EXPLORING THE IMPACT OF FREE MARKET MECHANISM ON SUGAR PRICES AND VALUE CHAIN ANALYSIS

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PIDE2019FMPHILENV16

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2022

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CERTIFICATE

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Dedication

DEDICATED TO MY

PARENTS

Acknowledgment

First, I owe big thanks to **Allah Almighty (SWT)** for giving me the spirit to learn and excel in my field. Then after having paid my homage to Allah Almighty, I express my supervisor **Dr. Abedullah** for his support, patience, motivation, and immense knowledge that have inspired me to carry out the onerous task of writing this thesis. His guidance helped me a lot throughout the research and writing of this thesis. I could not have imagined having a better advisor and mentor for my MPhil study.

I would not have succeeded without the kind support and prayers of my family and dear friends **Danish Bhutto and Gulreen Zaka**. I want to express special thanks to my parent for pouring in tireless efforts to put every day together and boost my morale when my confidence touched low.

I cannot forget to thank all the well-equipped interviewees who graciously gave me their precious time and views. This study would remain piecemeal without their views and perceptions.

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Nageen Binat Khalid

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ABSTRACT

The sugar industry is the second-largest cash crop industry domestically and the fourth largest globally. The industry offers 3.9 million seasonal jobs in Pakistan and employs a 12.14% agricultural labor force. It also contributes 1.1% to gross domestic product (GDP). Every country strives to ensure and maximize the wellbeing of its stakeholders, i.e., consumers and producers. In this study, an effort has been made to analyze the cost of government interference and the impact of the free-market mechanism on sugar prices. To accomplish the objectives of this study, both primary and secondary data have been utilized. The primary data is collected through snowball techniques from 22 farmers, millers, and institutional experts. The objective of these interviews was to investigate the sources of market inefficiency. At the same time, the secondary data consists of two parts. The first part deals with the annual data on production, consumption, export, and import of sugarcane between 1980 to 2020. The second part consists of monthly data for 2019-20 to investigate the situation thoroughly. The analysis reveals a huge difference in domestic and international sugar prices. Even after adding 10% handling cost (storage, loading, unloading, etc.) then, it is still observed that international prices were significantly lower than domestic prices in 2019 (US$66/ton). This implies that rather than interference in the sugar market, if the government had left the market free, then consumers would have enjoyed lower prices. The government would have saved the cost incurred in terms of subsidy. Due to government interference in the market, consumers paid Rs. 96 billion extra in terms of high prices during 2019, which could be saved by keeping the sugar market open for import. The government spent Rs.2 billion to compensate the exporters for exporting sugar surplus because international prices were low in 2019, but later on, it was found that there was a shortage and local stock was not sufficient to meet the demand. The government also could have saved Rs.3 billion spent in terms of subsidy to keep the prices low but failed to achieve the objective. This implies that the government could have saved Rs.5 billion by adopting the free market mechanism, which could be a win-win situation for both the government and consumers. Therefore, all kinds of barriers to import (permission from the ECC committee) should be abolished to create free-market mechanize in a true sense. If the government still wants to give subsidies to the marginal consumers operating below the poverty line, it should give targeted subsidies to consumers by using the BISP database.

Key Words: Sugar Industry, Value Chain, Free Market Mechanism, Government Interference, Pakistan.

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CHAPTER 1

1. INTRODUCTION

1.1. Background of the Sugar

Sugar changed into production from sugarcane in Northern India after the 1st century AD. There are five phases of sugar production history: Firstly, the extraction of cane juice from the sugarcane and the following domestication of the plant in tropical India and Southeast Asia around 4000 BC. Secondly, the intervention of manufacture of cane sugar granules from sugarcane juice in India 2000 years ago, and through improvements in refining the crystal granules in India within the early centuries AD. The third phase is the spread of cultivation and manufacture of cane sugar to the medieval Islamic world, together with a few enhancements in production strategies. The fourth era sugar era about the cultivation and production of sugar from cane initiated in the West Indies and tropical parts of America beginning in the 16th century. They made more inventions to enhance manufacturing procedures in the 17th century to become a part of the world. The last phase is improvement and expansion in secondary production from sugarcane like bee sugar, high-fructose corn syrup, and different sweeteners in the 19th and 20th centuries (Wikipedia, 2021).

Sugar is a total carbohydrate and an important nutrient that supplies energy to the body. In the present world, more than 130 countries take part in sugar production worldwide. Sugar is one of the important commodities in the international trading market. Countries like Brazil, Indonesia, India, and France have an absolute advantage in producing sugar but face hurdles in pricing the commodity (sugar prices). These countries attempt to tackle inflation and pricing challenges through price policies. Sugar pricing is one of the major sources of income of such countries because sugar price is not limited to their industry but also has a multiplier effect on other countries. Variations in the exchange rate depreciation affect the sugar demand domestically, and such domestic changes affect sugar prices. It indicates that sugar-producing countries protect their sugar industry from macroeconomic shocks through price policy (Jati, 2013)

1.2. Current Global Share

The global production sector encountered an overall sugar production decline in 2020. Brazil and India are the two largest cane-growing regions, followed by Thailand and China. The crops in these regions are troubled during the hot season. Extreme heat and lack of rain lead to drought, adversely impacting cane growth, leading to far smaller cane crops. The extreme heat should be like increasing sucrose yields stored within the cane.

(Table 1) shows that Asia's share in sugar production is 38.2% in 2020 which shows it to be the largest sugar-producing area in the world. But in terms of countries, Brazil had the largest share, is 18% in sugar production in 2020. As per data, India production has been increased with the 2% decline of Brazil production. As per the Indian Sugar Mill Associations (ISMA), production of sugar declined by 15% from the previous year due to the extended lockdown COVID-19 pandemic. It created a feeling of distress in the value chains of Indian sugar stakeholders. According to ISMA, nearly INR 0.7bln of sugar is stuck to unsold, and demand for ethanol has also dropped down. Due to lockdown, there is a shortage of laborers and the cash flow of sugar mills impairs their ability to pay farmers. Thailand has a drastic 43.2% decline in production of sugar and the USA faces a 10.9% decrease in production.

(USDA, 2020) Global production of sugar is up 6 million tons to 186 million as higher manufacturing sugar in the EU, India, and Thailand is greater than make up for the decline in Brazil. Consumption puts the pressure upward due to new growth in markets which include China and India. At world level sugar consumption is rising due to expansion in sugar markets such as Egypt, India, Indonesia, and Pakistan. In (PARC, 2020) report export of sugar was higher, but due to increase in sugar demand around the world, the level stock of sugar declined by 8 percent with lower production in India, China, Pakistan, and Thailand.

Table 1:1: World Sugar Production

Sugar Production Share						
Period	MY15	MY16	MY17	MY18	MY19	MY20
Asia:						
India	17.2%	16.6%	12.8%	16.9%	18.0%	17.4%
China	6.2%	5.5%	5.3%	5.3%	5.7%	6.1%
Thailand	6.1%	5.9%	5.8%	7.2%	7.5%	5.0%
Pakistan	3.5%	3.9%	4.3%	4.3%	3.6%	4.0%
Other Asia	3.6%	3.7%	4.2%	3.7%	4.2%	5.6%
Total Asia	36.6%	35.7%	32.4%	37.4%	38.9%	38.2%
South America:						
Brazil	20.2%	21.0%	22.5%	20.3%	18.2%	18.0%
Other South America	4.6%	4.4%	4.3%	3.8%	3.9%	3.5%
Total South America	24.8%	25.5%	26.8%	24.1%	22.1%	21.5%
North America	8.0%	8.9%	8.4%	7.7%	7.8%	7.7%
Central America	3.2%	3.3%	3.2%	3.0%	3.0%	3.0%
Europe	10.9%	9.0%	11.0%	11.4%	11.2%	10.8%
Former Soviet Union	3.9%	4.6%	5.3%	5.1%	5.1%	6.4%
Oceania	2.8%	3.1%	3.0%	2.6%	2.7%	2.6%
Other Regions	9.7%	9.9%	9.9%	8.7%	9.2%	9.9%
Total World	100%	100%	100%	100%	100%	100%

Source of Data: PARC Report Presentation (PARC, 2020)

Brazil is one of the major sugar producers and exporter countries globally, and its cost of production is comparatively less than other sugar-producing countries. Therefore, any slight change in sugar prices in Brazil leaves a tremendous effect on the international sugar market. Brazil's exchange rates and ethanol production in energy markets are pushing upward pressure on global sugar prices in the international market. The volatility of price movements in the past year in Brazil was mostly the result of supply shortfalls tied to changing economic incentives, weather disruptions, and domestic policy factors. It affects other countries because it creates competition in the sugar and ethanol production industry at the world level. The U.S. is also affected by global sugar price fluctuation, and when domestic prices are higher than the prices of sugar U.S imports sugar from Mexico. These imports account for over 25 percent of global sugar consumption, a

share growing in volume since 2005. These four countries produce 20 to 30 percent of the total world production. Over time, India is growing fast as compared to its neighboring countries. Over the past ten years, India's production has increased more than double, i.e., from 14.1 to 30.8 million metric tons (McConnell, Dohlman, & Haley, 2010).

1.3. Pakistan Sugar Sector

In the world ranking, Pakistan falls at 4th in sugar production. The sugar industry is the 2nd largest sector and cash crop in Pakistan. The sugar industry in Pakistan consists of 89 companies, including small and big firms. Political leaders own five major companies. The sugar industry's share in GDP is 18%, crashing capacity is 79%, and consumption is projected to be 5.8 MMT while the total industrial demand is 60%. A decline of 18% in plantation and 19% in production compared to the plantation and production of sugarcane in 2018 was recorded (PSMA, 2019). A decline of 6% in MY 2019-20 was expected owing to various factors such as a fall in water supply, late payments to farmers, and a lack of high yield varieties (Rehman, 2020).

Figure 1:1: **Sugarcane Production & Harvested Area in Pakistan (1980-2020)**
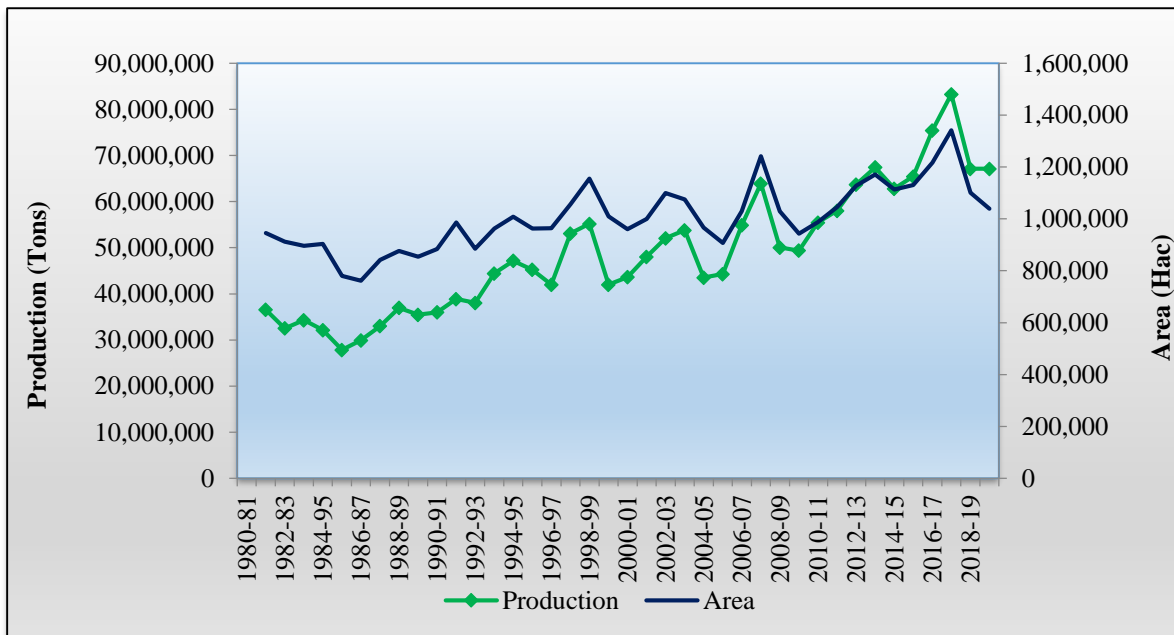
Source of Data: Pakistan Sugar Mill Association, Economic Survey

The graph demonstrates a continuous increase in the history of sugarcane production, but the increase rate is not as high as needed. From the beginning, sugar harvest is on the increase, but it is not as per expected domestic sugar production. As per historical data, sugar production is less

than sugar demand in the region. If we pay attention in the last decade, we are in surplus in sugar production, but the harvested area of sugar has declined over many years. All these happen just because the governments fail to achieve Sugarcane and Sugar's good policies. There is a little invention in the sugar sector; the cost of production is high compared to other crops as it is harvested for a longer period. Late payment to the farmers is also the reason for the decline in the cane area because of the mill owners' behavior, farmers' morale goes down, therefore, and they shift to other cash crops. Other factors which affect sugarcane production are environmental conditions, water shortage/mismanagement, and political influences in the sugarcane and sugar sector.

More than 45 percent of people generate their income from the agricultural sector in Pakistan. Small farmers contribute 35% in agriculture GDP (Raza, Saeed, & Shahid, 2013). The sugar recovery is hardly 9.5 % in Pakistan, which is significantly low than other sugar-producing countries (12-14 %). The sugar recovery is hardly 9.5 % in Pakistan, which is significantly low compared to other sugar-producing countries (12-14%). The high fluctuation in sugarcane production leads to price fluctuation in the country that can tackle by adopting free mobility, export, and import of sugar, i.e., free-market mechanism. However, this is only possible if sugar is excluded from the list of necessary commodities. It is only possible through an amendment to this effect. The second reason for price fluctuation is the monopolistic distortion to earn a high profit, but this can also handle this by adopting a free-market mechanism policy.

Figure 1:2: Sugarcane Yield in Pakistan (1981-2020)
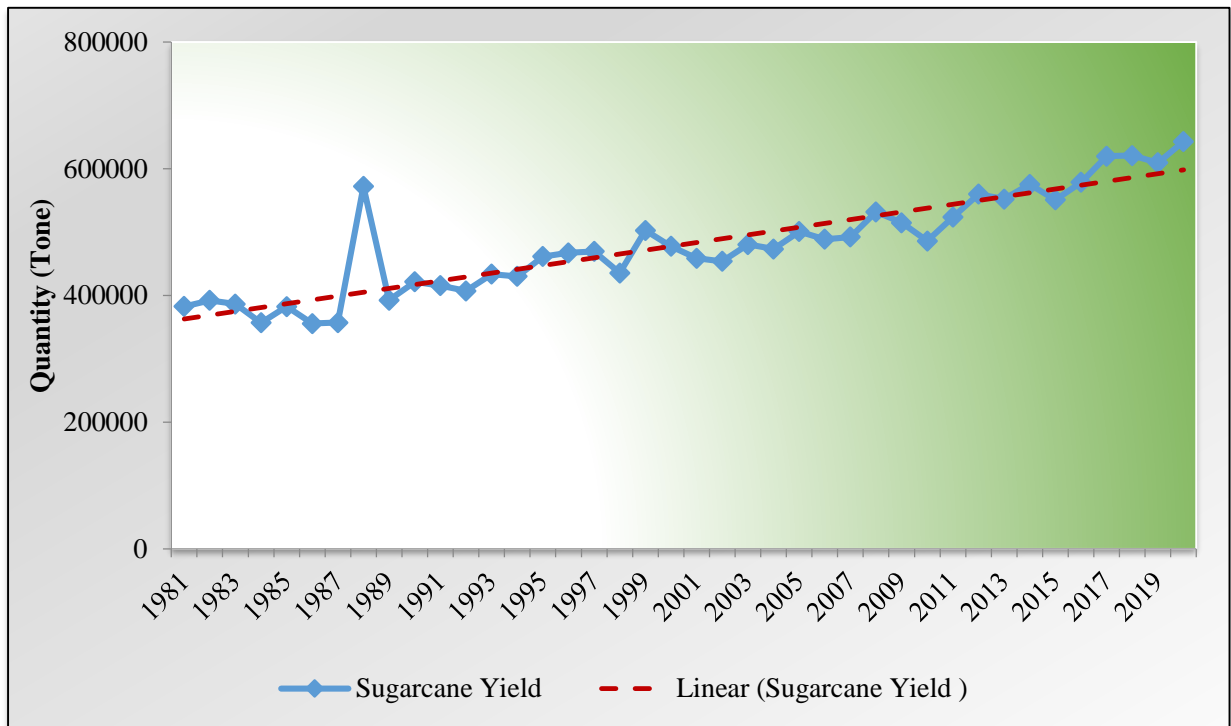
Sugarcane is significant for industrial cash crops in many countries, including Pakistan. Historically, the rate of cane yield has been very low through a rise in yield has been recorded lately. Historically rate of sugarcane production in Pakistan is very low compared to that of other countries. In Pakistan, there is a need for new cultivation technology to improve the yield. Recently, Pakistan has registered a higher rate of sugarcane yield, though there is still a need for quality crop seeds. In Pakistan, a per-acre sugarcane yield is about 622 maund which is less than the international yield standard. Other factors that affect the yield are the overwhelming use of the crop to produce brown sugar and traditional sugar, which is locally known *as Gur*. Still, there is less by-production in Pakistan than in other neighboring countries.

In many countries, including Pakistan, extensive adoption of the research results remains comparatively limited, keeping these countries below the world production frontier. In Pakistan, sugar recovery is hardly 9.5 percent as against 12-14 percent in other world sugar-producing countries. More than 45 percent of people generate their income for the agriculture sector in Pakistan, and 85 percent of them are small farmers. The factors such as lack of agriculture financing facilities marketing either raw or finished products adversely affect sugar production.

These market deficiencies must be solved through market goods organization and market institution intelligence as well as modern farming techniques to boost the sugarcane production (Raza et al., 2013).

As per (Figure 3), updated data sugarcane cultivation area has been increased in Punjab whereas it has decreased in Sindh and KPK. As per our data estimates, the main reason behind the area decrease in Sindh and KPK is the mill's behavior regarding payments to the farmers and the seed quality. Sugarcane production also faces other factors that affect its production: lack of agricultural education in small farmers, environmental fluctuations, and meager resources for cane growers. In addition to that, delay in payment has also caused a decrease in the area for cultivation of cane

Figure 1:3: **A 2 Year Comparative View of Sugarcane Cultivated Area**
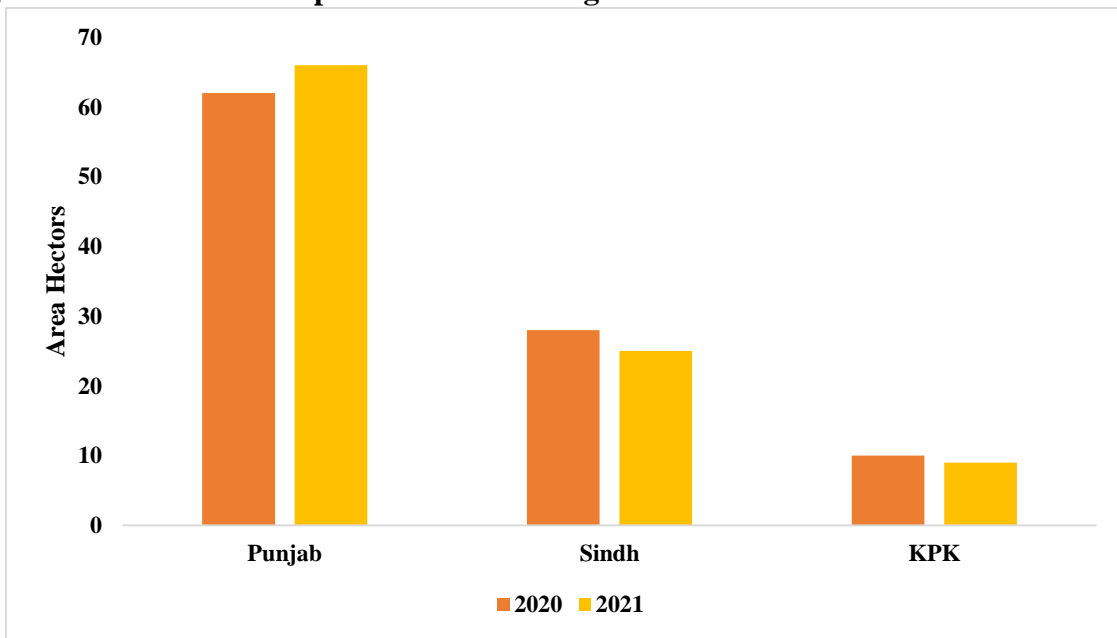
Source of Data: Pakistan Sugar Mill Association (PSMA)

Pakistan faces a sugar crisis due to political interference and government policy flaws. With the increasing population, the demand for sweeteners also increases. Domestic prices are high because government authorities interfered in the trade market mechanism. No freight support or subsidy was awarded for sugar export except by the government of Punjab. The government of Punjab announced support of PRs. 5.35 per Kg ($34 per ton) with a total outlay of Rs.3 billion ($19 million) to support the sugar sector in Punjab.

The government of Punjab announced support of PRs. 5.35 per Kg ($34 per ton) with a total outlay of Rs.3 billion ($19 million) to support the sugar sector in Punjab. Therefore, sugar prices increased during the first quarter of 2020. According to (USDA, 2020) report on Pakistan's productions is down 305,000 tons to 5.3 million on revised Post data. Consumption could be down due to a high increase in prices while production level and exports are showing down trends 400,000 tons as pre predication. The sugar stock in go-downs is expected to be lowest in 5 years on lower at starting hoards.

It is apparent that the water crisis Pakistan faces is not of literal shortage; it is one of the unfair distribution and accessibility. Pakistan's dependence on agriculture may be one of the tremendous causes of the water disaster. According to the Pakistan National Water Policy (2018), the state allocates roughly 95% of its water to agriculture and leaves just 5% for other uses. In a country in which the UN estimates that 40% of deaths are caused because of insufficient supply to households as compared to the agricultural sector (Sattar, 2020).

Pakistan faced institutional failure in 2020 as the Punjab government allocated PRS 3 billion at a time while sugar prices increased in the domestic market. On the other side, the farmers got higher prices than international prices. Consumers are the top losers as sugar price is insulated from world markets, and they pay an excessive price for poor quality sugar. The crisis in the industry has not occurred for the first time as every year at the beginning of the crushing season, a continuous battle among two predominant stakeholders, farmers, and millers, plagues the enterprise (Muhammad Hamza; Weekly Techonology Times, 2020).

1.4. Problem Statement:

Pakistan faces many difficulties in the sugar industry. Sugar price in the domestic market is continuously increasing. Currently, domestic prices are 52% higher as compared to international prices (Rehman, 2020). Sugar producers (mills) enjoy high prices in the domestic market and benefit from export subsidies. Government interference in the free-market mechanism through price control intervention provides opportunities to monopolists to charge high prices in the local market and receive additional benefits in the form of export subsidy and tariff reduction in case of import from international markets. As per the report of the Pakistan Sugar Mill Association (PSMA, 2020) during 2018-19, there was a surplus of sugar stock. The government of Pakistan

and the Competition Commission of Pakistan (CCP) give subsidies on export to release the stock of sugar. Under the World Trade Organization (WTO), the subsidy cannot be awarded to promote export. According to (PSMA, 2019), there was a surplus of sugar in the country. However, government and institutional bodies open-handed permission to the producer for export with handsome subsidies, after that shortage appeared in the first quarter of 2020, well before the next crushing year. Finally, by this act of government, prices increased to 120/kg by the end of October 2020, which is almost double the prices at the time of crushing. Mills protect their profit internationally and domestically by charging high prices at the domestic level and getting subsidies for international trade, and the economy falls into a crisis. Pakistan had neither much work done on the sugar sector nor in research and development. Mostly government intervention in the market to mention that he protects producers for their wellbeing and profit. The government endorses the sugar mafia in cane production, although it is a water-intensive crop. Pakistan lacks research on consumer welfare and how much the government bears loss in terms of monetary cost. The government should have no role in maintaining the minimum possible prices at the domestic level. This study aims to shed light on these severe issues in Pakistan.

1.5. Research Objectives

In the light of the above discussion, specific objectives of the study are to:

- Investigate the role of stakeholders involved at each node of the value chain

- Estimate water use efficiency of sugarcane and its competing crops.

- Identify and discuss the tools that the government is frequently using to distort free market mechanism and the impact of these policy tools on different exchequers (government and consumer) in 2020.

1.6. Research Significance

Government interference in the free-market mechanism negatively affects consumer welfare and poses an additional burden to the government. The purpose of interference was to ensure low prices to the consumers, but the government failed to achieve this goal. This study evaluates the free market mechanism and provides empirical evidence that free-market mechanisms can lower retail

level prices close to international prices. The policy had a turning point when domestic prices in March 2020 sugar wholesale prices stood at $507 per metric, an estimated 52 percent higher than those of the international market pegged at $334/metric ton (Rehman, 2020). Local prices are not returning close to the international prices indicating market inefficiency and policy failure. The lack of R&D departments in sugar sectors, inadequate technology, and services towards cane growers. If the government had adopted the free market mechanism, prices would have been stable at a much lower level (i.e., close to international prices Rs.44 ($0.28). As per major crop comparison, monetary benefits of water use efficiency in cotton production are significantly higher than that of sugarcane at both levels of farm and marketing.

1.7. Organization of the Research

In the beginning chapter, historical background, global and domestic statistics of sugarcane and sugar sector conditions have been described further objectives of the study and research question are mentioned. Chapter II literature review has been done, which is related to the value chain of sugarcane and sugar, water efficiency in sugarcane and its competing crop, government interference in the free market mechanism, and consumer and government loss analysis. Chapter III has briefly described the conceptual frameworks. Chapter IV explains the methodology of the study area, data collection techniques to achieve the objectives, and the empirical framework that has been done. Descriptive and estimation results are mentioned in Chapter V, and the last Chapter summary of the study, conclusion, and policy recommendations have been made.

CHAPTER 2

LITERATURE REVIEW

In the light of the study's objectives, the literature review has been divided into three categories. The first part covers the literature about value chain practices around the globe. Similarly, the second section revolves around the efficiency of water usage for sugarcane and related competing products. Furthermore, the next part of the literature review focuses on the tools for interference that are available to the government to interfere in the free market mechanism of the sugar industry. In contrast, its subpart second last section of this chapter briefly discusses the literature about the cost of state intervention. Lastly, the final section majorly revolves around the literature covering the government's monetary cost due to its excessive intervention.

2.1 Value Chain

The sugar milling level of the value chain in South Africa and Zambia is extremely focused, particularly inside the production of business sugar. In Zambia, monopolist players essentially set the sugar prices. In addition, no law governs the placing of sugar prices. Hence, for the small and medium-sized producers, the large grocery store chains are no longer a sustainable path to the marketplace; most of their income goes to the wholesalers. In Zambia, the situation is especially extreme with business banks, for they do not have an available source of financing for their companies. The import obligation structure is that input products have high import duties while finished products have comparatively lower duties. It increases costs for the industrial sectors that often depend on imported inputs. This underlying anxiety arises because import duties are a source of revenue for the government concurrently when it has a bad effect on the improvement of the domestic industrial foundation and downstream welfares (Das Nair, Nkhonjera, & Ziba, 2017)

The Indian sugar industry (a major participant in the national economy) has confronted many demanding situations within its journey. The threat posed by using the developing pandemic, the novel coronavirus (COVID-19), has been the most challenging one, and it had a far-reaching impact on the sugar industry stakeholders and its integrated industries. However, not only India but every nation in the world is being mangled by this challenge. The entire value chain of the Indian sugar enterprise, sugarcane, sugar, molasses, ethanol, and their following marketing and

export, have been adversely affected by the spillover effects. COVID-19 has directly or indirectly affected the sugar industry stakeholders and its integrated industries. Various hotels, retail, and catering marketplace segments that are one of the biggest sugar consumers have impacted the sugar business badly countrywide. All resorts, eating places, bars, sweetmeat shops, and different miscellaneous food establishments have been closed during the lockdown. With a fall in demand, the sugar mills did not fulfill their monthly sales quota of sugar, thereby leading to a reduced profit (Solomon, Rao, & Swapna, 2020).

The sugar industry is composed of various stakeholders who pursue numerous goals, and complexity arises from those coupled interactions. Complexity theory is used to examine the stakeholder's relationships in a mill place within the sugar enterprise. It is well-known that stakeholders' interplay contributes to general knowledge. Shared approach and expertise and collective interaction positively influence the overall performance. Important factors that might be observed influence stakeholders' interplay, which consists of the potential for alternates, facts, transparency, allotted management, flexible organizational systems, and the ability of stakeholders to contribute. This study gives a huge contribution by offering conceptual fashions to better recognize multi-stakeholder situations (Proches & Bodhanya, 2015)

The sugar enterprise in Zambia is a monopolistic marketplace ruled by one company, Zambia Sugar Plc., which contributes over 90% of the whole countrywide sugar manufacturing. Zambia is one of the lowest-cost manufacturers of sugar globally. However, the high domestic price increases questions of home competitiveness of the sugar marketplace. The enterprise faces challenges of transport infrastructure constraining exports and global competitiveness. Water rights and land tenure protection have emerged as fundamental troubles requiring attention to beautify investments and elevated participation via smallholders. The lack of a clear policy framework on ethanol manufacturing negatively affects the sugar industry. It has no strategic framework to manual the manufacturing of this essential by-product. Potential for expanded cost addition inside the enterprise exists via widening the home and marketplace base through funding, including biofuels and other downstream sugar products (Kalinda & Chisanga, 2014).

The nominal price of protection (NRP) technique is used in a value chain framework. We expand our method for three forms of cost chains: a new value chain created by policy, a value chain in

which a by-using-product is grown in the processing of a commodity, and a value chain wherein the processing of a commodity generates new products. Anyhow, the two cases of free chains are also taken into consideration: while the commodity is tradable and its mills are non-tradable. The proposed indicator, value chain NRP, lets coverage-makers look at an aggregate measure of all policy effects on all the commodities and products within the value chain normalized on the farm level. This method is used in India to estimate sugar value chains. The effects indicate that farmers are subsidized but at different prices. Both sugarcane producers and sugar manufacturers are protected; however, sugar producers are protected at higher prices. Downstream merchandise producers, including ethanol and molasses, are taxed, whereas the crushing industry is subsidized. There is increasing protection alongside the fee chain from commodity to product for the oilseeds quarter, while the photo is less clear for the sugarcane value chain (Tokgoz & Majeed, 2019).

In Pakistan, policy flaws and difficulties are faced by one stakeholder alone in every stage of processing. Although the high gratified refined sugar varieties are available in Central Punjab and Southern Sindh Clusters, their availability at the farm level is restricted in Southern Punjab and Southern KP clusters. Besides India and Pakistan, all sugarcane-producing countries have shifted to a quality-based payment that has advanced the efficiency and profitability of the sugar enterprise. When raw material is insufficient supply during the bumper crop season, two kinds of flaws get notable. Firstly, sugar generators get sugarcane without competition, causing leniency through the sugar mills in making payments to farmers. The laborers get their payment late, but when there is a supply shortage of sugarcane, the payment is made on time. Another flaw in the value chain is the insufficient transportation of sugarcane. Likewise, mostly the trolleys are overloaded, and sugarcanes are placed on the outdoor frames of the trolley, creating site visitor's hurdles and accidents. There is no competition in the sugar market at the local level. Pakistan has huge potential to adopt new technology, but no sugar mill can currently change initial sugarcane juice into anhydrous alcohol. Moreover, the uses of the by-products of sugar industries are very limited in any of the sugarcane clusters in Pakistan. Processing sugar juice and making molasses-based feed needs additional operational costs (Commission , Planning, Development, & Initiatives, 2020) .

2.2 Estimate the Water Use Efficiency of Sugarcane and Its Competing Crop(s)

Sugarcane is one of the most water-intensive crops. According to one estimate, it requires around 400 m3 of irrigation water to produce a ton of sugarcane in the country. In the last few years, Pakistan has faced severe water shortages as water availability decreases due to the expansion of irrigated areas, population growth, and urbanization. Water usage and its availability for water resource planning are required to satisfy the increasing demand for food production in future (Farooq & Gheewala, 2019). The cultivation of sugarcane crops has started to endanger natural resources such as soil and water. Sugarcane is a water-intensive and yearly crop that impacts the fertility level of the soil. In the case of cotton, water conservation was better (Shahzad, Iftikhar, Shahbaz, & Wajid, 2021).

The most serious impact of climate change in sugarcane growing clusters has appeared in the form of growing water shortage which has become an everyday phenomenon. In the case of canal supplies, either less water is available, or farmers do not get their usual turn. In the case of underground water, farmers must pump from an increasingly lower aquifer, which has dramatically increased pumping costs. Sugarcane is a highly water-consuming crop. Therefore, saving water is very important for the competitiveness of sugar crops and the whole agriculture sector. Sugarcane requires 48 acre-inches of water for the whole season, similar to that used in rice but more than three times higher than that used in wheat and maize and almost double that needed for cotton. However, revenue per water inch in sugarcane is higher than in cotton and wheat (M. Ali, 2020)

Growing demand for more crop production worldwide would further put the global water resource under increasing pressure. One of the greatest challenges facing will be sustainably increasing global crop production while reducing the negative impacts on global social and ecological systems. All over the world, 40% of the irrigation water is consumed to grow 16 crops is a violation of the environmental flow requirement. More recent work showed that 51% of irrigation water consumed to grow crops was unsustainable and violated the environmental flow requirement. They showed the major crops and countries that contribute the largest to the global unsustainable water consumption (Mekonnen & Hoekstra, 2020).

2.3 Tools of Government Interference in Free Marketing Mechanism of the Sugar Industry

Sugarcane prices cause variation in supply and demand conditions for the economy. Different types of subsidies practiced at the domestic level create distortions in trade. There is a need for the center to evolve a uniform policy so the industries could charge the same process across the world. Establishing a pricing system strengthens free trade (Reddy, 2011). The policy of sugar price is in favor of sugar growers domestically and internationally. It supports its financial performance. It causes a higher price of the cost of production for scarcities. Government intervenes in the industry because of sugar-containing products. Domestically high prices are beneficial for large firm owners and discourage small firms. The policymakers protect the domestic industrial sector, which belongs to political parties or other elite business class (Siokos et al., 2018).

Since 1789, the U.S. government has concerned itself with the sugar industry, putting import and domestic quotas, tariffs, and support prices. U.S. government involvement in the prices of sugar has been much higher than world prices. Due to the high price of sugar, the domestic market faces many challenges. High domestic prices force people to shift into substitution goods, restricting imports quota to raise foreign policy risk. Due to such situations, Government officers and bureaucrats who make policy and participate in domestic and foreign markets face many difficulties at the market level. It discourages the production of sugarcane and declines economic growth (Lopez, 1989).

(Mpapalika, 2019) investigate the regulation of sugar market price in developing countries. The Sugar enterprise is one of the most regulated industries subjected to import duties, subsidies, and quotas. Most developing countries produce sugar for domestic consumption, which satisfies the local market and devotes a very small portion to export. In developing countries' market systems, occasionally, sugar is exported illegally to generate artificial market failure or inefficiencies. When prices are unstable in the market, regulation fails to achieve equilibrium in the presence of imperfect competition by monopolistic and lack of knowledge. The government can interfere with the economic system through government law, tax/subsidy, or direct public goods and services. Government involvement has been powerful in controlling the industry. (Kalinda & Chisanga, 2014) have claimed that Kenya's pricing policy is inefficient because of strong restricted policies against imports, limited supply of sugarcane, and administrative operations control. (Akiyama,

Baffes, Larson, & Varangis, 2003), have proven that government intervention in the sugar industry harms mills' output, proficiency, and advancement, which will impact domestic growth.

In Pakistan, the retail price of sugar started to increase in December 2018 when sugar was allowed to export. The retail prices changed to the lowest at Rs 55.99/kg in November 2018; however, in June 2019, it stretched to Rs 71.44/kg. It changed mainly due to the export of sugar which has laid strain on the leftover inventory and has enlarged the gap between supply and demand. The price increased by Rs 16/kg within seven months. Correspondingly, a foremost increase in ex-mill price (from Rs 41.64 to Rs 63.59) took place for the identical duration, which is set Rs 12/kg (Interior, 2020). The retail price also rose from Rs 71.44 to Rs 74.64 from July 2019 to January 2020; however, PSMA denied the data by claiming that the ex-mill price of sugar had no longer been modified. It is important to be aware that there has been no increase in GST or other taxes. Furthermore, the price of sugarcane and other inputs persisted steadily in this era. In the presence of robust indicators of increasing prices within the local market, the authorities reacted slowly to cancel the export license, which annoyed the sugar crises within the country (Abeudllah, Quarshi, Saddiq, & ZIa, 2020).

2.3.1. Cost of Government Intervention on Consumer Welfare

Unstable prices and general government intervention have characterized world sugar. Controls on domestic prices, demand, and supply have led to an ineffective worldwide production, consumption, and trade pattern. Worldwide prices fluctuate less stable than within the state, and the economic condition of the developing countries could improve through export. But due to unstable economic conditions, the chance to increase the financial growth and to reduce the cost of production remains low (Borrell & Duncan, 1992).

In Pakistan, sugar mills earn huge profits. Sugar mills work with stable economic conditions and are comfortable with low production costs. Even in comparison with artificial sugar prices, they are generating higher profitability. It normally happens during Holy Ramadan when the sugar crisis is created intentionally by the mill owners and suppliers to earn maximum profit. Trade Corporation of Pakistan (TCP) has stated that the Government of Pakistan has imposed export and import taxes and duties to balance the impact of the sugar crisis, but since sugar hoarding is mostly intentional; therefore, fluctuation in prices remain constant (Chhapra, Mashkoor, & Syed, 2010).

Due to the inequitable distribution of agricultural land in Pakistan, a majority of the farmers have small land holdings and, as a result, do not make sufficient money to devote to advanced farming. The processing structure of Pakistan is still traditional because farmers have limited financial ability to invest in up-to-date technology. The Sugar Industry in Pakistan has suffered from unchecked growth with no consideration of real capability and availability of raw material (sugarcane). Most operating units have a crushing potential of less than 6,000 TCD below the viable global potential of 10,000 TCD. Currently, 89 sugar industries operate in the country, primarily owned by a private group of actors from the powerful elite class. As the sugar industry is dependent on sugarcane yield and its availability, hence one of the detrimental effects on the crop caused by climate change is mostly adverse towards the sugar field (Abbasi Securities, 2019).

Furthermore, to obtain self-sufficiency in sugar production, the government has sustained excessive support prices for sugarcane and arranged protection to the domestic sugar industry by charging tariffs and other regulations on sugar. The government administered the market for consumer welfare and industrial profitability by laws and regulations. Yet this policy has shown limited gainful outcomes. Heavy taxes on white sugar production have constrained the capacity of the sugar mills sector to compete for sugarcane components. Sugarcane production has stagnated in recent years, and yields have remained low despite high support prices. It shows that Pakistan today is a tremendously excessive cost manufacturer of sugar, and massive imports are nonetheless required periodically to meet the increasing demand for sugar (SBP, 2020).

2.3.2. Government Faces Loss due to Interfering in Free Market Mechanism

In a domestic and international context, Romania's price instability is a mixture of imported variability, internal instability, and lack of maturity in its market structures. Price instability represents a very difficult phenomenon that can moderate only up to some extent by adjusting market structures and specifying regulatory and fiscal policies and sugar-related policies that depend on EU and Common Agricultural Program (CAP) regulations (Pop, Rovinaru, & Rovinaru, 2013). Prices affect Indonesia domestically in output, import, export, and balance of trade of the sugar industry. Uncertainty in sugar prices happened because of the government's poor policy setup, and it also led the agricultural market sector in an intense situation (Pudjiastuti, Kembauw, & Econ., 2017).

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Pakistan's sugarcane sector exposed that under import substitution administration, the cane farmers in all farming regions of Pakistan were taxed both in input and output markets in 2004-05 and 2008-09. While under the export promotion regime, the cane farmers enjoyed positive support in input and output markets in both harvesting years 2004-05 and 2008-09. It implies that the current macroeconomics and agricultural policies were inconsistent with the existing pattern of comparative advantage and have discriminated against the sugarcane production in both import substitution and export promotion regimes. The study recommends that Pakistan's top administrators and policymakers should make serious efforts to formulate policies that are consistent with national goals of agricultural development, trade, and food security (G. Ali & Khan, 2012).

(Haq, Nazli, & Meilke, 2008) estimated the impacts of growing world food prices on poverty in rural and urban areas of Pakistan. Household revenue and spending data for 2004/2005 have been used to estimate reimbursed and uncompensated price and expenditure elasticity using the linear estimate of the almost ideal demand system. Taking the unexpected component of higher domestic food prices in 2007/2008, own and cross-price compensated elasticity have been operated to originate the changes in the quantity consumed, food expenditure, and impacts on poverty assume food crisis that happened in 2004/2005. A high as 34.8% increase in poverty severely affected the urban areas where poverty increased by 44.6% as paralleled to 32.5% in rural areas. The estimates show that 2.3 million people cannot reach even one-half of poverty line expenditures while another 13.7 million are just below and 23.9 million are just above the poverty line. It is important to ensure food availability to these people in the short run. In the long run, the policy environment of subsidizing urban food consumers by keeping wheat prices lower than the international price needs to be reconsidered to provide the right incentives to increase food availability.

In Pakistan, the main agricultural food share has declined over time. Agricultural marketing runs under the public sector. The evaluation of the incidentals of government-owned departments with that of the non-public investors shows the inefficiency of the former. In addition to value distinction, corruption is prevalent in commodity marketing, especially in the public sector (Ahmad, Croraton, Qayyum, Iqbal, & Dorosh, 2005).

(Kim & Kim, 2019) analyzed the acreage response when price support and trade liberalization take place at the same time. It analyzed that the effect of market prices generates a heavier impact on farmer acreage assessment, leading to an effect on support prices. Government supports prices and encourages them, but trade liberalization reduces the variability of their decision to produce more products. On the other hand, in the long run, an enlarged local supply causes the variability in sugar prices and increases the cost toward central government and consumers.

CHAPTER 3

3.   CONCEPTUAL FRAMEWORK

Pakistan is still not a competitor in the international sugar market. Although the sugarcane yield in Pakistan is close to the world's average yield, it is less than that of the major sugarcane-producing countries. The recovery rate of sugar from sugarcane remains lower than the world average, and the gap is much higher when compared with the recovery rate of the major sugar-producing countries. Sugarcane crop is less efficient in water consumption than other major crops domestically. The lower yield per hector with a low recovery rate contributes to comparatively higher production costs for sugar and higher domestic prices. Whereas, ironically, the sugar sector pays a lower price to sugarcane producers compared to the cost of sugarcane production. On the other hand, the sugar industry charges higher prices to its domestic and international consumers than the world's average (Commission et al., 2020). This study has been divided into three-part. The first part focused on the value chain of sugarcane to sugar to highlight the problem and difficulties in every stage of the value chain due to government and pricing policy. The second part is about water usage efficiency and comparison with other crops. And the third part is all about free-market, consumers, and the government itself how much affected due to government interference in the marketing mechanisms.

3.1. The Sugar Value Chain

The sugar value chain consists of five main levels, i.e., input suppliers, producers, processors, distributors, and consumption, failing to achieve sustainable production and consumption. This study will analyze each stage of the value chain from input supply to sugar consumption. Hence, this study has been identified the hurdles and facilities available at each node of the value chain (Rubayiza et al., 2021).
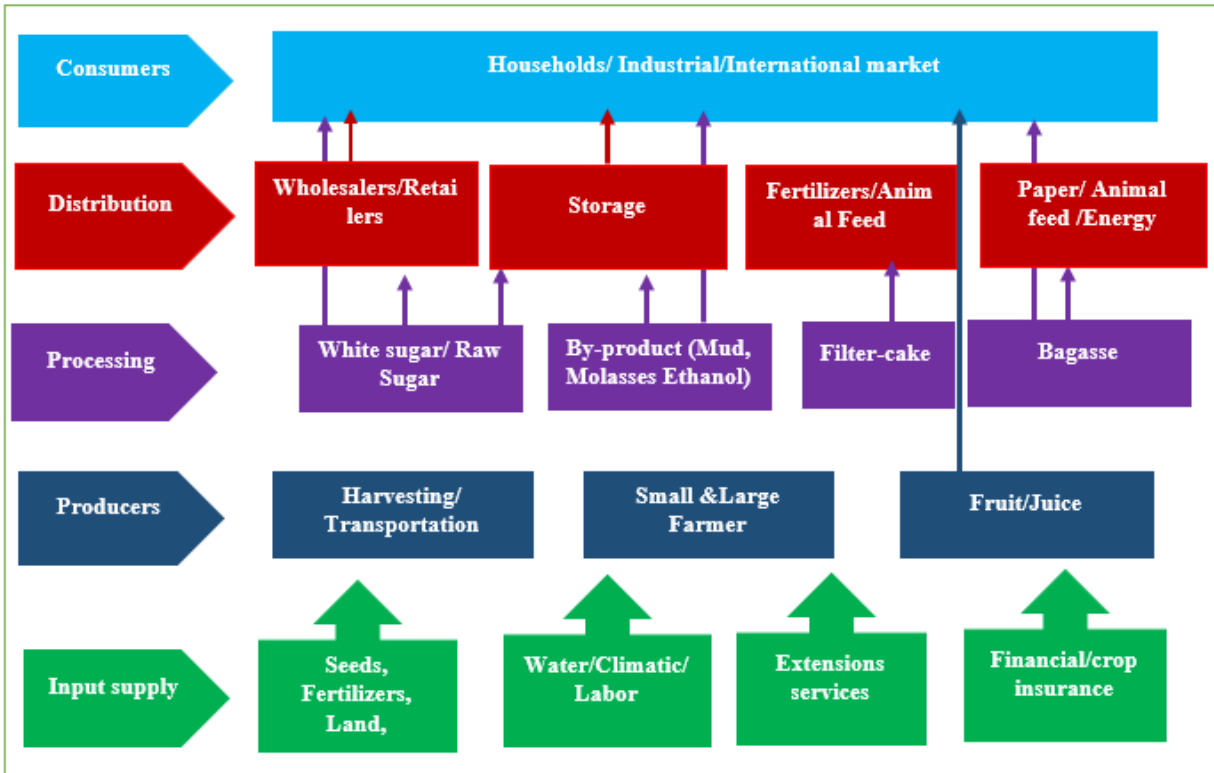
Figure 3:1:Value Chain of Sugar

Investigate the Value Chain Analysis

The previous figure defined the value chain of sugar. This study investigates the throughout the value chain with two dimensions as seen in (figure 3.2) first is snowball interviews and second about systematic literature review. Where study analyzed the government interference and pricing of sugarcane and sugar are the major hurdles for sustainable production and consumption.
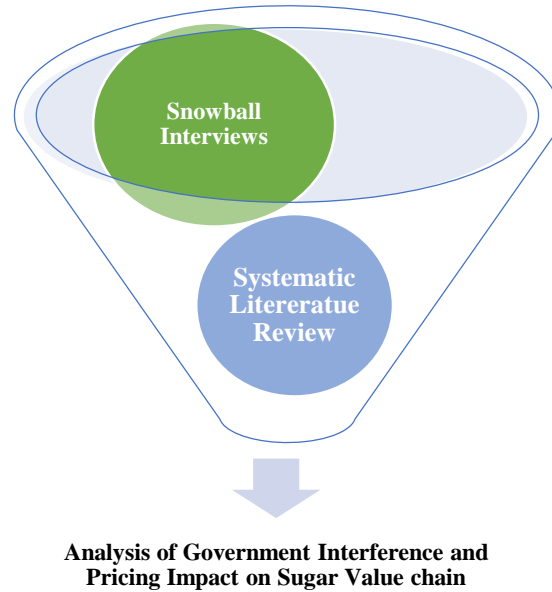
Figure 3:2: **Analysis of Sugar Value Chain**

3.2. Water Efficiency Usage Comparison between Sugarcane and Major Crops:

The below mentioned (figure 3.3) describe the concept of this study. The study has estimated the water-efficient crop from major crops. Where this study for evaluation take the first step for estimation from prices of crops, Quantity (Weight) of row product, water consumption for each crop after that estimate the monetary benefit ratio through net benefit ratio at farm gate and at the retail level, which demonstrates the efficient crop for Pakistan.
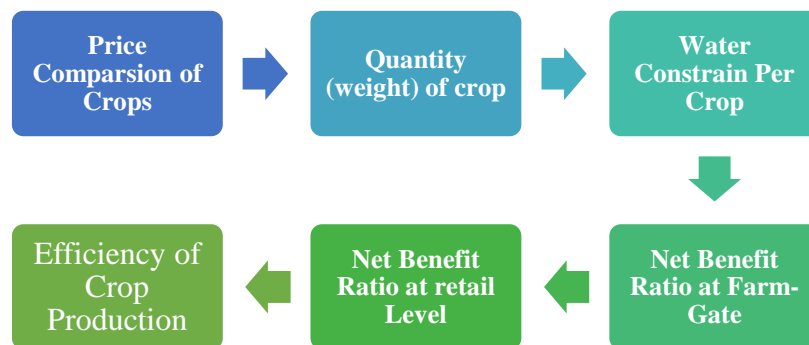
Figure 3:3: **Estimation of Water Efficiency in Major Crops**

3.3. Government Tools for Interference in the Free Market Mechanism:

This study below (figure 3.4) defines the concepts and their relations. The conceptual framework has contained multiple parts where government interacts with free-market. Each aspect is further analyzed in different dimensions where the government used various tools to intervene in the market. The study has analyzed the government intervention in the market through import and export and price regulation by subsidies, quota, and taxes to protect consumers or producers. The government has been controlling and regulating the market mechanism by controlling the food prices in our country for the last three seasons. As a result, the prices are much higher than those in the international market. It shows that government protects domestic sugar corporations by giving subsidies on imports and export to meet the domestic demand. By this action government also bear the loss. This study focuses on sustaining the free-market mechanism besides highlighting the government interference in the market mechanism. By this action government, consumers, and producers bear the loss.
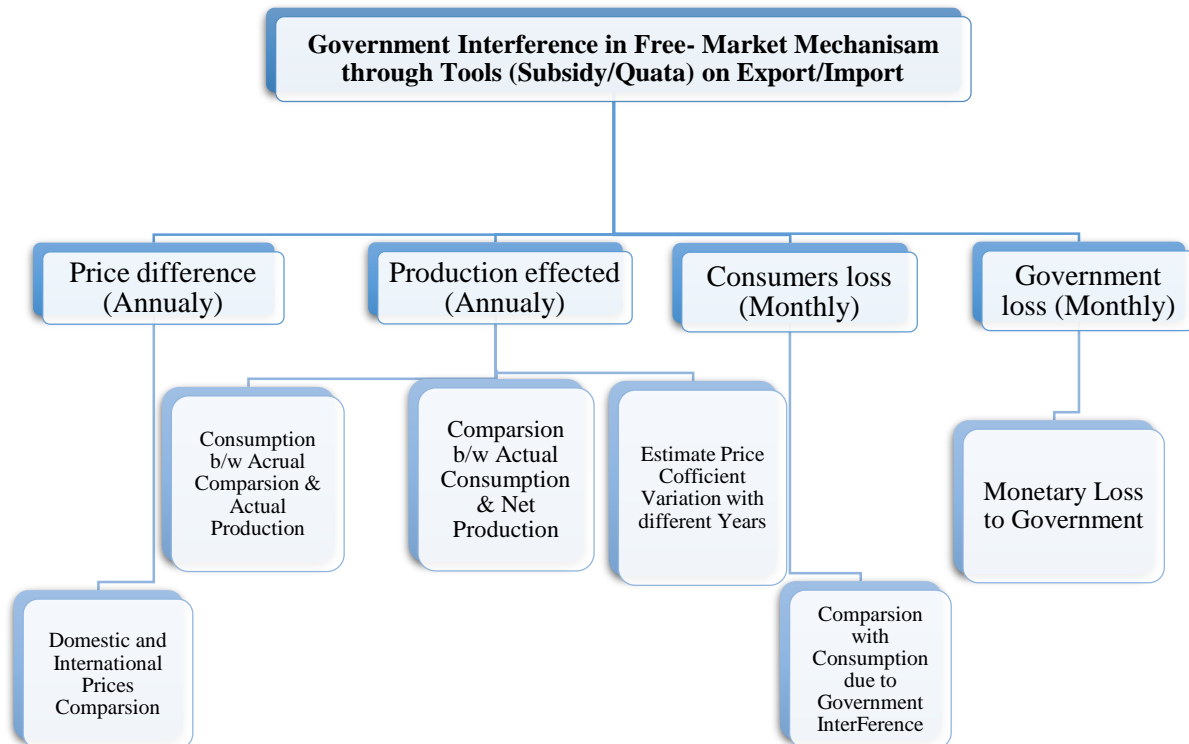
Figure 3:4: Government interference Impact on Free- Market Mechanism

CHAPTER 4

4. DATA AND METHODOLOGY

4.1. Data Collection and Sampling Technique

Annual data of local production, consumption, an interest rate of Pakistan, export, import, and local and international prices have been collected from different sources from 1980 to 2020. These sources include Agricultural Policy Institute (API), Ministry of Industries and Production (GOP), Pakistan Sugar Mill Association (PSMA), Ministry of Finance Government of Pakistan, State Bank of Pakistan, Pakistan Bureau of Statistic, and FAO to examine the difference in national and international prices of sugar in a different year (1980-2019), apart from above annually data there is also used monthly data from 2019 to 2020 starting from crushing season to till next crushing season. For primary data analysis, the snowball technique has been used to take interviews from the main stakeholder of the sugarcane value chain. The interview has been taken from Sindh, Punjab, and KP farmers and millers. NARC and PARC focal person's Interviews are also included in this qualitative approach. These interviews have been carried out to analyze the benefit/loss and investigate the problem of government and price variation at each node of the value chain. A quantitative approach has been employed to estimate the consumer's benefit/loss and cost to the government for intervening in the sugar market by comparing it with the free-market mechanism situation. To estimate benefit/loss to the consumer and cost to the government standardized approach available in the literature has been focused on. A standardized technique of the coefficient of protection for the consumer and producer has been highlighted to investigate whether the government is attempting to protect consumers or producers.

4.2. Study Area

Sugarcane is a high-value cash crop considered prime input for sugar and sugar-related industries in Pakistan. It contributes about 0.6 and 2.9 percent to the national agriculture GDP. Sugar is produced mainly in three provinces of Pakistan: Punjab, Sindh, and KP. Currently, 89 mills of sugar operate in Pakistan: 45 in Punjab, 38 in Sindh, and 6 in KP (GoP & Division, 2020). This study focuses on these three provinces of Pakistan.

4.3. Theoretical Framework

4.3.1. Investigation of the Value Chain of Sugarcane and Sugar

The study has been based on qualitative analysis; it has been divided into two parts; one is snowball interviews from 22 respondents, which conducted through open-ended questions to main stakeholders of the value chain: Sugarcane growers, Miller, from KPK, Sindh, Punjab as well, and Institutional Focal person NARC and PARC. Those main bodies have been taken from (Singh, Srivastava, & Jangirala, 2021) study. The second part is systematic literature review analysis has been used to investigate the other part of the value chain like; input suppliers, distributors, and consumption. The results have been organized around the value chain functions, including inputs suppliers, production, processing, distribution, and consumption of sugarcane and sugar. The analysis has been done to explore the inefficiency in sugarcane production and marketing mechanisms of sugar by the government interference in the market mechanisms.

Systematic Review:

The second part value chain analysis of the objective provides systematic qualitative evidence from the existing literature to answer the research question. It proposed possibly the best way to work efficiently for sustainable production and consumption. The value chain of agriculture is the best thing to address the economic growth and development in every economy. Still, in developing countries like Pakistan, it faces many difficulties to achieve sustained and smooth work.

Model Specification:

The methodology is contained of Research Question, Eligibility Criteria, Search Strategy, and Key words.

Research Questions:

Following are the research questions of this systematic review:

- How much government interference and pricing affect the value chain parts of input supplies, distribution, and consumption of sugarcane/sugar?

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- Which stakeholder in the value chain is the most effective due to government and pricing disturbance?

- What is the best possible way to develop a smooth and sustainable value chain of sugar and sugarcane?

- What are the most effective, proficient, and flexible policy options to obtain sustainable production and consumption in Pakistan?

Eligibility Criteria:

Inclusion Criteria:

The literature should ensure that it meets these criteria for the studies included in the descriptive systematic review:

- The Literature for review must write in English.

- The study focuses on sugarcane input suppliers, distributors (marketing), and sugar consumers.

- The Literature has been focused on input suppliers, distributors, and consumers of sugar/sugarcane under the government and pricing effects.

Exclusion Criteria:

The studies that met these criteria were excluded from the systematic review:

➢ Does not include native language literature.
➢ The literature focuses on producers and processors in the value chain.
➢ Research involves other aspects of social relevance and its impact on the value chain.

Search Strategy:

The search strategies have been used the Boolean technique and field code (agriculture, seed, middleman, etc.) through keywords taken from research questions.

Following are keywords used on e-databases to search the studies:

Input suppliers in sugarcane/agriculture, distributor (wholesaler/retailer) of sugar/ final product, consumer of sugar, sugar pricing effect on consumers, disruption for input suppliers, government impact on distributors, pricing impact on input supplies, financial sector impact on input suppliers.

4.3.2. Estimate the Water Use Efficiency of Sugarcane and Its Competing Crops

To achieve the second objective, to estimate the water use efficiency of sugarcane and its competing crops based on economic return. This concept of estimation of water use efficiency for crops has been taken from Dr. Abedullah's study. The revenue of each crop understudy has been estimated, and then it has been divided according to the amount of water required. This estimation generates the return from each crop per water unit, and this number will compare across crops. Since different crops have different durations, a simple return per cubic meter may mislead. Therefore, in this order, the study refined the analysis for further per cubic meter return divided with crop duration to estimate per day return, which has been compared across crops.

4.3.3. Government Interference in the Free Market Mechanism

To achieve the third objective, estimate the main drivers and their impact on free-market mechanisms. The "Graphical Representation" has been used to show the results. Main tools the government uses for interference in the free market mechanism like prices, export, and import and their impact on domestic prices, Consumers, and the government itself; how much bear loss. For estimation, the total quantity produced, total consumption, and total quantity export and import estimate has been used to compare the domestic prices with those of prices. The study has been following from (Abedullah & Ali, 2001; Alderman, 1988; Hayami & Herdt, 1977) to discuss the market and policy option.

4.3.3.1. Price Scenario

In the first step, estimate local prices with the international market prices and data taken from 1980 to 2020. Firstly, the local prices have been converted into US $ according to the exchange rate of that year, and 10 % handling/transportation cost adding in international prices to make international prices and local prices at the same level. After that, a graphical representation study shows their difference and analyzes how much government interferes in the free market

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mechanism to protect producers. Firstly, it shows in tabulated form after that graphical representation has been done to analyze the price difference.

$$P_D = Domestic\ prices\ in\ dollars\ =\ domestic\ prices\ in\ rupees\ \div\ exchange\ rate\ of\ Pakistan \qquad (4.1)$$

$$P_I = International\ price = International\ price + 10\%\ Transportation\ and\ Handling\ Cost \qquad (4.2)$$

4.3.3.2.   Production Scenario

The second step has been divided into three parts to evaluate the production side scenario under graphical representation. The first stage investigates the difference between total domestic consumption and total production at the domestic level. Later on, the second stage defines the gap between actual consumption and after the export of sugar domestically available supply (production) of sugar to estimate how abundantly government interference destroys the free-market mechanism. At the third stage, after the import of sugar, available supply (total production) comparison has done with total demand (actual consumption) of sugar domestically to show government interference either protect consumers or producers.

➢ For the estimation of total actual quantity consumed sugar and total quantity production of sugar domestically:

$$Gap\ b/w\ Total\ Actual\ Production\ and\ Actual\ Consume\ Sugar\ =\ TQ_P - TQ_C \qquad (4.3)$$

➢ For the estimation of total quantity of production exist in domestic after export

$$TQ_{P\prime} = TQ_P - TQ_E \qquad (4.4)$$

$$Gap\ b/w\ Available\ Production\ (after\ export)\ and\ Actual\ Consume\ Sugar = TQ_{P\prime} - TQ_C \quad (4.5)$$

➢ Estimate the total quantity of production exist in domestic after import

$$TQ_{P\prime\prime} = TQ_{P\prime} + TQ_M \qquad (4.6)$$

$$Gap\ b/w\ Available\ Production\ (after\ import)\ and\ actual\ consumed\ sugar = TQ_{P\prime\prime} - TQ_C \quad (4.7)$$

Variable/ Tolls Specification:

TQ_P = Total Actual Quantity of Sugar Production at Domestic Level

TQ_M = Total Quantity of Import

TQ_E = Total Quantity of Export

TQ_C = Total Quantity of Actual Consume Sugar Domestically

$TQ_P{}'$ = Total quantity of available production after export

$TQ_p{}''$ = Total Quantity of Available production after import

4.3.3.3.   Coefficient of Variation (CV) of Prices:

The coefficient of variation is the ratio of the standard deviation to the mean. It is a useful statistic for comparing the degree of variation from one data series to another; its means are also different.

In this step, the study estimates the sugar prices CV on monthly based data in different years. CV in sugar prices data takes under 2010, 2011, 2016, 2018, 2019, and 2020 from May to December. For CV estimation, prices data has been taken in more/less export and import years to determine price variation. Take an average of all monthly prices and estimate the standard deviation (SD) of sugar prices to find out the Coefficient of Variation of Prices, SD divided by average.

$$\textbf{Average} = \frac{(P1+P2+P3+\cdots.PN)}{N} \qquad (4.8)$$

$$\textbf{SD} = \sqrt{\frac{\Sigma(P_i-\mu)^2}{N}} \qquad (4.9)$$

$$\textbf{CV in Suagr Price} = \frac{SD}{Average} \qquad (4.10)$$

Variable specification

$P_{1,2,3\ldots N}$ / P_i = Retail Sugar Price

N = Numbers of Months

μ = Mean of Sugar Prices

SD = Standard Deviation

4.3.3.4. Estimate the Consumer loss due to Government interference

The study estimated that consumers paid extra to the government in this part. Monthly data analysis identifies the gap between national and international prices. Domestic prices converted into US/tons for comparison with international prices. Where 10% of handling cost has been in international prices, these difference has been shown with graphs. Variables have been taken from Dr. Abedullah studies to analyze these studies.

Gap between International Prices and Domestic Prices

$$P_D = Domestic\ prices\ in\ dollars\ = domestic\ prices\ in\ rupees\ \div\ exchange\ rate \qquad (4.11)$$

$$P_I = International\ prices\ = International\ price\ + 10\%\ Transportation\ and\ Handling\ Cost \quad (4.12)$$

Consumer Loss due to Government Interference

To estimate the consumer loss due to government interference in the market. Where study estimated local and international sugar prices difference and multiplied with monthly consumption to find out how much consumers bear the loss.

$$CL = (C_m * (P_D - P_I)) \qquad (4.13)$$

Variable Specification:

CL= Consumer Loss

P_D= Domestic Sugar Prices (US$/Ton)

C_m= Consumption per ton monthly

P_I= International Prices+10% Handling cost (US $/Ton)

After finding consumers' loss on a monthly basis, this study calculated a fourteen months' loss which consumer have been paid due to government interference.

4.3.3.5.   Estimate the Government Monetary Loss

This study estimated the government's loss due to their inefficiency in providing subsidies on export or import to the Sugar Corporation. This study estimates the government loss on monthly base data. Data has been finding out the efficient result about how much government bears the loss due to tax money given to domestic sugar corporations. If the local prices are higher than international prices, then how much government give subsidies to producers to export the sugar. The study will estimate the government loss by estimation of local and international prices difference.

$$GL = P_D - P_I \qquad\qquad (4.14)$$

Variable Specification:

P_I= International prices + 10% Handling Cost (Parity prices after Import)

P_D= Domestic prices in dollars = domestic prices in rupees ÷ exchange rate

GL= Government Loss

Hypothetically Data Estimation Shows

The graphical representation (Figure 4.1) has been used to show how the study estimates. The research is assumed to define the two scenarios of domestic market mechanisms with government interference: one is a shortage, and the other is excess sugar at the domestic level. P1 and Q1 are the equilibrium situation in the domestic market at point E. If we assume that commodity supply is too little to fulfill the demand within the country, then the quantity demand has been shifted to Q2. Here storage of the commodity prevails in the local market. So, we import sugar from the international market. If the international prices are lower than the domestic prices, then the government adds the 10% Transportation Cost in import prices in the international prices. Therefore, the study has compared the local prices with international prices if it is still lower than there is Consumer benefit and government benefit.
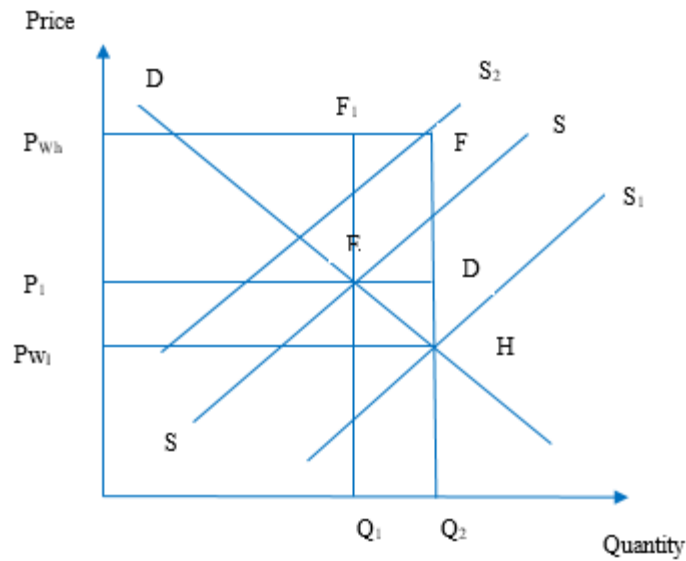
Figure 4:1: **First Scenario Equilibrium**

It shows that if international sugar prices are higher than domestic prices, then the government will intervene to fulfill the demand domestically with higher and lower prices. Government imports the sugar at higher or lower prices and sells at higher prices in the local market where government loss will exist. The government subsidizes sugar corporations on imports to meet the domestic demand.

In (Figure 4.1) the government loss is:

Area of government bear the loss= P_1Pw_HFD

$$\text{Loss of the Government} = (Q_2 - Q_1) * (P_{WH} - P_1) \qquad (4.15)$$

$$\text{Consumer benefit} = (Q_2 - Q_1) * (P_1 - P_{WL}) \qquad (4.16)$$

In the second scenario (Figure 4.2), this study estimates the excess supply of sugar in the domestic market. Supply curve leftward from S curve to S' and demand increases but at a lower rate than supply. In excess of supply, the government will export the commodity. If prices are higher than the domestic prices in the international market, then the government intervenes in the market to export the commodity. Under this scenario, there is a benefit for the government. If the domestic prices are higher than international prices, there is a loss for the government. Here the study will estimate the government revenue on export and import.

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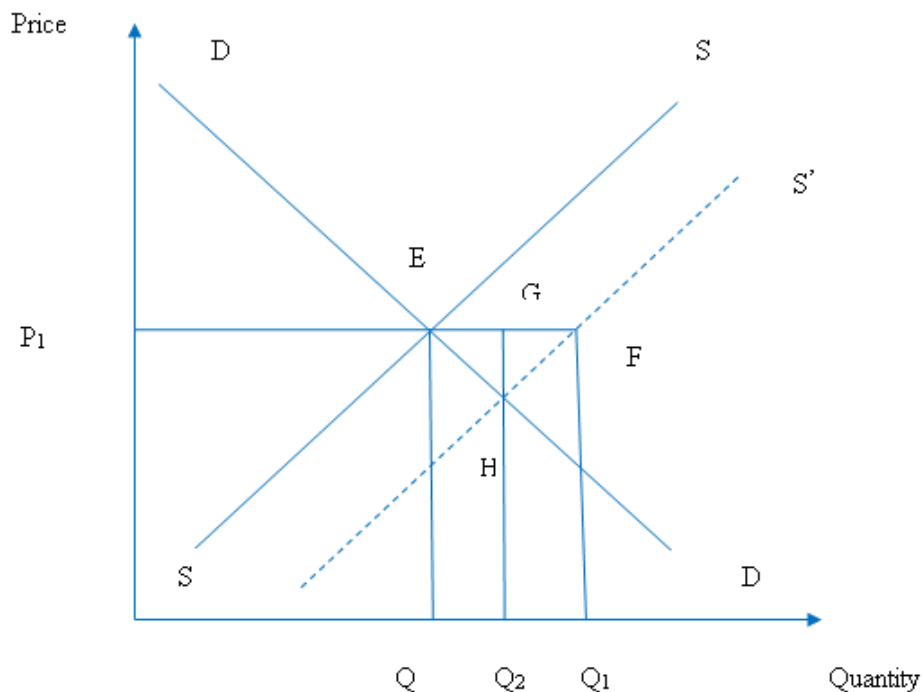
Price

Figure 4:2: **Second Scenario Equilibrium**

If domestic prices are higher than international prices, then sugar corporations demand subsidies from the government to export the sugar. In this scenario, a government bears the loss by giving a subsidy on export. In the case of excess supply scenario, a quantity of demand, Q2 is less than quantity supply Q1. Domestic prices (P) are higher in a less demand situation; the consumer bears the loss by paying G price at less demand, and producer gain with high prices in the domestic market.

$$GL = (P_D - P_W) * (Q_P - Q_C)   \quad\quad (4.17)$$

$$GE = Q_M * [P_D - (P_W + TC \%)]   \quad\quad (4.18)$$

Variable/ Tolls Specification:

P_I= International sugar prices

TC = 10% Transportation and Handling cost (parity prices after import)

P_D= Domestic prices in dollars = domestic prices in rupees ÷ exchange rate

TQ_P= Total Quantity of Sugar Production at Domestic Level

Q_M= total Quantity of import

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Q_E= Total Quantity of Export

P_{Wh}= world price at high level

P_{wl} = world price at lower rate

TQ_c= Total Demand (Consumption) at Domestic Level

GL= Government Loss

GE = Total Expenditure spent on Export and Import

Consumer and Producer surplus

In (Figure 4.3) estimates the sugar producers' and consumers' surplus or loss scenario; the study has used the country's supply and demand of sugar. After estimating quantity, the study has used the graph to estimate consumer and producer surplus or loss. In the above-assumed scenario, a diagram shows that equilibrium exists at point E, and Consumer Surplus is equal to P1EF and Producer Surplus is equal to P''EP1.

Figure 4:3: **Consumer/ Producer Surplus or loss**

Suppose that due to the government inference or some other reason, the Price becomes higher than the actual level. In that case, the Consumer Surplus declines up to P'GF level and Producer Surplus increases. Here I have estimated that the Loss in Consumer is PEGP.''

$$\text{Loss in Consumer} = P_1 EF - P'GF \qquad (4.19)$$

CHAPTER 5

5. RESULTS AND DISCUSSION

This chapter contains respondents primarily based on data gathered in three provinces of Pakistan. Snowball interviews and systematic reviews to evaluate in-depth information analysis in every stage of the sugarcane value chain have been done. Furthermore, calculated of water efficiency with major crops, and graphical representation of the results and their interpretation of government interference in the market and its impact on the economy has been discussed in this chapter like domestic and international sugar prices, production and consumption of sugar, comparison between net production after export and import with sugar consumption on an annual basis from 1980 to 2020, but to find further in-depth analysis study estimated the data at month level from 2019 to 2020.

Qualitative Analysis

5.1. Systematic Review and Snowball Interviews:

5.1.1. Systematic Review Results:

Study Selection and Data Extraction:

Initially, a total of 115 studies has been searched through the above-mentioned searched engines. Among the total of 36 studies, found duplicated. After the removal of repeated studies total of 79 studies were left for screening which includes a review of titles and abstracts of the studies. Then 32 studies have been removed at the screening level, leaving behind 47 studies for full-text review. At this stage total of 28 studies had excluded based on exclusion criteria, and 19studies were selected for the final review after the screening of all gathered studies and selection of a total of 19 studies for final data analysis. Full-text readings to extract the required data for analysis. This review has collected data based on three major categories: a) objective of the studies, b) Methodology of the studies, and 3) Outcomes/Findings of the studies.

Data Quality Assessment and Data Synthesis:

Since this is a qualitative/descriptive systematic review, the tool for data quality assessment is a short checklist based on CASP Appraisal Checklist. This questionnaire has three main domains: A)The thoroughness of methodological approaches to design and carry out research questions and objectives. B) The credibility of the findings/outcomes of the selected studies. C) Relevance and Impact of those outcomes on society and how useful those results are to society and researchers for future research. The nature of this study is a systematic descriptive review; the framework for data synthesis has been made based on a theoretical approach. The tool which is used to synthesize data is narrative synthesis. A thorough review of the selected study and its interpretation is done in tabulation form.
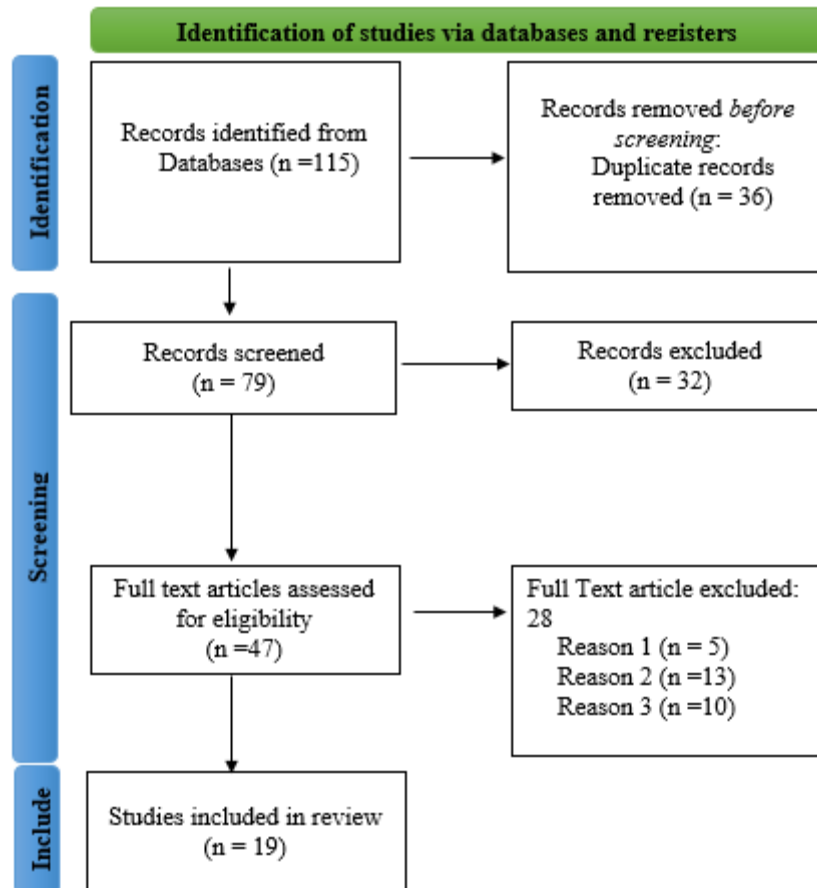
Figure 5:1: **PRISMA Flow Diagram**

Table 5:1: **Summery of Included studies**

S.No.	Author(s)	Year of Publication	Country	Title
1	(Ullah, Silalertruksa, Pongpat, & Gheewala, 2019)	2019	Thailand	Efficiency analysis of sugarcane production systems in Thailand using data envelopment analysis
2	(Olukunle & Economics, 2016)	2016	Nigeria	Economic analysis of profitability and competitiveness of sugarcane enterprise in Nigeria
3	(Aguilar-Rivera, 2019)	2019	Mexico	A framework for the analysis of socioeconomic and geographic sugarcane agro industry sustainability
4	(Cardoso et al., 2018)	2018	Brazil	Economic, environmental, and social impacts of different sugarcane production systems
5	(Bonnet & Requillart, 2011)	2011	EU	Does the EU sugar policy reform increase add Sugar consumption? An empirical evidence On the soft drink market
6	(Winkler et al., 2016)	2016		Substituting sugar confectionery with fruit and healthy snacks at checkout – a win-win strategy for consumers and food stores? A study on consumer attitudes and sales effects of a healthy supermarket intervention.
7	(Higgins, Thorburn, Archer, & Jakku, 2007)	2007	Australia	Opportunities for value chain research in sugar industries.
8	(Everingham et al., 2002)	2002	Australia	Enhanced risk management and decision-making capability across the sugarcane industry value chain based on seasonal climate forecasts
9	(Bocca, Rodrigues, & Arraes, 2015)	2015	Brazil	When do I want to know and why? Different demands on sugarcane yield predictions
10	(Djokoto & Owusu, 2016)	2016	Ghana	Adoption of organic agriculture: Evidence from cocoa farming in Ghana
11	(Akram et al., 2019)	2019		Impact of land use rights on the investment and efficiency of organic farming
12	(Edwardson & Santacoloma, 2013)	2013	India, Thailand, Brazil, Hungary Africa	Organic supply chains for small farmer income generation in developing countries: Case studies in India, Thailand, Brazil, Hungary and Africa
13	(Hanson et al., 2004)	2004		Risk and risk management in organic agriculture: Views of organic farmers
14	(Saqib, Kuwornu, Panezia, & Ali, 2018)	2018	Pakistan	Factors determining subsistence farmers' access to agricultural credit in flood-prone areas of Pakistan.

15	(Girei, Giroh, & Practice, 2012)	2012	Nigeria	Analysis of the factors affecting sugarcane (Saccharum officinarum) production under the out growers scheme in Numan Local Government Area Adamawa State, Nigeria
16	(Prathap, Murali, Paul, & Venkatasubramanian, 2021)	2021	India	Sugarcane Development Personnel's Attitudes Towards Internet Usage: Findings from a Study in Southern India
17	(Azam & Khan, 2010)	2010	Pakistan	SIGNIFICANCE OF THE SUGARCANE CROPS WITH SPECIAL REFERENCE TO NWFP
18	(Peerzado et al., 2016)	2016	Pakistan	Economic Assessment of Sugarcane Production and Its Marketing Constraints in Sindh, Pakistan
19	(Smutka, Rovný, & Palkovič, 2020)	2020	New York	Sugar prices development: The relation among selected commodity stocks exchange

The study (Girei et al., 2012) was conducted to analyze productivity and resource use efficiency in sugarcane production. The methodology used descriptive statistics and production function analysis. Results analyzed that production and yield were affected because of insufficient credit facilities during input supplies and insurance schemes, inadequate water supply, especially during the growing period, and farm inputs such as inadequate/high cost of fertilizer, sales, etc. Especially to small scale farmers, it is very challenging to find a source to gain farm inputs at low cost with subsidized. In India, (Prathap et al., 2021) this study's main objective is to facilitate the registered farmers through additional extensions by sugar factories under the Sugarcane Development Personnel (SDP). The SDP works thoroughly with the farmers, makes informed decisions on sugarcane farming, and ensures a regular supply of quality cane. Data were collected from 40 SDP and systematically analyzed. The findings of the study will be helpful to sugar factories, state development departments, sugarcane/sugar research institutes, and training institutions while integrating cyber extension into conventional agricultural extension services.

In this study (Ullah et al., 2019), analyzed crop productivity efficiency created at farm level decisions. The farmers can improve the overall performance through gentle intervention, including education, adopting higher management practices, and green mechanization. Physical inputs are reduced, which decreases the cost of sugarcane production without compromising the yield, which will lead to an increase in profits. The majority of small farmers limited access to farm technology. The findings of these studies can assist the attention and decision-makers to envision some rules to enhance the performances of the sugarcane farming structures, and technical efficiencies can

improve through capacity building of the farmers. According to (Olukunle & Economics, 2016) Cultivation of sugarcane has suffered due to the government administration's poor performance, which leads to the slow performance of sugar industries. Even the country has a comparative advantage in sugar production. At the distribution (marketing) stage cost of purchased products has been excluded, marketing and transportation cost are very high. Furthermore, the availability of mills is less as compared to farmers. Transportation is also high, and sugarcane is only sold to a limited number of mills. Investment in infrastructure with new innovative processing technology is essential for the development and the enlargement of local processing industries.

Under the (Bocca et al., 2015) general perspective sugarcane yield and crop evaluations on the based plan and decision where forecasted evaluation developed. The supply chain has been adopted to evaluate the climate's forecasting error and uncertainty impact. All thing has been done with proper planning; the budget, crop plan, and commercial strategy are considered critical because of their effects on the entire value chain and because of the high uncertainty associated with the timing of decision-making. This study (Aguilar-Rivera, 2019) highlight that the best area for sugarcane production, under the soil, climate, and production resource leads to sustainability. Because of healthy soil, fewer fertilizers increase the irrigation of land, and the high possibility of less use of water increases the productivity of sugarcane and is profitable. Furthermore, using compost, bio-fertilizers, biological pest controls move toward sustainability. It also generates more by-products, foods, feed, ethanol, bio-diesel, electricity, and most importantly, take part in more job creations. The fundamental objectives of sugarcane value chain mechanization are to increase the productivity of labor, and reduce operational costs, in addition to maintaining the level of competitiveness of the products and facilitating the management of the tasks intrinsic to the activity (Akram et al., 2019).

Many roads deteriorate with the movement of large trucks, especially in times of abundant rainfall, and due to the lack of conservation awareness in this regard. According to (Saqib et al., 2018) 70 percent of the cases surveyed are affected by excessive rainfall since there is a concrete possibility that the roads will be cut off and become isolated, with all the risks that this implies. According to (Everingham et al., 2002) uncertainty due to climatic change directly impact on sugarcane. uncertainty due to climatic change directly impact on sugarcane. Climatic impacts across industry sectors: cane growing, harvesting and transport, milling, and marketing. Under the perspective of

climatic impact on stake holder there are more need in R&D approach. Additionally, there is the need for climate forecast systems to estimate the variation in environment change. The quality of the service is fair to poor, and with high costs for small production volumes. This is the reason that various products are not competitive. In many areas where small producers are located, there are no local services. As specified above, 35 percent of the cases surveyed consider that the available supply of transport at the rural level is low (Edwardson & Santacoloma, 2013).

According to (Hanson et al., 2004), in recent decades and especially since the mid-1990s, there has been growth in the volume of agricultural trade at rates significantly higher than those of agricultural production. Agricultural exports represent more than 60% of total exports in Paraguay, approximately 50% in Argentina, 30% in Brazil, 53% in Uruguay, and 17% in Chile. However, despite its solid growth during most of the period, agricultural trade has been steadily declining in proportion to total trade, as other products, specially manufactured products, took on greater relative importance. Countries have diversified exports, broadened the product base, and increased their added value.

This study (Azam & Khan, 2010) use Cobb-Douglas production function to identify the various factors (i.e., land, labor, and capital) that impact sugarcane production in the study area and the least squares (OLS) method applied for analytical analysis. The results revealed that innovation/technology positively influences the dependent variable output. The agricultural sector is producing in the stage of increasing return to scale, which means that the allocation of inputs in this sector is not optimal. As per (Cardoso et al., 2018) modernization in sugarcane agriculture has been better, especially in harvesting and planting operations, in Brazilian. It generates inclusive information to subsidize policymaking procedures in Brazil and other countries where sugarcane production is still under development. Manual technologies increase the employment rate. But with technology harvesting, the cane with straw recovery presents a comparative balance in environmental impact. Technology with advancement sustainability impact categorized.

This study (Bonnet & Requillart, 2011) investigates the impact of EU sugar policy reform on the consumption of sugar-sweetened beverages. It leads to a decrease in regular soft drink prices by 3% and other related brands. The price variations lead to an increase in market shares of regular products by 7.5% and substitutions between brands to the benefit of products with the highest sugar

content. It increases the consumption of regular drinks. According to (Djokoto & Owusu, 2016) there is a lack of organization of the producers for the commercialization, and when preparing the product to transport to the market, there are usually great difficulties. This task is facilitated only when the organization is consolidated, and some links make them act together for certain actions, such as the defense of the land, sales strategies, the sharing of tools, the social benefits that reach the area, or bonds of trust and affection that facilitate the task.

In agriculture, value chain research provides a capacity to increase efficiencies, business integration, responsiveness, and ultimately market competitiveness. This paper (Higgins et al., 2007) highlight the upcoming opportunities in value chain profitable and sustainable sugar industries in different countries. Value chain profit has been gained through a technical solution, collective participation from across the chain, and usually scientifically and technologically change management reach at multi-agent approaches.

The aim of this study (Winkler et al., 2016) was to examine consumer attitudes and evaluate sales effects of a healthy checkout supermarket intervention to determine how much people are conscious about their health regarding sugar consumption. Project-based study on community health promotion intervention. Qualitative pre-intervention. However, the study demonstrated store managers' willingness to respond to local consumer wishes and the positive consumer feedback to this store initiative, thus potentially representing a win-win strategy for both store managers and consumers. It shows that food retailers and public health researchers can collaborate on community health matters, a good starting point.

According to (Smutka et al., 2020) the main objective is to identify the main feature and relations which influence the global and domestic sugar price development. The methodology has been used to investigate relation and long-term equilibrium through the Granger causality test and Johansen test. The global sugar market has suffered because of massive protectionism and governments' interventions. Everything happened because of limitation or distortion of price transmission among markets in inconsistency to a free market mechanism. Eventually, the quantification of the degree to which the analyzed sugar markets are connected has materially increased the understanding of the latest sugar price developmental trends. The conducted analysis revealed the existence of mutual interaction among selected sugar markets/commodity stock exchanges in selected regions

and confirmed the long-term equilibrium among them. However, the local sugar price differs from the region by region, country by country.

5.1.2. Stakeholders interference at Production, Processing and Institutional level:

Gathering information about the value chain from the main stakeholders of the sugar sector. The qualitative estimations study used the snowball technique to investigate the stakeholder interference in production, processing, and an institutional level. This technique has been used by private sources/contacts to reach farmers, millers, and institutes focal person to highlight the gaps between them. Data has been collected through open-ended questions from 22 respondents from Punjab, Sindh, and KPK farmers, millers, and focal persons of NARC and PARC.

Production of Sugarcane

Sindh

There are two types of sugarcane growers in every province: small and large. In Sindh, most of the sugarcane growers belong to Large Landlords/Waderey, according to **Manzoor Ali Palh** from Tando Allayer, Sindh, and Most of the problems they face are alike: climatic conditions water scarcity. They take fertilizers on loan, but high-quality seeds are not available. Only large growers can approach to get high-quality seed from Faisalabad. According to Manzoor, most committee members who set procurement pricing and sugar-related decision-making are only controlled by the top 15 sugar industry owners. They make decisions for their benefit rather than that of sugar growers.

On the other hand, mostly small farmers are uneducated, have no idea about marketing, and deal with all the problems through a middleman. The middleman concept exists only for small growers who make seeds from their previous crop. Most of the time, small growers remain at a disadvantage because of this process. Sugarcane growers face seed quality and high variations on its prices. As per **Faqeer**, small sugarcane growers have little knowledge about the input quality of seed and the pattern of production. Even in this situation of little knowledge about government facilitations towards farmers like support pricing, the small farmers are encouraged to go for more production. They face an extra burden in the form of middlemen, who cut their profit from their payment received from mills against their sugarcane. Small farmers have little idea about how much mills

pay against their sugarcane just because of the middleman. In Sindh, most of the Zeemedar have large tracts of land; still, they get to land on lease for more productions. There is no facilitation from the government or finance against inputs. Some of them are not receiving any support pricing from mills. They do not get any guidance from the mills to improve their production or quality. In Sindh, Khairpur Mill delayed the payments to the farmers in 2020, and they received their full payment in the mid of June in installments.

The agent from the farmer's side also belongs to the mills that pursue their motto rather than the farmer's benefit to set the support pricing. They never get suggestions about support pricing and talk with farmers about their problems. The government never provides them with any financial facilities. The cane growers' major hurdles are the absence of seed research and development institutes. There is no research institute in Sindh, and most of the rich farmers buy seeds from Faisalabad. It is put an additional cost burden on them.

Big growers also chase the bank loan to reach out for the fertilizers. Some farmers make contracts with transport facilitators for transport, and many growers use their transport to reach a mill. Mills give only big farmers guidance about sugarcane. For small farmers, most of their dependency on middlemen from harvest to reach their product to the mill. Payment procedure varies from person to person because growers who have direct contact with mills get timely payment/ on the spot. On the other hand, some mills pay quarterly, and if there is a middleman role, he uses chunks.

Punjab:

In Punjab, sugarcane growers are more advanced and educated than the farmers of other provinces. They are well aware of marketing strategies and financial sector facilities toward farmers under the government. In Punjab, most of the sugarcane growers are small farmers. They cultivate their land and even take land on lease from others (relatives or neighbors) to grow sugarcane. Most of them get loans without interest from mills for sugarcane inputs.

According to Muhammad Sarfaraz Tarar (cane grower), banks and government do not give any facility on in-put. Sometimes, the bank says the government gives that percent of leverage on loans almost the same as the market prices. Sometimes mill owners give seed and fertilizers to cane growers for better production. He produces sugarcane on 123-130 acres as a large grower. Mill

does not give payment to the growers on time. Sometimes, it would take 6 to 8 months to make payments. According to the sugarcane act, mills were bound to give payment to farmers within fifteen days. But now, the government has passed a bill that entitles farmers to a Cane Purchase Receipt (CPR) through which farmers can get their payments within 24 hours. Growers have an account in the bank where they get paid by CPR. Large growers use their transportation system, but private transport contractors facilitate them for small farmers. They charge Rs-15 on a 40 kg form grower according to the distance of the mill. Support pricing was received only this year, but in the previous years, Millers created problems regarding quality and cheated them in the government rates. Milles blackmail the growers in many ways, like a warning to dispatching the cane in front of their mill. For a grower, it could be difficult to shift his cane from out of a massive crowd of trolleys parked there for unloading. In this situation, if growers shift their cane to another mill, extra transportations costs are put on them. Therefore, they are forced to sell their can at a lower price, like a 10 to 20 percent deduction from Rs.180 to shift Rs.135. After that, in payment procedure, if growers ask about his payment, mills give money but after 10% deduction and give a thousand reasons for the delay in payment. Mill owners give higher payments to middlemen as compared to farmers. Mills have laboratories but only for checking quality rather than condensing sugar. Mill does not take dead varieties of sugarcane. If the quality is low, then the mill warns the grower that this type of cane is not acceptable if he gets this type cane.

Khyber Pakhtunkhwa (KP)

In KP, most of the farmers belong to small farmers. They have little knowledge about government support or no idea about the financial sector's existence. Even they do not take any support from financial help due to religious norms. They use seed from the previous crop if they feel production or quality getting down due to continuous repetition in the seed. Then they take seed from their companion growers (who have had good production in the previous year), or nearby villagers of this pass have planted good seeds. Mills are far away from their land, so do not approach them. In KP, a huge part of cane goes into the Gur production. Many small business people install Gur Production factories. Some farmers sell their crops before harvesting due to high transportations costs and labor costs. If some farmers are educated, they approach banks for a loan, but financial sectors discourage them and rarely cooperate. Even they didn't provide any guidance to growers.

In KP, only traditional sugar like Gur and Shaker is used for domestic consumption. Farmers use traditional methods to grow sugarcane. In Gur, production farmers benefit from higher prices. Farmers can sell their Gur at the Peshawar market for Rs. 20,000 against two maund of Gur. They get huge amounts against the bulk of Gur. Farmers give payment to the factory's labor during Gur manufacturing. They give 1400 to 1500 rupees against 40kg Gur production to Factory owners. Some farmers sell their crops to middlemen due to the high cost of production. Middleman bargains the rate with growers after seeing the quality of the crop. According to Atif (a cane grower), they get benefits in this way because he gets 1.5 Lac against 12 Canal from middlemen.

Processing of Sugar

Sindh:

Mill men either belong to any province, but their point of view is the same regarding government intervention. In Sindh province, most of the mill-owners favor working under government control. Most of them get financial help from the bank when they need it. In the last decade, most of the time, the mill's payment methods have been insufficient. By 2019, the government had set a payment method. It does not take more than six months which was the highest duration in the last decade. The payment method is used only based on sugarcane quality and weight. Some sugar mills give guidance to sugarcane growers, but most of them do not facilitate the farmer. The guidance includes advice about seed quality, fertilizers, and production patterns. Even some mills get to land on lease, then they facilitate the farmer by concession on fertilizers and provide them with the best quality seed.

According to Bawani Sugar Mill worker Ubaid Shanwari (Deputy Chief), most mill owners favor government control because the government facilitates them in every single stage of production. Private (financial) sectors with government assistance both facilitate mills in sugar production. Banks give financial support to mills in different installments. Most of the sugar mills start from the last week of December and end in March. In Sindh, some sugar mills make payments to growers based on cane quality. Sugar mills give guidance, and some give loans on seed fertilizers to frames. In Sindh, sugar mill workers face problems regarding their payment due to political influence. In Sindh, as per some mills, there is no need to further establish sugar mills. Existing sugar mills need to repair infrastructure and rephrase the internal policy. As per the previous

record, after a new setup of mills, existing sugar mills shut down their project due to low sugar production and high competition. Last year, in Sindh, mill owners got more profit because of the cane and sugar rate. They had enjoyed 15 to 16 billion rupees' profit in 2020. If a cane is in surplus, there is no problem in the crushing period. If cane production is short, then farmer waters the sugarcane during the crushing seasons more to increase its weight. It becomes a loss for the mill and a benefit for farmers because the grower gets payment according to cane weight rather than for sugar recovery.

Punjab:

According to Muhammad Ashraf, GM of Sehar Sugar Mill, the problems of farmers are related to the cane quality. He claimed that payments to the farmers are usually made on a timely basis, but delays are often observed during the off-season. Furthermore, he said that the farmers are given guidance regarding seed, fertilizers, development, and infrastructure. In Punjab, most mills give loans on inputs to farmers. Similarly, Sehar Mills give 60 to 70 million rupees to the farmers annually in two seasons. In Punjab, sugar mills facilitate and guide small growers through purchasing centers. If a farmer is faced with a transportation problem, he approaches the relevant office, and the mill facilitates him regarding transportation, loading, unloading expenses, and services. According to the mills, the government needs to balance the cane and sugar prices to protect growers and consumers. Suppose government fails to facilitate growers, shifting from less to more lucrative crops.

Mills get financial support from banks and pledge their sugar from the start; thus, they pay the farmers. Government has to increase the sugar price in favor of sugar mills. According to mills, the government needs to permit the establishment of a new sugar mill as per raw material facility for sugar mills to fulfill domestic demand. Furthermore, mill owners are not in favor of the free market mechanism. According to mills, the domestically higher price of sugar is because of the higher purchase price of cane. Government must work on sugar price take the initiative towards the policy regarding sugar price where consumers and mills stand to gain. Due to insufficient sugarcane production, the market becomes competitive; therefore, the higher purchase price of cane leads to a higher price of sugar. The government intervenes only till the time prices are set. The government does not intervene to fix the crushing time; therefore, the total recovery of sugar

is lower than expected, and it becomes more so if the sugarcane falls short of estimated targets. Usually, the recovery rate is 4 to 5 maund from 100 maund at the start of the season, whereas the normal recovery rate is 8 to 9 maund from100 maund of cane. Thus, it becomes a loss for the mill and economy.

Khyber Pakhtunkhwa

In KP, most sugarcane growers go for traditional sugar rather than white sugar. Many people have installed small units at the Gur factory. Most of the mill owners have closed their mills in KP after heaving faced the losses as white sugar has become an out-of-date concept. Other factors include longer distances for the transportation of sugarcane and the market price of white sugar. Denying manufacturing of white sugar is the long-distance of sugarcane grower to mills and price of white sugar. Farmers prefer to go for convenience rather than bearing extra transportation and loading and unloading costs. In the market, Gur prices are higher as compared to white sugar. As per the millers' point of view, sugar mills will either shift to other provinces or close down in the coming years. However, in KP, sugarcane has higher condensed sugar than other provinces with one condition if farmers use high quality of yield. Under this condition, mills get benefits. However, farmers gain more profit in Gur production than white sugar.

Expert Views

In Pakistan, as many as 90 mills run: 40% belong to JTK, 20 % to Khusro Bakhtiar, 5% to Zardari, 4% belongs to the Sharif Brothers, and others belong to small owners. The 15 families mostly influence pricing in the domestic market. Domestic sugar production is sufficient, but varieties of sugarcane seed are fewer, and quality is lower than that of other competitive countries. Farmers still rely on older and less productive traditional methods in sugarcane production. In Pakistan, payment on sugarcane is based on weight rather than on condense of sugar. Therefore, farmers give more water and urea to the sugarcane field from August to November; thus, the weight of sugarcane is higher through lower quality. It gives short-term benefits to the farmers but the long-term loss to the mill owners.

In Pakistan, the production of crops is not a problem, but excessive production is a problem. Most crops collapse just because of institutional mismanagement and internal lobbies because they

cannot handle excess production. It shows government institutional failure, and there are limited research and development projects in the sugar sector. There is a lack of valuation about setting support pricing of sugarcane. Government should take the initiative to set pricing according to the cost of production with added 5 % profit for both sugarcane growers and millers.

In Pakistan, a common grower has little knowledge about his rights. If the market is open, there is the likelihood of a breakdown of the private sectors. There is a need to improve the existing legislation and ensure it is implemented locally. There is no need to facilitate the farmers by giving subsidies on inputs and fertilizers; however, there is a 50 % subsidy to farmers for enhancement of production on machinery. Large mills contract farming and provide seed and fertilizers to improve sugarcane production. Some of them give guidance to farmers during the production of sugarcane that will improve their quality and quantity.

In Pakistan, there is no need for privatization of water management because of people's behavior, and it will become a huge blunder in the future. If water management runs under the private sector, there is the likelihood of a water- monopoly. This system works well only in developed countries, not developing countries. From the beginning, the sugar sector has been ignored. There is no work on sugarcane because of the lack of advanced technology. There is little work on the enhancement of sugarcane production and its by-products.

 In KP, mostly traditional sugar (Gur) mostly is produced, and even small farmers grow sugarcane produced for Gur production because, in the market, Gur prices are higher than the price of sugar. However, the quality of Gur in KP is low compared to that of Sindh and Punjab. Moreover, in Baluchistan, sugarcane is produced only in two districts, and to sell cane stalks, its prices are higher for the transportation cost.

In Pakistan, there must be work done on the sugar sector, from the harvest of sugarcane to sugar production. We need to properly utilize cane waste to run power plants. If we plant seed on 10000 acres or 100000acres after that we distribute it among the farmers, it will meet the demand for the next 2-year. There is also a need to work on chip bud farming to promote sugarcane production. It will be beneficial for sugar mill owners and economic welfare as well. Another method is flower breeding used for promoting sugarcane crops; currently, its six chambers are installed in Badin

and Alipur Chattha. Many districts have worked on it in the previous years, but due to lack of knowledge and institutional failure, it could not function properly.

Subsidy should achieve higher production and a richer cane quality instead of wasting it on seed or fertilizers. There is no need to give subsidies to growers. The administration has not worked properly on the sugar side because there is a lack of will to implement law and force. Government institutes and their representatives intervene in the sugar market to investigate their assets, and mostly they are bribed. Moreover, businessmen do not want government interference because it demoralizes their profit. Everyone tries to protect his profit rather than contributing to the overall economic welfare. The main problem of Pakistan is institutional and legislation failure.

Quantitative Results

5.2. Comparison of Water Use Efficiency between Major Crops:

The yield of cotton and sugarcane is 250kg/acre and 25830kg/acre, in that order (GoP & Division, 2020) indicating a huge distinction in terms of weight. In (Table 5.2), the study estimated water requirement per kg goes drastically down for sugarcane compared to cotton (i.e., only 625 liters per kg compared to 4300 liters for cotton).

Table 5:2: **Estimates of Water Use Efficiency of Major Crop and Monetary Benefit**

Water Requirements and Monetary Benefits Crops	Water Requirement (litter/kg)	Yield (kg/acre)	Per acre water requirement (litter/acre)	Water use ratio per acre (sugar/cotton)
Cotton (phutti)	4300	833	3581473 = a	(b/e) = 4.5
Sugarcane	625	25830	16143694 = b	
Wheat	1909	1160	2214890 = c	(b/(a+c)) = 2.8

Crop	Monetary Benefits from water usage (Rs/Litter)			
	Net benefit at the Farm-Gate (Rs/Litter)	Benefit Ratio	Retail level (Revenue Rs. /litter)	Benefit Ratio = (e/d)
Cotton (Lint) (b)	0.0025	(d/e) = 1.14	0.013=g	g/h = 4.2
Sugar	0.0022		0.003=h	
Wheat	0.002	(((d+f)/2)/e) = 1.03	0.021=i	(((g+i)/2)/h) = 5.8

Source: Author Estimations

The per kg price strongly influences revenue. Farm-gate prices of raw cotton and sugarcane are Rs.85.375/kg and Rs.4.85/kg, respectively (AMIS, 2020) Signifying that the price of raw cotton is 25 times higher than that of sugarcane. Consequently, water use efficiency, particularly based on the quantity (weight) of crop produced, presents an erroneous representation because the higher quantity (weight/acre) created does not justify higher monetary value. Proportionately, the duration of the cotton crop is only 5 to 6 months while that of sugarcane is 11 months, implying that even if the water requirement per month is the same for each of the crops, the total water constraint per crop season will be extensively higher for sugarcane because of its long period. Hence, the water use efficiency criterion should be based on every crop's monetary value. Farm-gate prices for 2019-2020 and the cost of products used in this study estimate the net return of each liter of water used in sugarcane and raw cotton. At the farm-gate, one liter of water in sugarcane and cotton production generates a monetary value of Rs.0.0022/liter and Rs.0.0025/liter, respectively. This simple analysis demonstrates that cotton production is more water-efficient than sugarcane production. Our yearly analysis reveals that one liter of water used in the cotton-wheat system generates a 1.03 times higher net return than sugarcane does.

The monetary value slightly decreases when the same assessment is repeated at the second stage of the value chain, i.e., after changing sugarcane to sugar and raw cotton to cotton lint. The variation reduces because, in the case of sugar, value addition occurs, while in the case of cotton lint, only cottonseed is separated from raw cotton. It is significant to note that one kg of sugarcane generates less than 100 grams of sugar, having a market value of Rs.7.9 (under the assumption that the retail price is Rs.79/kg). In comparison, one kg of cotton contains 43 percent fiber (cotton lint) and 54 percent seed, and the remaining 3 percent waste. Cottonseed is used to extract edible oil, with 10 kg of seed cotton giving one liter of edible oil.

We have relied on standard market prices to estimate oil and cotton lint. Wheat is changed into wheat flour, and the price of wheat flour used inside the analysis is Rs.40/kg. Our results show that each liter of water used in raw cotton production generates 4.2 times higher revenue than sugarcane at the second value chain level. On the other hand, our analysis on a per annum basis demonstrates that every liter of water used in the cotton-wheat system generates 5.8 times higher revenue than sugarcane does. (Table 1). The cost of sugar production from sugarcane and the cost conversion of cotton seed into edible oil is unknown. Therefore, comparison in terms of net return at the second stage of the value chain is impossible. However, if we compare the return of water use at the retail stage for sugarcane and cotton, the study finds a widening difference. It is well documented that 250 grams of cotton produce one shirt (Anjum & Zia, 2020) and each shirt has an average market value in the range of Rs.1000 to Rs.2000. Assuming that the average price of a shirt at Rs.1500, 10,000 liters of water, it has generated Rs.6000, equivalent to Rs.0.6/litre at the retail level. However, one liter in sugarcane production generates a monetary benefit of only Rs.0.003 at the retail level. Again, analysis at the retail level unravels that each liter of water used in cotton production generates higher monetary benefits than sugarcane (Table 1).

Moreover, the textile industry manufactured raw cotton to finished products by providing employment multiple times higher than that involved in the sugar industry. However, these other employment benefits still are not included here. It demonstrates that the monetary benefits of water use efficiency in cotton production are significantly higher than that of sugarcane at both farm and retail levels.

5.3. Government Interference in Free-Market Mechanism:

5.3.1. Government Interference in Price Mechanism

Historical Difference between International and Domestic Sugar Prices

(Table 5.3) shows the historical data of Domestic and International Sugar prices. Data used to analyze the Government Policy; is helpful either for the economy's growth or in favor of the Private Sectors. The data collected from different domestic wholesale sugar prices sources were obtained from AIMS. It has converted into US $/ ton through an exchange rate from SBP, Karachi. International sugar prices get from Pakistan Sugar Mill Association (PSMA) and Investing London-Sugar market.

Table 5:3: **Domestic and International Sugar Prices ($/Ton) in Pakistan**

Year	Domestic Wholesale Price	International Prices	International Price + Handling Cost	Difference in Prices
(a)	**(b)**	**(c)**	**(d)**	**(d-b)**
1980-81	606.06	192.16	211.376	-394.68
1981-82	707.07	200.06	220.066	-487.00
1982-83	663.28	207.556	228.3116	-434.97
1983-84	605.21	205.83	226.413	-378.80
1984-85	573.28	149.17	164.087	-409.19
1985-86	509.67	198.18	217.998	-291.67
1986-87	561.37	239.55	263.505	-297.86
1987-88	526.21	245.05	269.555	-256.65
1988-89	522.18	331.71	364.881	-157.30
1989-90	518.85	413.17	454.487	-64.37
1990-91	500.81	298.53	328.383	-172.43
1991-92	477.64	278.16	305.976	-171.66
1992-93	453.63	270.49	297.539	-156.09
1993-94	468.03	312.61	343.871	-124.16
1994-95	405.12	364.28	400.708	-4.41
1995-96	447.32	361.97	398.167	-49.15
1996-97	560.35	317.9	349.69	-210.66

1997-98	495.47	289.85	318.835	-176.63
1998-99	397.26	217.48	239.228	-158.03
1999-00	376.79	201.37	221.507	-155.28
2000-01	460.68	248.26	273.086	-187.60
2001-02	402.99	217.77	239.547	-163.45
2002-03	331.36	210.89	231.979	-99.38
2003-04	313.39	209.89	230.879	-82.52
2004-05	316.37	262.8	289.08	-27.29
2005-06	441.40	381.44	419.584	-21.82
2006-07	575.05	399.89	439.879	-135.17
2007-08	457.86	344.44	378.884	-78.98
2008-09	451.21	417.76	459.536	8.33
2009-10	551.65	588.67	647.537	95.89
2010-11	802.91	722.37	794.607	-8.31
2011-12	755.83	648.95	713.845	-41.98
2012-13	561.96	528.87	581.757	19.80
2013-14	524.74	470.46	517.506	-7.24
2014-15	502.05	392.53	431.783	-70.27
2015-16	556.33	460.82	506.902	-49.43
2016-17	601.17	511.04	562.144	-39.02
2017-18	515.65	357.5	393.25	-122.40
2018-19	451.66	334.39	367.829	-83.83
2019-20	464.72	362.34	398.574	-66.14
2020-21	515.12	417.81	459.591	-55.53

Sources of Data: Pakistan Sugar Mill Association, Agriculture Information Management System, State Bank of Pakistan, and www.Investing.com/Commodities/London-sugar.

The examination results show the difference between international and domestic sugar prices. Domestically prices have been generated through (Eq 4.1). For more accurate results, 10% handling cost has been added to the international prices (Eq 4.2) displays. Moreover, the variations in data have been estimated. As per data from the beginning domestic sugar, prices have continuously increased compared to international prices. There are only a few years when international Prices are higher as parallel to Domestic Prices; most of the time, domestic prices are

higher than international prices. Results clearly show that the government protects the sugar industry and encourages them to get more profit from the international market and domestically. Mainly focus on recent year's prices. In 2018 there is a huge difference in international and domestic prices, but still, the government gives subsidies on export. A result clearly shows domestic high price loss for urban and rural consumers and encouragement for the private service sector, such as transportation, storage, and distribution.

Government involvement in the Free-Market Mechanism leads to consumers' sugar prices being kept higher. Different prices in different regions of the world and domestic level are beneficial for the private sector. It leads to inefficient market systems because the private sector charges higher prices and gets subsidies domestically and for the international market. Higher prices of sugarcane and sugar create a gap between supply and demand domestically. It forces the government to give subsidies on export, import, and even the domestic sale market.

Price Mechanisms via Graphical Representation:

Graphical representation (Figure 5.2) demonstrates the data from international and domestic forty-year prices. Historical tabulated data specify that domestic prices have been consistently higher than international prices expected from a few years. For both prices, comparison international prices generate through (Eq 4.2) as shown and domestic prices with (Eq 4.1). Graph (5.2) shows the gap between international and domestic prices where domestic prices are higher as compared to international prices. If the government permits them to export, then why facilitate subsidies on sugar export to local producers? If we export or import at these prices, the economic profit. Just because of government interference in the free market mechanisms, domestic consumers and the government face a loss. Suppose the government lets the market free supply and demand automatically reach the equilibrium point. There is no need for the subsidy provided to the local producer on export and import.

Figure 5:2: Comparison between Domestic and International Prices from 1980 to 2020
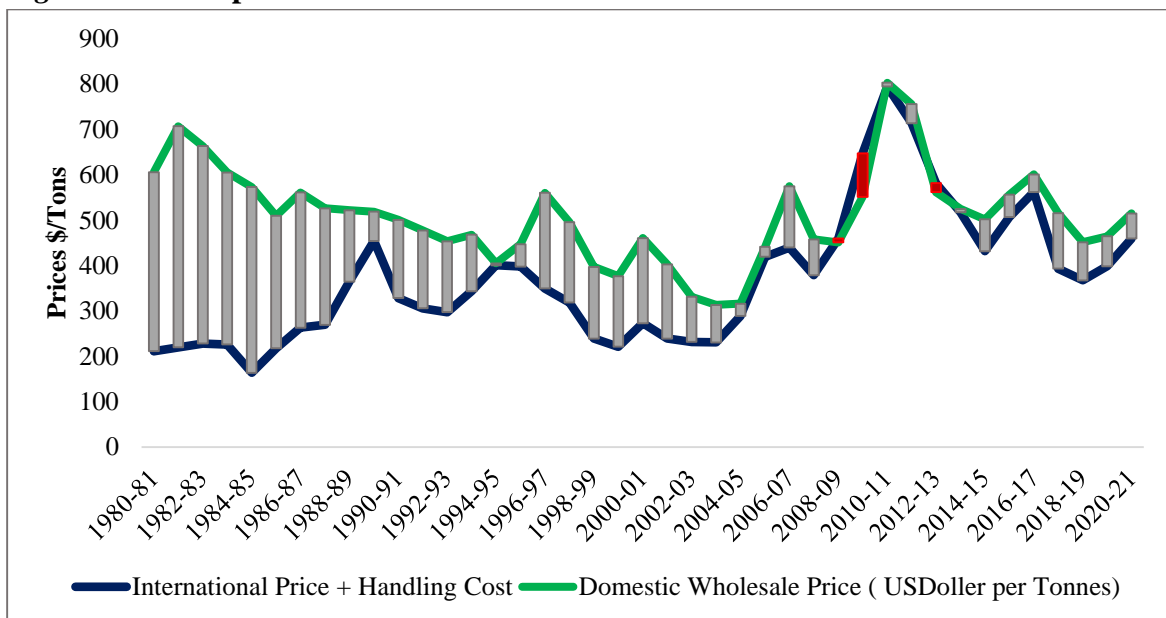
Local prices are continuously higher because the Pakistan sugar industry is incompetent, the cost of production is higher than that of the international market, and political instability. In the international market, prices are fixed under the supply and demand of commodities. It reveals that the Pakistan government should not be worried that if they leave the market open, sugar will export because no one wants to export under these prices. If any exporter wants to export sugar, he should reap the benefit or bear the loss.

After adding the handling cost in the last fifteen years, the data gap between international and domestic prices narrowed down, but it is still lower than the domestic prices except for a few years. The results demonstrate that by these conditions, if the government wants the local industry to compete, then there is a need to put pressure on local producers to lower the price domestically. The government should go for import because at the international market, and sugar has lower prices. If governments leave the market open, supply and demand automatically gain equilibrium. Otherwise, a government should import sugar and sell it lower.

The sugar industry explodes under this situation; when the government intervenes in the free market because it knows the private sector needs government permission to import sugar. In this

situation, the private sugar sector creates a crisis domestically and causes a jump in prices. Sugar producers charge from consumers domestically. If there is a free market mechanism, then anyone can import sugar anytime, and consumer exploitation by the sugar sector will automatically end. It will put pressure on the sugar sector, knowing that if it manures prices, the government will import sugar to protect the consumer, and its stock will go home.

Our sugar stock will go home. There are two ways to put pressure on them: one of them is to reduce the cost of production by adopting new methods. The market is open if they do not reduce the cost. Their local sugar prices are higher than imported sugar prices.

As (Murali et al., 2019), the supply of sugar and its prices appears to be the most important factor domestically and internationally in India. There is no single market found to be the price leader. The prices of sugar exported by India to the global market were not co-integrated and did not follow to Law of One Price. Because at the international market, international prices are lower than domestic prices even after adding transportation costs. Market mechanism plays an insignificant role in determining the relationship of sugar prices in the global market. The study suggests sugar policy reforms, steady export, and import strategies, and the abolition of export quota are absolutely important for market integration and convergence of prices in the domestic and global market.

The examination of the result visibly indicates no incentive for the government to control the sugar industry. Open market leads to lower consumer prices. As per prices data, after 15 to 10 percent added to the traveling cost, the private sector still has a margin to import and sell it at lower retail prices than the local prices. The probability of imported sugar prices will be less than the local sugar because of the sufficient margin.

5.3.2. Government Interference in Production Mechanisms:

Figure 5.3 shows the data on sugar production and sugar consumption domestically. The gap has been estimated by (Eq 4.3). The graph shows 40year's data from 1980 to 2020; in the beginning, sugar production is lower than domestic consumption. It demonstrates that there is a sugar deficit domestically most of the time. Therefore, the government imports sugar to meet the domestic requirements. During the last ten years, domestic production has been in surplus. If the local

producers want to export, the government needs not interfere through subsidies to the sugar sector. The previous graph shows that international prices are lower than domestic prices; if millers want to export their sugar. They will export sugar without government support because domestic demand is fulfilled under this production.

*Figure 5:3:* **Gap between Domestic Production & Consumed Sugar**
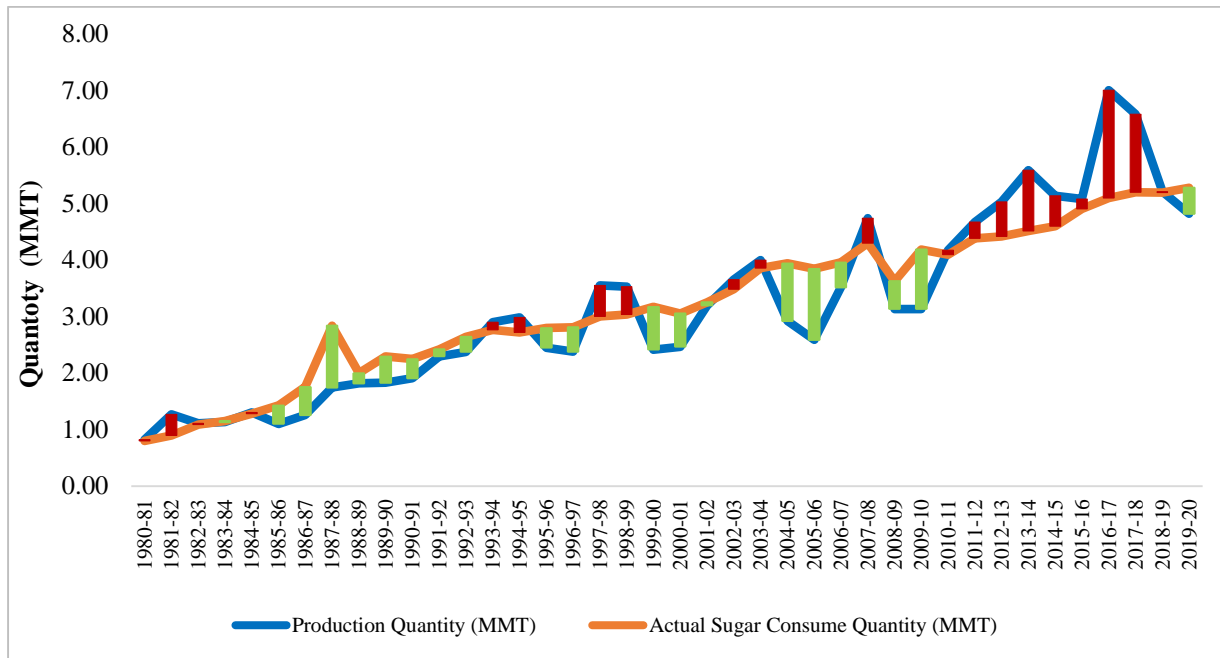
Sources: National Agriculture Research Center (NARC), Pakistan Sugar Mill Association (PSMA)

Since 2011, production has been continuously surplus, and consumption is less. In the international market, prices are lower than local prices in Pakistan. Under these circumstances, the export of sugar will not happen unless the government subsidies the sugar sector. It demonstrates from 2012 to 2018, there is a surplus in sugar production, and in 2020 there is a deficit. Still, here the government or millers can import sugar because international prices are lower than domestic prices. Government should not give subsidies to the sugar sector for export to fill the gap between domestic and international prices. If the sugar sector wants to export, it can, but it should not demand the government grant subsidies. As sugar production in 2018 has been insufficient, the still government does not need to worry. The government itself imports sugar from the international market at lower prices and sells domestically with a 15 to 10 percent margin. Still, it is beneficial for the domestic market.

Gap between Available Production (Production–Export) and Actual Sugar Consume

The previous scenario analyzes forty years of production and consumption of sugar domestically. The previous graph shows that the domestic production of sugar has been in surplus in the last decade. (Figure 5.4) as in below demonstrated the gap between net production (production–export) and actual consumption of sugar domestically. Net production has been estimated with (Eq 4.4). In the previous graph in the recent last decade, domestic sugar production is sufficient for regional consumption. Still, when the export is done, a deficit occurs, and demand for sugar is higher compared to available production. The shortage of sugar happened because of the government's insufficient policies about export. After that, to fill the shortage gap, the government has allowed local producers to import sugar from the international market with import subsidies. Estimations show sugar deficit happened because of government interference in the market mechanism. When the sugar is exported, the government subsidies export to local producers. But after the shortfall, the government has to import sugar with an import subsidy.

Figure 5:4: **Define the Gap between Sugar Productions (Production-Export) with actual Consume Sugar**
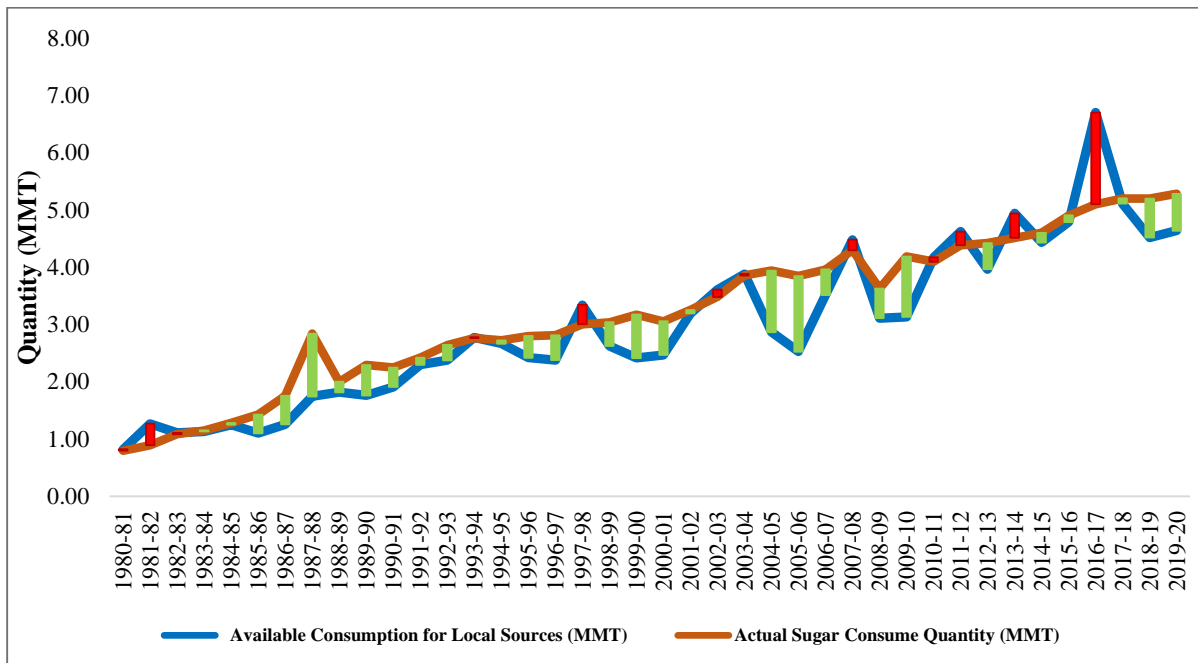
Sources of Data: Pakistan Bureau of Statistics, National Agricultural Research Center (NARC), Pakistan Sugar Mill Associations

Economic burden increases by bearing loss regarding subsidies and duty-free imports. In this regard, government revenue is not generated, and expenses increase. All such losses result from

the government's weak policy of supporting or protecting the local producers. Consumers also bear the burden of higher prices in the domestic market. Only one person who gains profit by both hands is local producers. The government can import sugar from the international market at a lower rate to fulfill the domestic need in a free market mechanism. These entire things revolve around international and domestic prices. The government should import sugar from the international market instead of giving incentives to the private sector.

Comparison between Actual Consumption and Available consumption after Import

In (Graph 5.5) shows whenever there is a shortage of sugar, the domestic sugar sector imports it from the international market. Because of its insufficient policy, the government subsidies the sugar sector to fill the existing gap. The sugar sector has been enjoying subsidies over the last ten years. When domestic sugar is in surplus, the government subsidizes exporters. It shows that the government always draws a fall policy without seeing the international market pricing situations. In 2018 shortage of sugar has been occurred, but as (graph 5.2) shows, the prices in the international market were lower than that of domestic prices government itself imported sugar at a lower price and sale it after the margin of 10 to 15 percent, which is economically beneficial.

Figure 5:5: **Gap between Sugar Productions (Production – Export) and Import with Actual Sugar Consumed From 1980-2020**
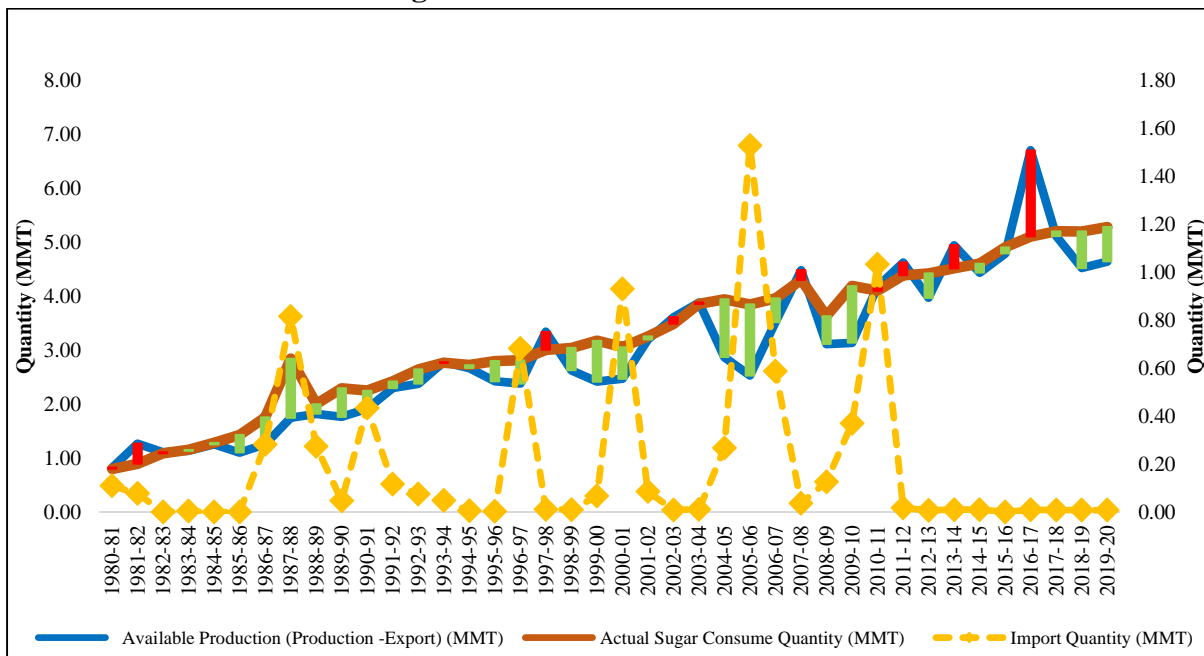
Sources of Data: Pakistan Bureau of Statistics, National Agricultural Research Center (NARC), Pakistan Sugar Mill Associations

If the government does not permit sugar industries for export, they are apprehensive about the shortage of sugar on the domestic front because international prices are lower than domestic prices. Automatically they must sell it at lower prices domestically. In addition to that, the government should impose restrictions on export and import. As per data analysis, the government is the main factor that allows market collapse. By this government's action, consumers also face higher prices at the domestic level. Only industrialists benefit in two ways just because of the government's insufficient policy: Firstly, in the shape of a subsidy on export and secondly by charging higher prices domestically. It indicates that the government protects the industrialists, not the consumers.

In 2010, sugar prices were higher than domestic prices in the international market, as demonstrated in the above table and (5.2 graphs). In figure 5.3 data estimations, domestic sugar production was lower than domestic sugar consumed, so the government had to import against higher international prices to fulfill the domestic demand. The government had given a 4000/Rs million subsidy on import to local producers on sugar imports.

Difference between Prices Coefficient of Variations (CV) with Higher and Lower Export & Import Years

In (Table 5.4) estimates the variations in the domestic prices in the most highlighted years under the net production (export and import) variation in prices monthly from the last decade. Firstly, for the estimation, different years, 2010, 2011, 2016, 2018, 2019, and 2020 with monthly data from May to Dec, have been taken. The coefficient of Variation (CV) in sugar prices has been taken into three-step, as average has been estimated with (Eq 4.8). In the Second step, standard deviation has been estimated with (Eq 4.9), and finally, CV estimated through (Eq 4.10). It used to show variations in sugar prices in different years. In 2010 due to the flood, domestic sugar shortage, and at that time, international sugar prices as well high, so the government gave Rs. 4000 million subsidies to local producers for the import of sugar. But at the domestic level, sugar prices are still higher. It shows after mid of July, prices due to shortage of sugar prices went higher than the previous months. Due to the decrease in sugarcane production, prices touched the peak, and utility stores corporations increased the retail sugar prices by Rs 10/kg to Rs 65/kg. It is also taking part in sugar higher prices domestically.

Table 5:4: **Monthly Difference between Prices Coefficient of Variations (CV) with Higher and Lower Export & Import Years**

Month/Year	2010	2011	2016	2018	2019	2020
May	61.28	65.77	63.75	52.68	67.99	81.37
June	63.27	69.19	64.37	53.69	70.83	80.92
July	66.68	70.74	67.34	55.21	72.38	84.19
Aug	72.26	74.65	71.17	55.59	75.38	94.90
Sep	80.43	76.03	71.03	54.99	75.02	94.79
Oct	81.91	72.01	71.04	54.78	73.78	99.32
Nov	87.98	67.25	71.80	54.87	72.61	99.17
Dec	73.78	55.52	63.68	55.63	71.08	83.20
Average	73.45	68.90	68.02	54.68	72.38	89.73
Stdev	9.49	6.42	3.65	1.01	2.43	8.06
Coefficient of Variation (CV)	13%	9%	5%	2%	3%	9%

*Source of Data: Pakistan Sugar Mill Association,
*Estimated Coefficient of Variation (CV)

In the year 2011, in the international market, sugar prices were lower as compared to domestic prices, but sugar has been imported at the highest quantity as compared to the import in the previous years. This year the variation in sugar prices domestically was 9%. The government also facilitated the sugar sector by granting the subsidy of Rs 4000 million. As per data estimations, international prices were lower than why the government subsidized the domestic private sector. It clearly shows governments protect the private sector domestically. As (DAWN, 2010) they charge higher prices domestically and get subsidies on imports, and in both cases, it is beneficial for them. If a free-market system prevails, the government no longer needs to worry about subsidies. Governments buy sugar from the international market at lower prices even after adding the handling cost and consumers also benefit from the average prices.

From 2016 to 2020, estimation shows production in surplus; therefore, the private sector exported sugar. At the same time, international prices were relatively low compared with domestic prices. There is no need to worry for the government because there is sufficient production for the domestic demand for sugar. It clearly shows that governments protect the sugar sector by giving subsidies on export and import, just because of false sugar policies. Domestically sugar prices were higher at the retail level in all these years. Only in 2018, variations in prices are low because the

previous leftover stock of sugar and sugar production was also in surplus. This study finds that there is a shortage prevailing domestically after the export, so the government imports the sugar to fulfill the domestic demand. Shortage of sugar leads to prices at higher levels in the region.

After 2018, clashes between the sugarcane producers and sugar industries increased on account payments. Besides that, vagaries of weather too contributed to the decline of sugar production. Because of low production in 2019 and 2020, prices domestically skyrocketed. Despite the domestic shortage of sugar in 2019, through the government subsidy, the sugar sector exported sugar to the international market at lower prices, evidently at the cost of the government. This situation is the main adjective of domestic higher sugar prices. All this happened under the government's generous supervision of sugar mills. Not only do consumers suffer under this circumstance, but also the economic loss is considerable. If a free market exists, there is no need for subsidies on the export or import of sugar.

As we estimated, sugar consumption in Pakistan has persistently increased because of the population explosion and expansion of the domestic food-processing sector. Sugar consumption is projected at 5.6 to 5.9 MMT, four percent higher than last year. The bulk of sugar is consumed in bakery items, candies, ice cream, and soft drinks. Interestingly, it consumed 60 of the total demand. The study clearly shows sugar is mostly consumed by upper-income class groups, and the subsidies are beneficial for them alone rather than the lower-income groups. There are variations in the domestic prices in the most highlighted years under the net production (export and import) variation in prices monthly from the last decade. The government gives a subsidy to consumers as well as per analysis most of the sugar consumed at the upper class, and they take more advantage toward subsidies. Government should take necessary steps to facilitate the lower-income groups by subsidies.

5.3.3. Estimate the Consumer Loss under Government Interference

Difference between Domestic and International Prices

Our calculations demonstrate that there is a huge difference between the domestic and international prices on an annual scale even after adding the handling costs. For further clarifications, we have estimated the prices monthly to clearer results. Calculations in (Graph 5.6) are evidence of the

monthly estimation between national and international markets. International prices of after adding 10% handling cost by the (Eq 4.12) and then domestic sugar prices used as shown in (Eq 4.11) after that it shows quite similar to annual data where international prices are lower compared to domestic prices. As per the free market, in case of a shortage at the domestic level, sugar can import from the international market because usually, prices in the international market are lower. If the governments leave the market free, there is no need to get permission to import sugar, not even need to give subsidies on import and export to the local sugar producers for their benefit.

Figure 5:6: **Gap b/w Domestic and International Monthly Sugar Prices from 2019 to 2020**
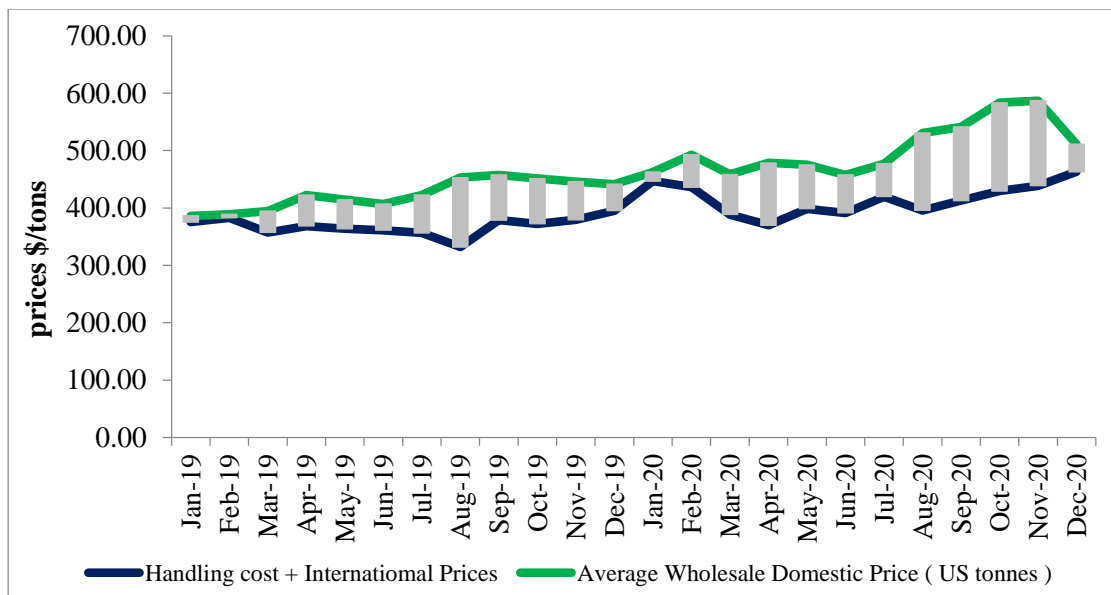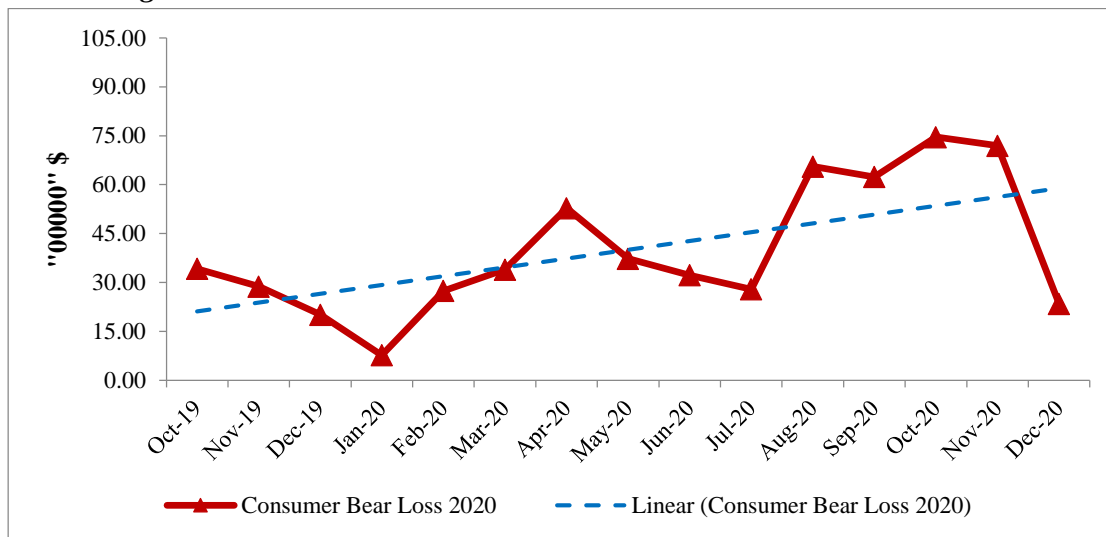

Source of Data: Pakistan Sugar Mill Association AIMS.

The government can fulfill domestic consumption demand with low prices on lower international sugar prices. Under the government's permission scenario, the domestic consumers face loss, but the private sugar sector gains. It demonstrates that the government has become a shelter for the private sugar sector. In 2019, the government gave a $35 per metric ton subsidy to the sugar sector on export. Even for domestic consumption, sugar production is sufficient after exporting, and there is a shortage at the regional level. According to (Rehman, 2020) the government also had withdrawn all duties on imports as well in 2020. For this reason, the domestic prices were recorded 33% higher than those of the previous year. On the consumer side also, the government gives subsidies. We have found that the consumer loss or benefit, private sector charges.

Consumers Bears Loss by the Interference of Government

According to this study analysis, the consumer is at a loss. The calculations in (Figure 5.7) demonstrate that the domestic consumer continuously bears the burden. Because of higher prices domestically, consumers are bound to pay high prices. If there is a free market, then a government does not need to permit export, and after shortage no need to give subsidies on imports.

Figure 5:7: **Consumers Paid Cost due to Government Interference**

*Source of data: Ministry of Finance, State Bank of Pakistan, Pakistan Sugar Mill Association

Consumer loss due to government Interference is = Rs. 95.929 billion

The above graph shows how much consumers have to pay extra prices and bear the loss. Due to government mismanagement, fourteen months' calculations, Oct-2019 to Dec-2020 estimated loss of consumers is around Rs. 96 billion just from the sugar industry. Consumers pay extra prices on sugar. If the government left the market open to import sugar, the prices could go down, and consumers could save up to Rs. 96 billion.

Meanwhile, in 2020, the export of sugar was less than the previous years due to insufficient sugar production. In the starting months of the crushing season, the sugar sector exported and the government-subsidized sugar. After that, there was a shortage in 2020. To fulfill consumers' sugar demand, the millers imported sugar from the international market at a lower rate and sold it at a higher price in the domestic market. Here consumers can bear losses in the shape of higher prices, and the private sector benefits from the international market and domestically.

It led to 46 percent higher prices domestically than the prices in the years 2018; therefore, the sugar sector was allowed to charge high prices. If the government left the market open, then imported sugar prices could be lower even after adding 10% transportation and handling cost. But domestically, consumers were discouraged, and the economy's welfare also decreased.

5.3.4. Monetary Cost to the Government in 2020

In (Figure 5.8), the data demonstrate that the government is continuously at a loss. In the below graph, the study evaluates the governmental loss monthly and finds how much the consumers have to pay for the government intervention. In this graph, international prices are lower than domestic prices even after adding the 10 percent transportation and handling cost. In this scenario, the subsidies by the government to the domestic producers seem an out-of-place question. In (Figure 5.8) shows that the export of sugar is less than its imports because of less domestic production. The government of Punjab announced the sugar subsidy of Rs. 5.35 per kg ($35 per ton) to support the local producers domestically. On the other hand, the government imposed a quota on imports, showing that domestic producers gained domestically with high prices. Thus, the government welfare decreased, and the burden increased and government paid extra to local producers on export and import.

Figure 5:8: **Monetary Loss due to Government Intervene**
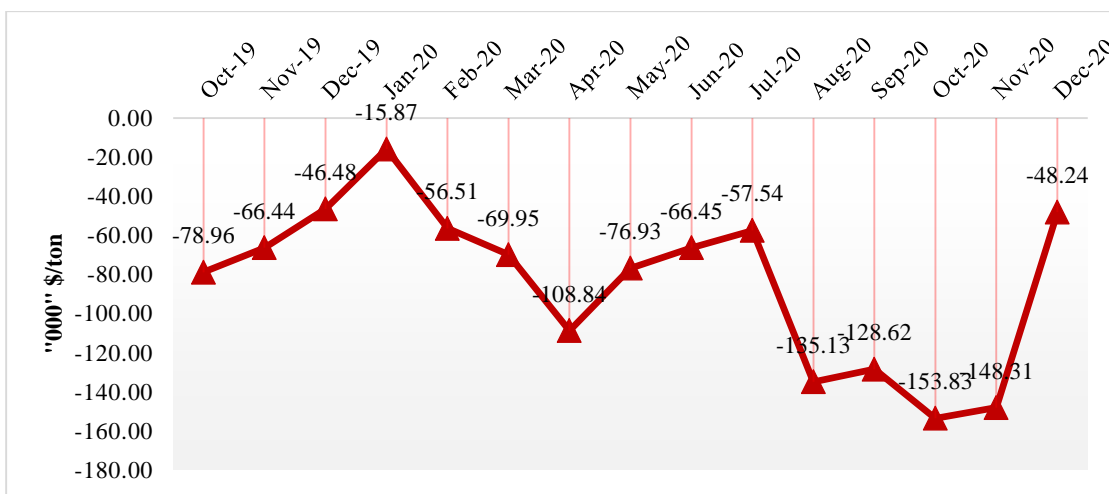
Source of data: www.investing.com/commodity/london-sugar , Pakistan Sugar Mill Association

If a free market exists, there is no need to facilitate the local producers. The government frees the market, and supply and demand automatically create an equilibrium. Even at the domestic level, a

shortage occurs; the government or local producers easily buy sugar from international markets with low prices and sell it on average prices domestically after getting their profit. Under these circumstances, domestic consumers benefit themselves, and general economic welfare increases. The government has given a subsidy of Rs.0.023939 million/ton to local producers from the last decade. Total Rs. 12926 million has been given to local producers.

CHAPTER 6

Conclusion and Recommendations

This chapter defines the major findings and gives a conclusion based on the findings, recommendations and policies, and the last part is study limitations.

6.1. Conclusion

Pakistan is a developing country where most of the farmers are uneducated. They dwell on the same traditional pattern for agricultural production. Their productivity is less as compared to that of the other countries. They rely on the previous crops for seeds to cultivate the same crops in the next season, adversely affecting their productivity. Unfortunately, small growers get guidance from mills between them. Middlemen approach only small farmers just because of their insufficient knowledge. They cut their benefit from farmers' payments like the middlemen approach to Faqeer (Small Grower) to facilitate transportation and payment. He gives money to farmers on time but after cutting his profit. If a farmer's original payments are Rs.350, the middlemen deliver him around Rs.230-250, which is a small amount indeed.

Sugarcane production is higher in Punjab as compared to other provinces. Even in KP, most farmers produce traditional sugar (Gur) compared to other provinces, which is the biggest reason for the low production of sugar. Gur prices in the market are higher as compared to sugar prices. In KP, most of the population consumes Gur as per human behavior. KP and Sindh province consumer more Gur than its consumption in Punjab.

On the other hand, sugarcane is a water-intensive crop. Sugarcane is less profitable as compared to other major crops. There is less monetary profit as compared to cotton or wheat. All these things happen just because of the drawbacks of government policies.

As per data estimations, domestic prices are higher than international prices. As per analysis from the beginning, we have an absolute advantage if the government imports sugar instead of encouraging domestic production. Governments intervene in the sugar market through marketing tools like quotas and subsidies on export and import. It sounds like the government protects private

producers domestically by facilitating them through subsidies and quotas. This drawback of government policy mostly affects both the consumer and the economy. Consumers pay higher prices domestically due to the government intervening in free-market mechanisms. In Pakistan, political elites force the state machinery to run the administrations and the policies to secure their benefit. So, the rest of the stakeholders bear the loss. Even if a government gives subsidies on domestic sales, it is also in the interest of the elite class due to the huge quantity of sugar consumption in the upper class.

The government should allow freedom to the market, which will cause less burden to the consumer, which he faces because of the closed market. There is also a needs to work on research and development projects and cane technology. Everyone faces the loss except private sugar producers. The government is required to open the sugar market where supply and demand automatically create equilibrium in the domestic market.

6.2. Policy Recommendations

- During snowball interviews with sugarcane growers, millers, and institutional experts, the study analyzed that sugarcane production decreased, lack of advanced seed/technology, and knowledge about advanced methods. There is a need to give awareness about sugarcane plantations with advanced methods like seedling, bud chipper, and breeding. By this action, farmers can grow another crop at that period and save more cane due to seed plantation and bud chipper plantation.

- As results show, there is a lack of extension and financial insurance toward farmers from the institutional and Miller side. The payment method is based on sugarcane weight rather than condense sugar in sugarcane. Miller and institution make sure to provide extension and insurance of crop. On the other side payment method should be based on sugar condense or by the end of the product. It will give benefit the economy and all stakeholders.

- As the results show, due to government interference in the market, the government has to pay the high cost of her interference to keep the price at a lower level. As the government has been spending on higher tax money, it could use for another purpose.

- As per estimations, government interference could not manage to offer lower prices to consumers. These analyzed free-market mechanism is the best strategy to keep prices at a low level domestically.

- It can be seen from the results of this study the government give subsidy on sugar at the marketing and consumption level, which is affecting our economy and society to a great extent. The government has given subsidies on sugar consumption domestically for the last decade. The analysis shows 60 percent consumed bakery items and mostly consumed by the upper-class group, another government policy failure as the government has BISP data of poor/lower-income groups. By utilizing this data, the government can make policy in the fever of poor people who live below the poverty line. It can help make a record of sugar consumption. This policy directly subsidized the poor population on sugar consumption.

6.3. Study Limitations:

The study is compiled from the limited sources available. Due to the Covid-19, the respondent sample of the study has been 22 and collected through the Snowball technique. Most of the questions are based on available literature or from the interviews during the Snowball Interviews. There is a language barrier also main constraints during the interviews. There is no data available regarding monthly subsidies due to the sensitivity and confidentiality of the industry. There is less literature on sugar consumption and consumer's behaviors.

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APPENDIXES

I. Appendix: Systematic Review

Research Protocol:

The study protocol of this systematic literature review is based on PRISMA-P 2020 Checklist. The study protocol comprises components that describe the study design/plan. The following mentioned components describe this systematic literature review's study design.

Rationale: identifying the lags and difficulties look in Input supplies during sugarcane production, at the marketing level, and consumption level due to pricing and government disturbance.

Research Questions/Objectives: A well-defined set of structured research questions based on the (PICO) Population, Intervention, Comparison, and Outcome of the selected studies.

Eligibility Criteria: A set of structured statements used for inclusion and exclusion of studies to be reviewed.

Information Sources: Sources or databases through which studies will be searched and obtained for the review.

Search Strategy: Development and listing keywords from the research questions, development of search string based on 3 W's and H; Why, Where, What, and How, and documentation of studies. Assessment is done through quality assessment tools/checklists/forms. This study has used a quality assessing form to elevate biases and to ensure the validity of included studies. This quality assessing form is based on the studies' objectives, methodologies, and findings.

Data Extraction: Tools like data extraction form are used to extract detailed information on objectives, methodology, and findings of the included studies for the analysis/review to justify and explain the research questions.

Data Synthesis: The evaluation and interpretation are made at this stage. This systematic review is done descriptively. A qualitative analysis has been done in this review study.

Research Questions Framework based on PRISMA-P 2020 PICO

Population	Literature has been arranged around value chain stakeholders like; input supplies, marketing (retailers, wholesalers), and consumption of sugar.
Intervention	Investigate the problem and hurdles stakeholders bear under government interference and pricing variation.
Comparison	Value chain stakeholders main pillars under free-market ensure a smooth and linear approach in the agricultural economy
Outcome	Identifying how much the government destroys the market mechanism and all three stakeholders. How efficiently input suppliers, distributors, and consumers (consumption) work with free-market.

Search Strategy Framework:

Which	A computerized technique has been used to analyze systematic overview.
Where	Open access and e-databases have been used to find the studies. Total 6 databases; JSTOR, Springer Link, Taylor and Francis Journal, ELSEVIER, Emerald, and Research Gate have been used along with the grey literature. Snowballing Method used to search literature from references list.
What	Literature has been searching for government interference, and pricing impact on three value chain stakeholders conduct this systematic descriptive review
How	It took around 2 and half months to gather the data for the review.

Documenting for Research:

Data Source	Documentation
HEC Digital Library	Name of database: JSTOR Search Strategy for the database: random forward and backward strategy. Name of database: Springer Link Search Strategy for the database: random forward and backward strategy. Name of database: Emerald Search Strategy for the database: random forward and backward strategy.
Google Scholar	Name of database: ResearchGate The snowballing strategy has been used for Research Strategy from list of references.

II. Appendix: Main Stakeholder Interviews: (Government Institute)

Name of institutes: _____

1. Sugarcane and sugar prices are higher than international prices in previous years. Does it show that you protect the domestic producer and benefit from the international market? Why?

2. Does government interfere in the Support Price Setting? Reason and why?

3. Sugarcane is a water-intensive crop compared to other crops; our country faces a water shortage, so why do we produce water-intensive crops?

4. For water management in agro-sectors, why are we not involving the private sectors to manage the water supply?

   · By bidding, select the private sector for water management.
   · Infrastructure management benefits lower-income groups on other crops.

5. Sugar gets more subsidies for export even on imports; even water management is also a big issue regarding sugarcane production. So, why cannot these investments in other crops benefit other groups of farmers and stakeholders?

6. Why does the government only support sugarcane producers?

7. Why does it not set support prices that stimulate the production of other crops?

8. We have a comparative advantage on import of sugar then why do we produce domestically?

9. Why could the sugar sector not go for privatization?

10. Why is the government not introducing a financial sector for sugarcane and sugar stakeholders?

11. There are few research and developments institutes to promote sugarcane production. Why is the government not working on it?

12. Why cannot sugar producers go for the by-products of sugarcane and sugar? Which are more profitable as compared to sugar?

13. Why are we not introducing by-products with brand labeling?

III.   Appendix: Mill Questionnaire

Name of Mill_____

Location of Mill_____

1. What problem do you face from the farmer's side?

2. What is the frequency of payment to farmers?

3. Approximately how much of total purchases of sugar cane come from lease land production?

4. Approximately how much of the total purchases of sugar cane come from direct purchases from farmers?

5. Do you guide farmers regarding input usage and production patterns?

6. Do you give transportation facilities to farmers? How much do you gain from it?

7. Do you involve/hire a middleman to communicate with farmers?

8. Did you mention the quantity and quality of sugarcane to farmers at the time of sowing?

9. What are the main problems and issues from the government side?

10. What problem do you face when the government sets a date for sugarcane crushing?

11. Does the government support pricing effects on your production of sugar?

12. Sugar prices are getting higher day by day compared to the world. What is the main reason for it?

13. Did you agree on the privatization of the sugar sector?

14. Did you support the open market mechanism?

15. Did you agree with more mill establishments?

16. Do you agree on government interference in the mill establishment? Is it good or bad?

17. Do you have Laboratory for checking water condenses in sugarcane?

18. Did you agree on a payment method used by this farmer; sugarcane weight+ sugar condense?

19. What is the main source of financing?

20. How much do you get financial support/assessment from the government?

IV. **Appendix: Interview Questions for Farmers**

Name of Farmer_____

Location _____

1. What do you think about financial sector development regarding loans on inputs?

2. Did you receive support prices from the mill set by the government?

3. How much do you get benefits from support pricing?

4. What problems do you face from the side of mills?

5. What was mill's behavior with you regarding payment?

6. How much exploit your production due to mill behavior?

7. Which tactics do you face by mills?

8. Is there any role of an intermediary? How much does it exploit your production?

9. Is there any guidance about the quality or quantity of sugarcane?

10. How much knowledge do you have about the marketing prices of sugarcane?

11. What are the main hurdles that you have faced?

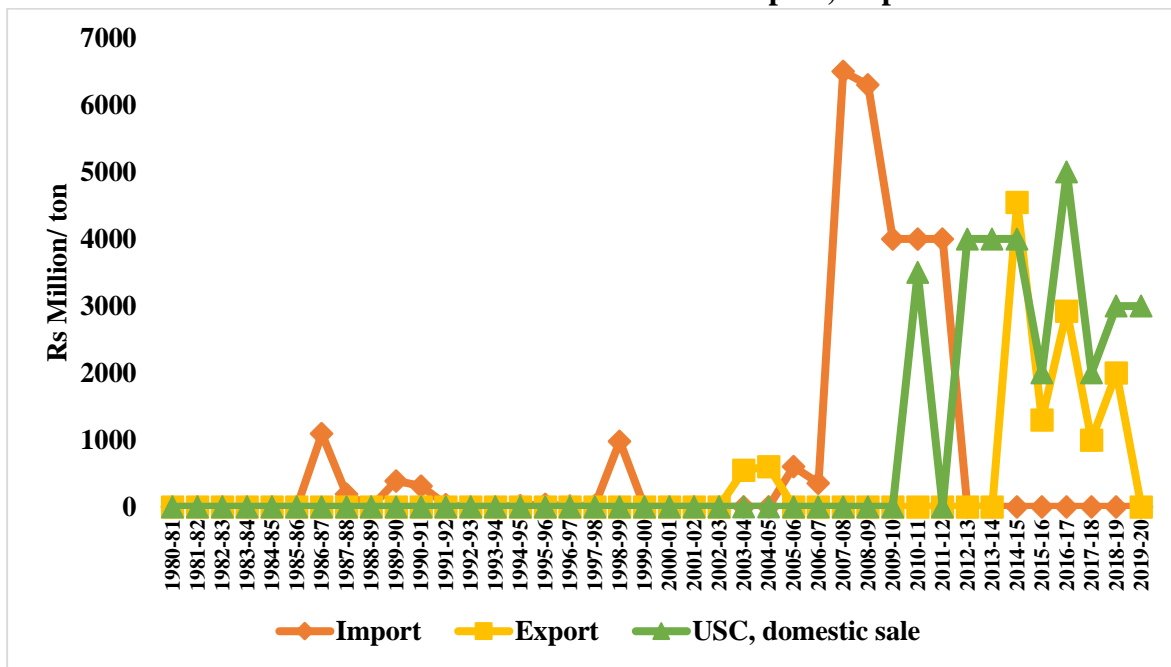## V. Appendix: Government Bear Loss by Intervene in Market from 1980 to 2020
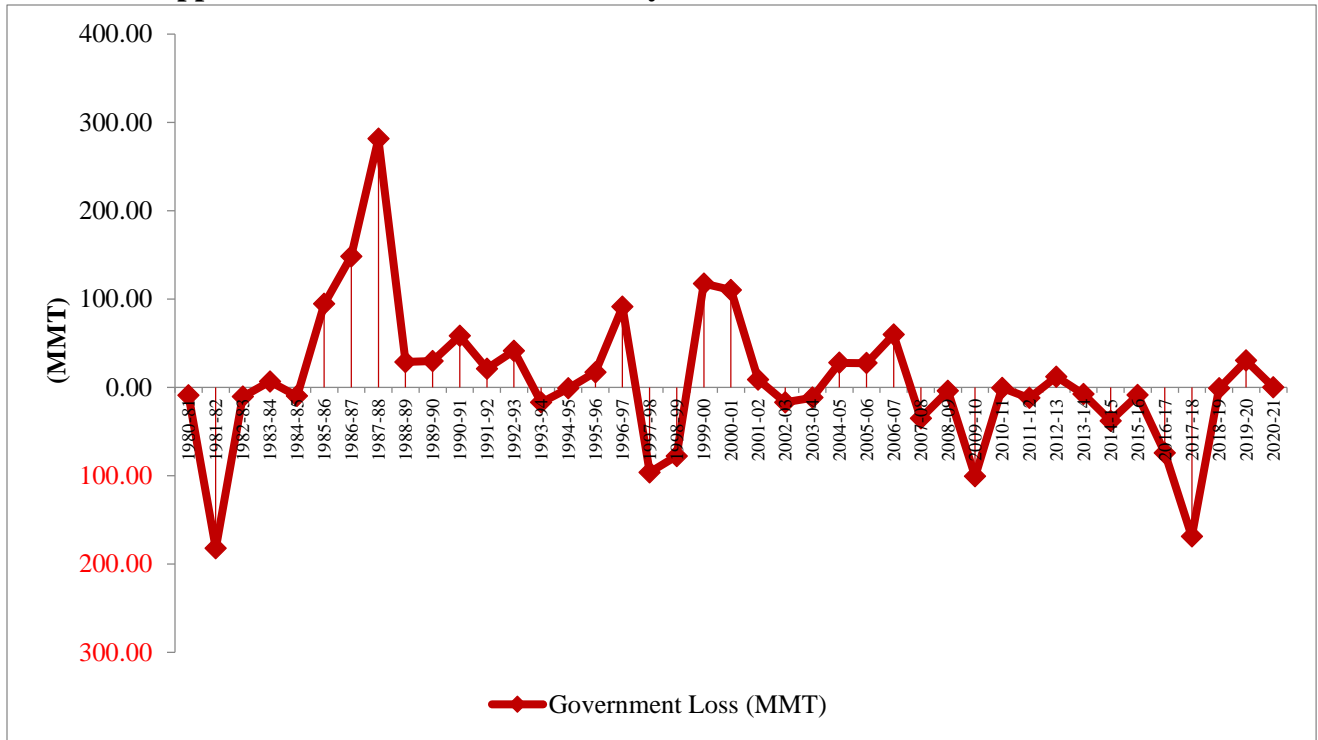
*Source of Data: PBS, GOP, FAO, SBP

VI. Appendix: Sugar Previous Leftover Stock from 1980 to 2020.

Domesticaly Previous Leftover Stock from 1980-2020
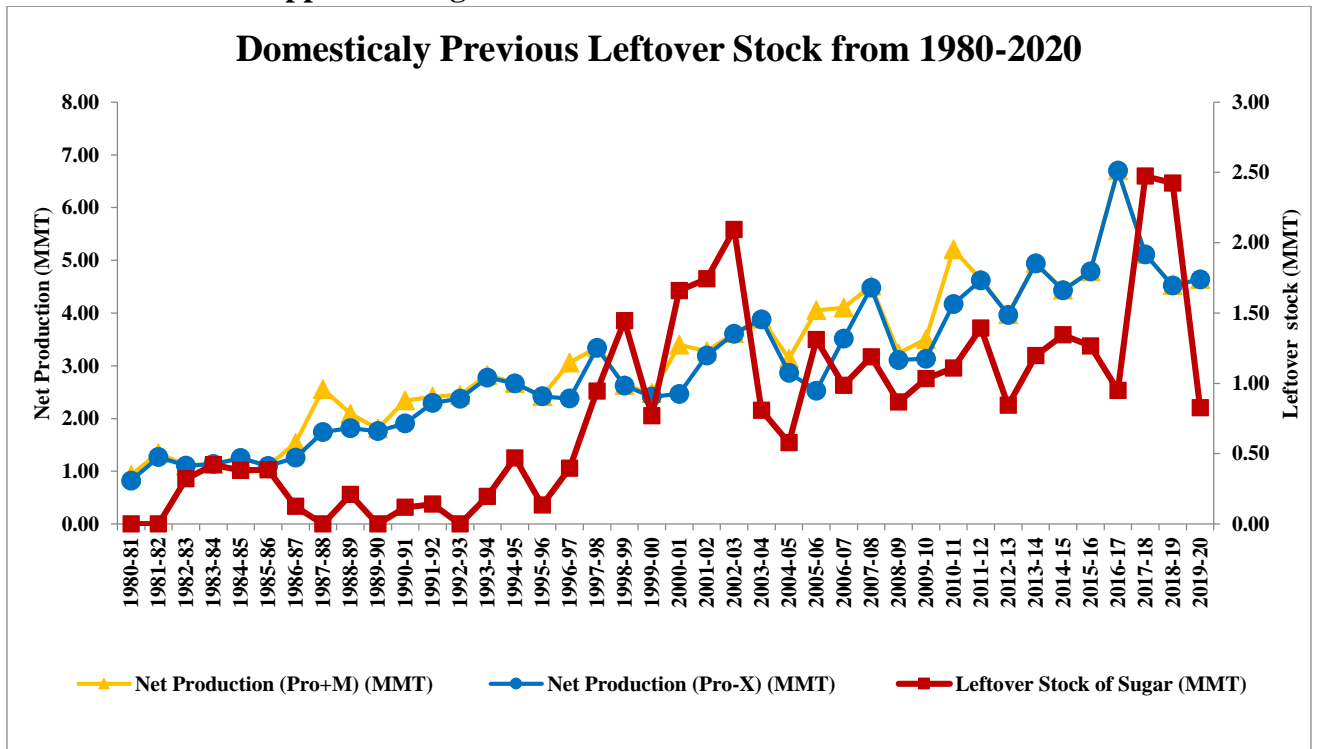
Source of Data: National Agriculture Research Center, PBS, GOP

VII.   Government Bear loss in terms of Subsidies on Export, Import and Domestic Sale

*Source of Data: National Agricultural Research Center (NARC)