomato and onion throughout the year. There are months throughout the year, where the production exceeds the demand. This leads to the decrease in the prices and exploitation of the farmers and end consumers by players in the supply chain. For example, in tomato, the supply exceeds than the demand starting mid of the April and till end of June. This is the period, where the price of the tomato is generally at its lowest. Similarly, the supply shrinks during September, October and November, which leads to

an increase in the price of tomatoes. In onion, there are comparatively fewer price fluctuations. However, production during May June and July significantly exceeds demand, which leads to lower prices.

- **Perishability and Shelf Life:** Tomatoes are perishable and cannot be stored in a warehouse without being kept at a constant temperature. Consequently, farmers must sell their crops as soon as possible because any delay may result in greater postharvest losses. The perishable nature of these commodities, often deprives farmers of their due profits. Better harvesting technologies and packing could increase the shelf life and prevent significant amount of losses. In case of onion, it is a relatively non-perishable vegetable and could be stored up to three months at warehouses and up to 9 months at a cold storage facility. Therefore, onion pricing patterns exhibit less volatility.
- **Lack of Grading and Packing:** Farmers generally do not grade their produce, increasing their chances of getting lower prices. Proper grading, packing, and branding of tomato or onion will not only help farmers get better prices but also enable them to compete with other farmers in other markets. Moreover, it can also boost export of these commodities.
- **Manipulation by the Commission Agent**: The commission agents are a source of distortion in the market for fruits and vegetables. When farmers bring their crops to the Mandi, they may be ignored, or fewer individuals may participate in the auction as the commission agents want to complete the auction as quickly as possible. The auction process is driven entirely by the commission agent, and there have been reports of transparency issues in the auctions. The farmer is unaware of the true price, and the commission agent therefore dictates the pricing of thee commodities. Such incidents were reported from Bhakkar, Swat, Mardan and Karachi. Farmers have been victimised by commission agents or beoparis because of advance funding or loans in the past. They must accept additional conditions such as high commission rates. etc. In short, farmers are denied a level playing field as a result of these manipulations by commission agents.
- **Export and Import Planning**: The key informants highlighted their concerns regarding import and export planning process. As per standard economic principles, the import of the produce during the time of shortage and export during the period of excess can impact the prices positively. According to the informants, there have been instances where crops were imported when local crops were already on the market. This resulted in a supply glut, which lowered prices and severely dented local farmers
- **Enforcement of Pricing Regulations**: The level of enforcement of price control regulations also have impact on the price variations from one area to other. However, the retailers at large have shown their concerns on the price control enforcement actions. They are of the opinion that holistic reforms are required in the entire supply chain instead of enforcing price control regulations at retail level. Needless to say, the price fixation is contrary to the principle of free market or laisezz-faire. The government's role should essentially be reduced to ensuring adequate supply, as well as maintaining fair and transparent competition, and helping to raise agricultural productivity through research based interventions.
- **Lack of awareness about Pricing and availability at Mandi Level**: Generally, the farmers do not have adequate awareness about daily pricing and supply situation at mandi level.

e) Pricing Mechanism

There is no uniform pricing mechanism across provinces. Primarily the pricing mechanism exist for retail prices which are regulated by the district administration. The pricing is based on the total supply of the crop on that day, demand, and sampled auction in the Mandi. For example, in Punjab, a sample of five auctions is used to determine the average price of the commodity and then nearly 10 -15% of the margin is added to cover the profit for Pharya and retailers. However, this mechanism is flawed. The Deputy Commissioner of Lahore introduced a pricing mechanism in consultation with Punjab Agriculture Marketing Department in 2021. The mechanism accounts for recording of all auctions and almost equal margins for Pharya and Retailers, overhead cost, wastage and supply situation of the commodity in the Mandi. After collection of auction prices, three slabs i.e. highest, middle and minimum auction rates of each selected commodity are organized. Rupees 2/Kg overhead costs, wastage and profit margin for Pharya and retailers are added in each slab to prepare the final retail list. The below example from Lahore may be helpful to understand the pricing at Mandi and retail level.

Table 11: Tomato Price - Example

Tomato Price - Example			
Pricing Factor	**Tomato Per Kg**		
	A Grade, 80 gram per piece	B Grade, 50 to 80 gram per piece	C Grade, less than 50 grams
Average Auction Price	50	45	40
Wastage 6%	3	2.7	2.4
Margin for Pharya 7.5%	3.75	3.375	3
Overhead Cost of Pharya 1/Kg	1	1	1
Pharya Price	57.75	52.075	46.4
Retailer margin 7.5%	3.75	3.375	3
Overhead cost Retailer 1/Kg	1	1	1
Retailer price	**63**	**56**	**50**

The similar is the example for onion but with slightly different wastage and margins for Pharya and retailers.

Table 12: Onion Price - Example

Onion Price - Example			
Pricing Factor	**Onion Per Kg**		
	A Grade, 110 gram per piece	B Grade, 70 to 110 gram per piece	C Grade, less than 70 grams
Average Auction Price	50	45	40
Wastage 4%	2	1.8	1.6
Margin for Pharya 5%	2.5	2.25	2
Overhead Cost of Pharya 1/Kg	1	1	1
Pharya Price	55.5	50.05	44.6
Retailer margin 5%	2.5	2.25	2
Overhead cost Retailer 1/Kg	1	1	1
Retailer price	**59**	**53**	**48**

The market committee focal person from Lahore claimed that all auctions of tomato and onion are recorded and average is taken based on the recorded auctions.

The price determination mechanism is simple in the KP province and it is done only for retail level. The price fixation committee is notified by the Deputy Commissioner which consist of President of the respective Mandi, Representative from Food Department, Agriculture department and district administration. Both tomato and onion are segregated in A class and B class based on the quality of the produce brought in the market. Nearly 5-7 rupees are added to the auctioned price to provide for the overhead cost, transportation and margins. For example, if the auction price of the tomato or the onion is Rs. 50 per Kg, the retail price will be notified between Rs. 55 to 57 per Kg.

In Sindh province, apparently the pricing mechanism involve setting price at three levels. The auction price is notified based on the average sample of auction for grade A and grade B varieties of tomatoes and onions respectively. Based on the auction, the price for Mashakhor/wholesale and retail are fixed. In Hyderabad, the price was notified by the district administration. If the auction price was 50 or more then Rs. 10 were added for wholesale and a further Rs. 10 were added for retail to cover the overhead expenses, transportation and profit margins etc. However, if the auction price was below Rs. 50, then Rs 4-5 rupees were added for whole sale and a further Rs. 4-5 added for retail. The price notification from Deputy Commissioner covers auction, Mashakhor/whole sale and retail price.

6. Factors disrupting supply chain

The study identified several key issues across the supply chain starting from farmers to retailers. Some of these issues were cross cutting and have been identified by almost all districts. However, there were some province or district specific issues identified which may need attention by the respective provincial governments. The issues have been categorized into four main categories namely: farmer/Grower, mandi, retail level and others, which are summarized below.

a) Farmers/Growers

The farmers or the growers play a critical role in the supply chain. There are number of issues identified by farmers across the board. These issues have been broadly categorized in two major categories. One is at input level and second is marketing level.

I. Input Level

The availability and access to the quality seed remains the core issue identified for farmers of both commodities. Those who have access to comparatively better quality seed mentioned their high price(s) as the Achilles Heel. The farmers also stated that several diseases assault the crop on a regular basis. Typically, they rely on information provided by pesticide sellers, fellow farmers, or commission agents regarding pesticide use. Farmers were particularly concerned about the inferior quality of pesticides, which demanded repeated crop spraying. Some farmers mentioned spraying their crops fortnightly. This also raises question on the safety of the commodity for consumption.

The role of agriculture extension department is of increasing importance to raise awareness about the quality of seed which are more relevant to geographic conditions and are disease resistant. Similarly they should proactively help farmers to identify the pesticides under a specific diseases attack.

The farmers also raised their concerns on the high cost of fertilizers and pesticide sprays. The farmers in district Bhakkar and Swat identified water shortage as a key problem. Introduction of advance irrigation technologies like drip irrigation and provision of tube wells with solar energy may be useful alternatives.

II. Non Institutional Financing of Inputs

To buy the seed, fertilizers, and pesticides, the farmers must look towards the village *Beopari* or commission agent to finance the inputs. The farmer's preference for availing this non-institutional financing is due to lack of procedural requirements and ease of getting the finance timely as compared to institutional financing. Inputs are financed by commission agents or Beoparis, and they must accept several additional terms in exchange for selling their harvest. The usual percentage of the commission for the agent, which is almost 3% in the Mandis, rises to 8 to 10% for farmers who use non-institutional funding. In addition, the buying has also been reported by commission agents from those farmers without

involving the formally regulated trading structures (Mandis) at their own conditions. Non-institutional finance is readily available to farmers at low lending rates, but in exchange, farmers may be exploited with additional terms and limits on selling crops to other beoparis or commission brokers, depriving them of access to markets and a level playing field.

III. Postharvest Losses

The vegetable growers in Pakistan are facing serious problems from production to marketing. These constraints not only reduce per hectare yield but also its quality. For example, tomato losses account for nearly 30% of the produce from harvesting to high-end market. These losses can be reduced through suggested interventions like using appropriate harvest index, proper picking, washing, modern harvesting techniques, small packing, safely transportation by providing pad in packing material. The experts suggested that if appropriate harvest and post-harvest strategies are adopted, these losses can be reduced from 30% to 10%. This will, according to the Planning Commission, generate additional income to producers as well as value chain actors, worth of Rs. 432 million (or US$3.2 million)[5].

The postharvest losses account for nearly 30% of the fresh produce which prevails in all onion clusters due to the lack of appropriate storage and poor post-harvest management practices like packing, transportation, etc. With improved post-harvest technologies, these losses can be reduced up to 10%. This will generate estimated revenue of US$ 1.3 million to various stakeholders in all clusters at the existing onion prices[6].

IV. Marketing level

Farmers in Pakistan hardly ever mark their produce. They mostly sell their harvest to Mandis in simple polypropylene packs, wooden or paper boxes. The biggest reasons for small farmers not marking their produce are the high expense of branding and a lack of awareness. Many middlemen, Beopari, or commission agents, on the other hand, employ their own branding for specific items. Furthermore, at farm level, grading of crop and or standardization practices are not in place. There are transportation issues particularly when they have to transport their produce to other districts or bigger mandis. The shelf life of tomato crop is low and there is elevated risk of high post-harvest losses.

The farmers in almost all districts pointed out that when they transport their crop to Mandis and participate in auctions, the process is not in their control and at times, they do not get an adequate return on the investment. However, when a Beopari or commission agent himself is participating in the auction, the produce is comparatively sold at a higher price. This also indicates exploitation of the farmers and raises questions regarding the transparency of the mechanism.

The farmers in Mardan, Swat and Bhakkar indicated that some of the auctions are conducted secretly by the commission agents and the price is not shared with farmers. So the commission agent decides that how much price will be paid to the farmers.

b) Mandi Level

I. Pricing Mechanism

The primary responsibility of managing Mandis and ensuring the transparency of auctions at Mandi level lies with the Market Committees. The district administration or representative of the Deputy

[5] https://www.pc.gov.pk/uploads/report/Tomato_Cluster_Report.pdf Page 45
[6] https://www.pc.gov.pk/uploads/report/Onion_Cluster_Report.pdf Page 62

Commissioner regulate these Mandis as well as the pricing mechanisms. Punjab Agriculture Marketing department is trying to initiate basic reforms at the Mandi level. One good example is the Agriculture Marketing Information System (AMIS). The representatives of the department collect information from the Mandi about the auctions, enter the data into AMIS and also help determine the price of daily commodities. This is a solid start, but there are several problems, such as the staff's ability to collect sufficient amount of data and its subsequent entry into AMIS. The study team observed significant variations in the auction price. This poses a serious challenge in the quest for a generally acceptable District Administration price, based on the auction price. For example, the study team at Faisalabad visited Faisalabad Mandi on 16th June and observed the following auction price of Tomato.

Table 13: Auction Price of Tomato in Faisalabad

S#	Approximate Quantity (Unit)	Quality	Auction Price	Per Kg Price
1	20 Kg Polypropylene Pack	A	380	19
2	23 Kg Polypropylene Pack	A	350	15.21
3	14 Kg Polypropylene Pack	A	180	12.85
4	14 Kg Polypropylene Pack	B	150	10.71
5	14 Kg Polypropylene Pack	B	140	10
6	13 Kg Branded Pack	A	290	22.30
7	13 Kg Branded Pack	A	80	6.15
8	23 Kg Polypropylene Pack	A	420	18.26

The price of Grade A tomato varied between Rs 6 to 19 per Kg, which further illustrates the problems in determining a uniform price for tomatoes. Due to various reasons its difficult to arrive at a consensus. This may be the primary reason behind the dissatisfaction of the retailers vis a vis the price set by district administration.

Furthermore, while the auction is open to everyone, the auction is usually attended by Pharyas or wholesalers. The retailers in larger Mandis typically do not participate in the auction and prefer to buy from Pharya since it saves them time and does not require them to invest higher sums. In addition, there may be a risk of quality as well if they buy from the Auction. Moreover, the retailers can usually check the quality of their commodity, while they are buying from Pharya. It is difficult for them to assess the quality of the auctioned items particularly when bought in large quantities.

In KP province, there are only two Mandis (Peshawar and DI Khan) that have market committees and are regulated by the government. The remaining mandis are run by the privately constituted associations of traders. The district administration, on the other hand, sets the price based on the auction and relevant information provided by the Mandi Association. There are various transparency issues identified by farmers regarding pricing at mandi level. The farmers in district Swat and Mardan mentioned that auction is done secretly and the commission agent decides about the price to be paid to the farmers. This leads to the exploitation of the farmers.

However, two good initiatives of the KP Government include, the introduction of Kissan Markets and Mandi App. Such moves help in recording price trends as well as comparative analysis. The Mandi App may be downloaded from the Google Play Store for Android phones, and it can be used to examine pricing patterns and other information. The App is maintained and operated by Agriculture Extension Department of KP. The pricing information is readily available and is useful for farmers, traders, and consumers.

However, the pricing data entered in the apps is based on the price list notified by the district administration. There are challenges associated regarding the quality and transparency of the data. The

The KP government established approximately 52 Kissan markets, where farmers could bring their products directly from their farms and sell them to people. However, due to a lack of farmer desire, these Mandis have had limited success. Many of the traditional market players have now started dominating the Kissan market space. However, figures from the KP Government show that consumers pay slightly less at Kissan markets than at regular Mandis. The research suggests that if the trade takes place in Kissan Markets, both the consumer and the farmer benefit. This initiative should be assessed, and based on the results, it may be strengthened.

c) Retail Level

The primary problem of the retailers recorded by the study team was their dissatisfaction on the price list of district administration. As per argument by the retailers, the price of the purchase is higher than the price set by the district administration. "We have our expense which includes transportation and a regular business operating cost. The profit margins are thin and there are undue enforcement actions on retailers due to the price list enacted by the district administration", said a number of retailers. The example of auction mentioned above from Faisalabad, also indicate the same issue.

Another problem indicated by the retailers is the manipulation of the price by the commission agents and Pharyas. The Phraya charge higher margins and retailers are exploited. However, when a fact check was applied by the study team on the margins of the wholesalers, these were found higher in some instances. However, the fact check does not support the argument of the retailers at large, regarding high margins of the wholesalers. The study team also observed that the actual retail price charged by the retailers were higher than the rate list provided by the district administration.

d) Other Issues

I. Planning of Glut and Stress Period of Produce

The stress and glut period varies in provinces. Farmers and other players in the supply chain showed concern on inadequate management of the glut and stress period. During the glut period, the supply of the crop is much higher than the demand and resultantly the post-harvest losses are increased due to curbs on exports. As a result, the farmers do not get good returns on the crop. The primary reason for inadequate glut and stress management are the current preferences of the consumer about use of the fresh tomato. However, processing of tomato during the glut season and its release during the stress period could help in bringing the smoothness in the supply chain, prevent losses, and create economic activity and jobs. Further, there are no adequate storage facilities, transportation, and marketing support available for farmers under surplus production. The Government should create an enabling environment for processing industry which may introduce Tomato purees, pastes and dried vegetables which may be used during the stress period. Similarly, onion processing industry may be helpful to bring a balance between glut and stress period of the produce.

II. Demand Estimation

The production estimates are primarily provided by the Provincial Crop Reporting Departments. However, there is no adequate demand estimation mechanism in place in the country for tomato and onion consumption. Most of the demand and targets for production are based on the previous trends. There are seasonal variations in the demand and events like Eid and Ramadan also increase the demand for tomato and onion. An adequate mechanism for estimation of demand is pivotal which can help in reducing interruptions in the supply chain.

III. Decisions for Import and Export of the Crop

Official provincial sources said the coordination among provinces and federal government needs to be strengthened particularly regarding import and export decisions of the produce. The import and export decision should be well planned, duration and quantities should be decided in consultation with provinces and based on the availability of the produce. Any import during the glut period may exploit the farmers. The import during the stress period may be useful to provide relief to consumers and also protect local farmers.

IV. Crop Reporting Data

The sources also raised their concerns on the crop reporting mechanism. The primary concern was related to the capacity of the Provincial Crop Reporting Departments which needs to be strengthened by the provincial governments. Further, the technological advancements need to be introduced in the crop reporting.

7. Anti-Competitive Practices under the Competition Act 2010

a) Price Controls

The essential commodities sector is heavily regulated through price controls at retail level. The prices for tomato and onion are determined by the Deputy Commissioners on daily basis at retail level. Implementation and monitoring of price controls is not only difficult but also a contradiction to the principles of free market economy. Price controls and its regulations may reduce entry and investment in the long run and act as a disincentive to improve quality, create black markets, and stimulate costly rationing[7].

b) Farmers Exploitation through Non-Institutional Financing

The institutional financing in Pakistan is complex and lengthy due to many processing requirements. It is costly, can cause delays and sometime involve malpractices at banking staff level. This has resulted in creation of a parallel non-institutional and unregulated financing sector. The village beoparis and commission agents are the major financiers for farmers. They provide loans in form of cash or in form of inputs for the crop like seeds, fertilizers, and pesticides etc. As a result of such non institutional financing, additional conditions are applied on the farmers which include higher commission rates, exclusive auctions at Mandi through the selected commission agent, and low purchase prices paid to farmers while circumventing auctions in the process.

8. Best Practices in the region and other countries

China and India are world leaders in the tomato production. India has taken number of key initiatives to reduce the post-harvest losses and improve efficiency of the tomato crop[8]. As a result of Indian government support (e.g. 50% subsidy in Maharashtra) and private-sector involvement, farmers are using plastic crates, which reduces losses by up to about 75%. Although the costs for this type of packaging can be recovered in 10-20 trips, but farmers were not able to afford it due to cash constraints, so the external support was required.

[7] The problems of Price Controls by Fionna Scot Morton, Cato Review of Business & Government, 2001

[8] https://reports.weforum.org/enabling-trade-from-valuation-to-action/enabling-trade-from-farm-to-fork/a6-case-studies-f2f/indian-tomatoes-adding-value-and-reducing-losses-through-processing/?doing_wp_cron=1625850638.5701670646667480468750

To reduce the post-harvest losses, Indian Government developed cold storage facilities, mainly for potato. The Government provided 50% subsidy to private sector for construction of cold storage. Aside from availability of long-term financing, another barrier to the adoption of storage technologies was cash constraints, which farmers face at harvest time, forcing them to sell quickly. To overcome this, **the Indian government first removed price-controls**, allowing cold-storage owners to set prices freely. This flexibility reassured banks of profitability and freed up loans. These loans are offered to the cold storage operators, amounting to 25-40% of the current price for a 50-kg sack of potatoes. The cold storage operators then lend this amount to farmers.

In the tomato industry, Indian farmers have adapted their harvesting strategy to deal with lack of infrastructure. They pick their tomatoes when green instead of red-ripe, so that the tomatoes can be sent on longer distances as they will take longer to ripen. Moreover, farmers have introduced new tomato varieties that are more resistant to transport bumps and handling. In the long run, the tomato supply chain could marginally benefit from the operationalization of the cold chain.

Tomato Processing Industry

Experience from other countries shows a high correlation between GDP growth and development of the tomato processing industry[9]. The Indian government is supporting this hypothesis. As the Indian middle class grows, consumption habits change and shift towards more processed food. The Public Private Partnership (PPP) in Maharashtra provides promising evidence of the potential benefits of a developed processing industry in India. Hindustan Unilever's PPP in Maharashtra has demonstrated that professionalized farms can achieve higher yields and lower waste than unskilled farms. However, to be sustainable, the private sector needs a push from the government in order to establish proof of concept.

Kitchen Gardening Club

In its simplest form, a kitchen garden produces fresh fruits, vegetables and herbs for delicious, healthy meals. A number of countries have created an enabling environment for kitchen gardening by creating clubs or community of likeminded people who are interested in growing organic vegetables and fruits at their houses or schools. The kitchen gardening is an evidence based intervention tested in various countries like Thailand and Bangladesh. FAO and USAID also supported various programs to strengthen supply of vegetables through kitchen gardening and promoting income generation opportunities for women. As per experts, Bangladesh, Thailand and many other countries have promoted kitchen gardening in their countries and remained successful in increasing the supply of vegetables for own consumption of the growing houses.

Kitchen gardening has been piloted in Punjab in past but mainly remained limited to seed distribution and could not get much success. However, Pakistan Health Research Council initiated a project in Islamabad

[9] https://reports.weforum.org/enabling-trade-from-valuation-to-action/enabling-trade-from-farm-to-fork/a6-case-studies-f2f/indian-tomatoes-adding-value-and-reducing-losses-through-processing/?doing_wp_cron=1625850638.5701670646667480468750

where more than 300 kitchen gardening clubs were set up. The project seems an interesting model with potential to increase supply of organic vegetables. A comprehensive evaluation of the project may be useful to consider scaling up of this initiative to other parts of the country.

Yield of Tomato and Onion

Tomato is the world's largest vegetable category, representing 16% of vegetable area. Globally during 2017, it was cultivated on 4.85 million hec supplying 182.3 million tons of tomato with an average yield of 37.6 per ha. About 42 million tons or 23% of tomatoes are processed into various tomato products and remaining are consumed fresh. It is worth noting that increase in tomato production in Pakistan is higher than that at the world average implying that Pakistan's share in international tomato production is improving overtime. This is one of the few vegetables where Pakistan's share is improving. However, most of the increase in production in Pakistan, unlike at international level, came from area expansion without or negligible improvement in per hectare yield thus deteriorating Pakistan's competitive position.[10]

Worldwide, onion is cultivated on about 5.2 million ha producing 9.8 million tons of production, which give an average yield of 19 tons per ha. China and India are the largest producers of onion in the world[11]. The average yield of Pakistan as per data by Ministry of National Food Security and Research is 14 Tons per hectare.

The regional comparison[12] of tomato and onion yields is shown in the table below. The regional countries have comparable conditions and reflects the potential for bringing reforms and improvements in a comparatively shorter period of the time.

Table 14: Tomatoes, Yield (kg/ha) (2019)

Countries	Yield (kg/ha) (2019)
Pakistan	10,157.7
India	24,336.7
Bangladesh	13,744.1

In 2019, for tomatoes, India had the highest yield (kg/ha), followed by Bangladesh and Pakistan.

Table 15: Onions, dry, Yield (kg/ha) (2019)

Countries	Yield (kg/ha) (2019)
Pakistan	14,025.5
India	18,704.1
Bangladesh	10,454.1

In 2019, for onions, India had the highest yield, followed by Pakistan and Bangladesh.

The minimum regional benchmark for Pakistan in the short term could be India. The Research and Development Institutions in the country need to focus on introducing varieties of the crop which could produce higher yield and are compatible with the various climatic and ecological condition.

[10] https://www.pc.gov.pk/uploads/report/Tomato_Cluster_Report.pdf

[11] https://www.pc.gov.pk/uploads/report/Tomato_Cluster_Report.pdf Page 16

[12] Source: http://www.fao.org/faostat/en/#data/QC

9. Recommendations and Proposed Way Forward

a) Short Term

1. **Effective Supply Chain Management**: The commission agents or the beoparis are the primary controllers of the supply chain and movement of vegetables from one Mandi to other. The study team observed during the survey that the same lot of bulk onion (usually a truck) is sold multiple times starting from one Mandi, to other and then to another. Timely data sharing among provinces, districts and its public availability may be useful to identify the supply gaps. The AMIS by Punjab and Mandi App by KP government could be effectively utilized for sharing information publicly. The district administration should closely observe and ensure that such information is openly available in Mandis, so that traders could ensure timely supply.
2. **Federal/Interprovincial coordination**: Better coordination between federal and provincial governments is necessary, in fact urgent, to ensure un-interrupted supply of the essential commodities. The production forecast, glut and stress situation of the crop be considered at each province before making such decisions.

b) Medium Term

1. **Farmers training on Harvesting, Packing and Transportation**: Most of the postharvest losses could be prevented through adequate training of farmers regarding the appropriate harvesting time, techniques and the use of packing materials for transportation to Mandis. The role of provincial agriculture extension departments is pivotal in providing such trainings and increasing awareness among farmers on strategies to reduce the post-harvest losses. For example, a simple grading of tomato and removal of any produce with diseases at the time of packing could prevent a significant postharvest loss.
2. **Easy Interest Free Loans for Farmers on Inputs**: Under the current circumstances, the institutional financing is complicated, costly and causes delays. Thus, the farmers prefer non institutional financing mainly through commission agents. The farmers are exposed to the exploitation by the commission agents. The provincial government may plan to provide easy and interest free loans to farmers. Kissan cards may be a good initiative in this regard.
3. **Scale Up of Kitchen Gardening Clubs:** Kitchen gardening is a tested strategy used to increase supply of vegetables and household income. The FAO and USAID also promote kitchen gardening to ensure food security and maintenance of livelihoods. There are various strategies adopted by other countries to scale up kitchen gardening. Facilitating formation of kitchen gardening clubs, backyard gardening, roof top gardening and school gardening are various strategies which may be adopted by creating an enabling environment, awareness, input distribution and monitoring and evaluation. The Pakistan Agriculture Research Council formed a Kitchen Gardening Club and provided trainings, and inputs like pots with plants at affordable prices to increase the supply of organic vegetables including tomato. It is recommended that a comprehensive evaluation of the project should be carried out and based on the lesson learnt, further scale up may be decided.
4. **Crop Reporting Data:** Crop reporting is of great importance in the planning process. Crop reporting requires comprehensive reforms which may be planned in the medium to long term. The medium-term reforms include capacity development, integration and triangulation of the information with other departments like revenue, agriculture extension and SUPARCO.

The medium to long term reforms include restructuring of the crop reporting departments as well as technological advancement.

c) Long Term

1. **Ensuring Availability of Quality Inputs**: Quality inputs like seeds, fertilizers, water and pesticides are primary determinants of good production and high yield. Pakistan is importing nearly 80% of the tomato seeds and 40% of the onion seeds[13]. The respective provincial administrators must assure the supply of seeds of those types that are suited to the climatic conditions of each ecological zone. Similarly, the provincial government should look into the excessive use of pesticides which may be a threat to food safety. It is necessary to promote and subsidise the seeds of disease-resistant agricultural varieties.

2. **Reduction in Post-Harvest Losses:** The post-harvest losses in tomato and onion are significant. In the regional countries, India has adopted useful strategies to reduce the post-harvest losses which may be instructive for Pakistan. The provincial governments may consider the following steps.
    a. **Enhance cold storage facilities through Public Private Partnerships**: The private sector should be encouraged to build cold storage facilities. These facilities may have only a limited impact on tomato but could be very useful investment for other perishable essential commodities like potato, onion etc. However, together with other strategies these facilities could play a significant role in reducing the postharvest losses.
    b. **Packing Material**: Introduction of new generation packaging materials can help reduce losses. In addition, foldable plastic packaging or nestable containers could be introduced. India incentivized and introduced the use of plastic crates which proved very effective in reducing the postharvest losses during packing and transportation. Pilot projects for new generation packaging materials may be launched by provincial agriculture extension departments.
    c. **Value Addition and Processing Industry:** Currently there is less than 1% processing of tomato and onion in the country. Although this is a long-term strategy, but improving the value addition and processing industry of tomato and onion can significantly help reducing the postharvest losses, deal with the glut and stress period of the produce, increase economic activity, create jobs and generate revenue for the country. The government needs to create and enabling environment for the private sector and incentivize the processing industry. It can help raise awareness among consumers and consequently bolster agricultural production.

[13] Interview with PARC expert

Limitations

The study has various limitations the Commission would like to highlight for anyone who consults this study for reference or any decision making.

1) The data collected from the farmers and some other key informants from field was based on their memory and verbal information. The study team applied various fact checks for quality assurance of the data. However, the study team acknowledges the absence of documentation at the farmer's level as a major impediment.
2) The identity of the study team as representatives of the Commission may have created some biases in the mind of respondents.

Annex

Figure 5: Comparison of province wise production of tomato

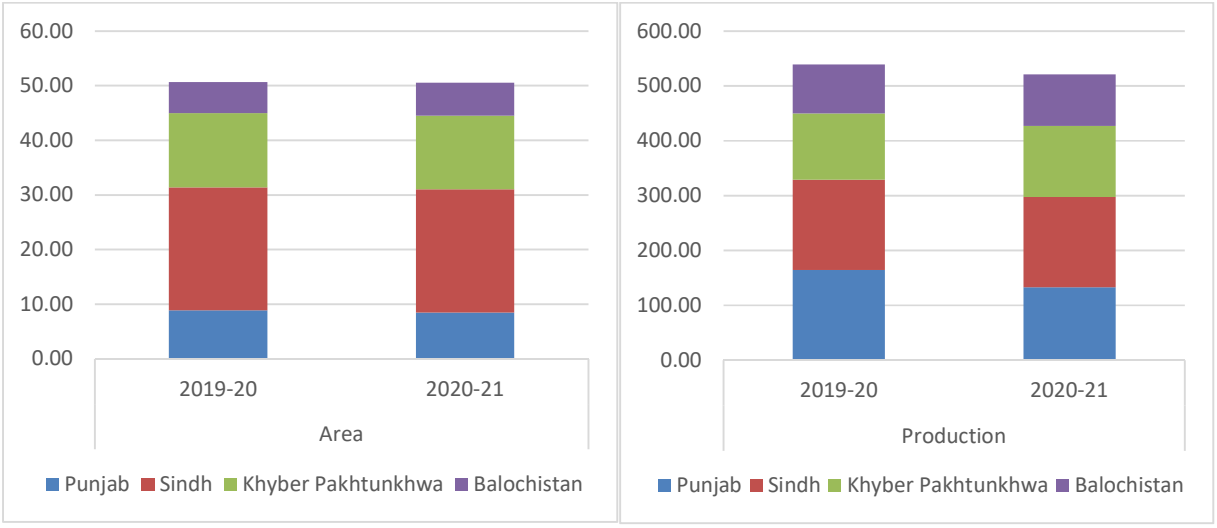
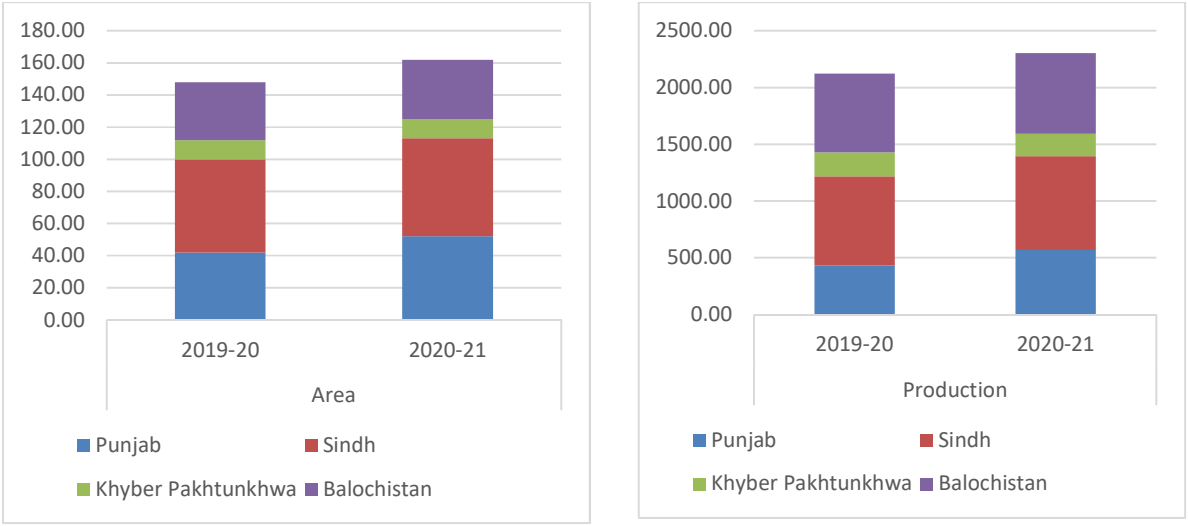


Figure 6: Comparison of province wise area and production of onion



List of key stakeholders consulted

1) Member Social Sector, Pakistan Agriculture Research Council

Punjab

2) Special Secretary Agriculture (Marketing) Punjab
3) Director General Agriculture (extension) Punjab
4) Director General Agriculture Marketing Regulatory Authority Punjab
5) Director Horticulture, Department of Agriculture Punjab
6) Project Manager (AMIS), Department of Agriculture Punjab

Khyber Pakhtunkhwa

7) Director General Agriculture (Extension) Khyber Pakhtunkhwa
8) Director Agriculture Marketing, Department of Agriculture Khyber Pakhtunkhwa
9) Deputy Director Horticulture (HQ), Department of Agriculture Khyber Pakhtunkhwa

Sindh

10) Director General Agriculture (Extension) Sindh
11) Director Horticulture, Department of Agriculture Sindh
12) Director Agriculture Marketing Sindh

Academia

13) Professor & Director, Institute of Horticulture Science, University of Agriculture Faisalabad
14) Assistant Professor1, Institute of Horticulture Science, University of Agriculture Faisalabad
15) Assistant Professor2, Institute of Horticulture Science, University of Agriculture Faisalabad
16) Assistant Professor 1, Institute of Business Management Science University of Agriculture Faisalabad
17) Assistant Professor2, Institute of Business Management Science, University of Agriculture Faisalabad
18) Associate Professor, Food Science Department, University of Punjab, Lahore