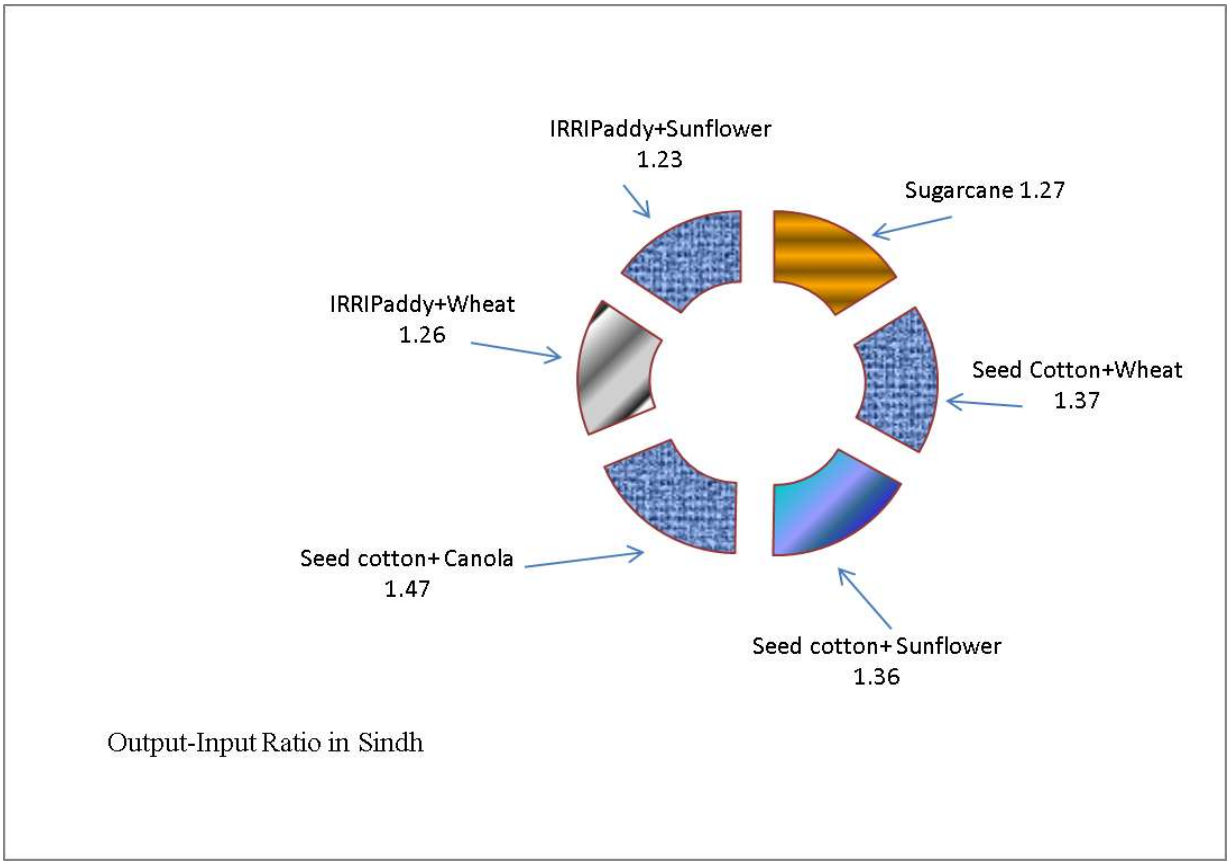
API SERIES NO. 282

SUGARCANE POLICY ANALYSIS FOR 2022-23 CROP



Output-Input Ratio in Sindh

AGRICULTURE POLICY INSTITUTE
MINISTRY OF NATIONAL FOOD SECURITY AND RESEARCH
GOVERNMENT OF PAKISTAN
ISLAMABAD

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Preface

The fundamental objective of this report is to provide information on various economic aspects of the sugarcane crop. In this context for dynamic agricultural cost and price environment, price policy is increasingly becoming concern with anticipating future movements in agricultural production and prices and facilitating the adjustment process to those movements.

The Principal product of this institute is the economic analysis, which culminates in the recommendations to the Government with respect to minimum support price and other relevant aspects of price policy. These reports, in general, and this report, in particular, is the product of substantial background study; compilation of cost of production, widespread enquiry into markets, both at home and abroad; detailed analysis of international price data; technical studies (NPC, EPC, DRC); interviews of the farmers, including field visits; and consideration of a large number of non-price factors.

We as API, collectively owe thanks to all the committee members and participants of the various meetings, for their valuable discussion and input, Federal and Provincial Governments for sharing of information, without all that it would have not been possible to complete.

API greatly appreciates feedback and suggestions ranging from policy makers to planners, academia, researches, student community, growers/farmers associations, chambers of agriculture, traders etc. We are looking forward for a continued partnership in the formulation of price policy analysis and producing effective and applicable reports akin to agriculture and food security.

(Abdul Karim)
Director General

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ABBREVIATIONS

AARI	:	Ayub Agricultural Research Institute
API	:	Agriculture Policy Institute
BCR	:	Benefit Cost Ratio
C&R	:	Cost and Freight
CIF	:	Cost, Insurance and Freight
COP	:	Cost of Production
CPI	:	Consumer Price Index
DRC	:	Domestic Resource Cost
ECC	:	Economic Coordination Committee
E&M	:	Economics & Marketing
EPC	:	Effective Protection Coefficient
FAO	:	Food and Agriculture Organization
FOB	:	Free on Board
FSC&RD	:	Federal Seed Certification and Registration Department
FYM	:	Farm Yard Manure
HIES	:	Household Integrated Economic Survey
GDP	:	Gross Domestic Product
NARC	:	National Agricultural Research Centre
NFS&R	:	National Food Security and Research
NPC	:	Nominal Protection Coefficient
NSC	:	National Seed Council
OLS	:	Ordinary Least Squares
PARC	:	Pakistan Agricultural Research Council
PBS	:	Pakistan Bureau of Statistics
PSMA	:	Pakistan Sugar Mills Association
SRDB	:	Sugarcane Research and Development Board
TCP	:	Trading Corporation of Pakistan
WTO	:	World Trade Organization

TECHNICAL INPUT FOR THE PROVINCES FOR DETERMINATION OF INDICATIVE PRICE OF SUGARCANE, 2022-23 CROP

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I. Background

Sugarcane is the second largest cash crop of Pakistan, providing raw material to the second largest agro-industry i.e Sugar sector, after the textile. A significant portion of the rural farming community and the urban population is engaged in this enterprise/business. Globally, Pakistan, is a major producer, standing at 4thposition in terms of area and 5thin terms of production[1]. However, the productivity is far below (38th) as compared to other cane producing countries. Sugarcane is mainly grown in Pakistan for sugar production; however, it also produces numerous valuable by-products like, chemicals and alcohol, used by the pharmaceutical industry, ethanol used as fuel and exports, bagasse for paper and chip-board industry, press mud used as rich source of organic matter and nutrient for crop production, etc. In aggregate, the crop is an important source of income and employment for the rural and urban masses.

2. In view of this significance of the crop in the national economy, it is essential that sugarcane is grown continuously. Also, it is important that the production of sugarcane is expanded to meet the increasing demand for sugar as essential food commodity, mainly for the exponentially growing population. These settings are met once the farming community is earning from the crop and to ensure this proposition, the fundamental objective should be ensuring a price incentive to the farmers, essentially to encourage them to stay in the enterprise. During the harvest season, the price of farm commodities is observed keeping suppressed to the disadvantage of the growers. Announcement of Indicative Price is one of the tools, which the governments apply, particularly where the markets function under imperfect condition.

3. The economic analysis of the crop is carried out for multiple purposes including providing technical input to the provinces for determination of indicative price. This analysis is based on a number of key economic factors including the growth trends in production, cost of production estimates, import and export parity prices, domestic price of cane in the post-harvest/crushing season, domestic consumption requirements, price stabilization efforts, economics of sugarcane and competing crops, nominal and real prices, economic efficiency, domestic and global demand, supply, stocks, trade, non-price measures, etc. Consultation is carried out with the farmers/representatives of farmers' organizations, associations, chambers of agriculture, provincial agriculture extension and research, PSMA, ZTBL, PARC, etc. Field surveys are also carried out to gather primary data on inputs, farm production practices, custom-hire rates, etc.

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[1] Food and Agriculture Organization of the United Nations.

II. Production and long-term trends

4. Sugarcane production, during 2021-22 is estimated at 88.759 million tons[2] reflecting an increase of 9.6 per cent over the last year. This increase is attributed mainly to 9.2 per cent expansion in area and 0.3 per cent improvement in the yield. During the last decade (2011-12 to 2021-22), the annual growth trends in area, yield and production of sugarcane crop in all provinces were observed on positive side. Sugarcane production in Pakistan increased on average 3.1 percent annually throughout the period referred, owing to 2.4 percent improvement in yield and @ 0.7 percent expansion in area under the crop.

5. In the Punjab, sugarcane production during 2021-22 was reported at 63.945 million tons, which displays an increase of 12.2 per cent over the last year. This increase is credited largely to the 11.9 percent expansion in area and 0.3 per cent improvement in the yield. During the last decade, sugarcane production in the Punjab has been increased by 3.3 per cent per annum as a result of 2.9 per cent improvement in yield and 0.4 per cent expansion in area. This contribution of productivity (88%) in the increased production is significant and very encouraging, unlike the traditional pattern of depending on expansion in the area under the crop.

III. Domestic Price of Sugarcane

6. The price of cane received by the farmers during 2021-22 prevailed largely above the indicative price. Attracted by the comparatively better prices in the province of Sindh, supplemented by the higher indicative price announced by the Provincial Government, it was observed that sugarcane from southern districts moved to the adjacent areas in Sindh. The second important factor was the higher prices of sugar, which helped pushing the price of cane above the indicative price.

IV. International Prices of Sugar

7. The behavior of international prices of raw (fob Caribbean ports) and white (fob London) sugar has been observed fluctuating during the decade of 2011-22.During 2011–12, the price of raw sugar (Caribbean port) averaged US $499.96 per ton, which decreased continuously to US $307.69 per ton during 2014-15. In next couple of years, prices increased slightly, however, again declined averaging at US $276.23 per ton in 2019-20. Resurfacing again in 2020-21, the price touched$ 416.57 per ton in 2021-22 (Oct-Apr). An identical pattern was observed for London daily price of white sugar, declining from $607.2/ton to $378.96 in 2014-15, regaining

[2]Provincial Agriculture Department (Crop Reporting Service).

briefly in 2016-17 at $464.16, sliding again to $337.84, but reverting to the 2nd highest level of $509.27/ton in 2021-22 (Oct-Apr)[3].

V. Import of Sugar of Import Parity Price of Sugarcane

8. Pakistan is producing considerably higher quantities of sugar, largely for the domestic consumption. Despite the record domestic production of sugar, around 8.0 million tons during 2021-22, huge quantity of sugar was imported during 2021-22[4], as shown in the table below:

Year	Import of sugar Quantity (000 ton)	Value	
		(US $ 000)	(Rupees 000)
2021-22	312.39	191,719.00	32,913,148.44

9. The import parity price of sugarcane, based on average FOB London price of white sugar at USD 531.18 (Sept 2022) is estimated at Rs 520.22 per 40 kg in the Punjab. Similarly, the export parity price, based on average FOB London price of white sugar at USD 531.18 (Sept 2022) is estimated at Rs 345.38 per 40 kg. These prices are considerably higher than the indicative prices announced by the provincial governments and illustrate that the domestic sugarcane is available to sugarmills at relatively lowers prices.

VI. Cost of Production Estimates

10. Cost of production is an important factor in evolving suggestions for indicative price of the sugarcane crop. Its importance is well acknowledged due to wide spread impact of government policies on input prices. Different government policy initiatives may affect inflation and alter subsidy and tax structure for agricultural inputs which eventually tend to change cost of production of crops.

11. Agriculture Policy Institute gathers field data on different elements to assess cost of production of the concerned crop. These estimates provide guidance in determining the indicative price of the crop. Cost of production of sugarcane for 2022-23 crop has been estimated using customary input-output parameters, different inputs like seed, fertilizers, number of sprays, number of irrigations (tube well and canal) and number of tractor-run operations made for preparing soil and sowing seed and number of hoeing, etc.

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[3] International Sugar Organization.
[4] Pakistan Bureau of Statistics, Islamabad.

Cost of Production Estimates

Province	Sugarcane 2022-23 Crop (Rs per 40 kgs)
Punjab	245.31
Sindh	256.95
Khyber Pakhtunkhwa	254.99

12. The primary factors, which contributed to the rise in cost of cultivation of sugarcane are; increase in the price of fertilizers, plant protection, irrigation and the land rent, etc.

VII. Likely Price Policy Options

13. The economic analysis has been carried out for determining the Indicative Price for Sugarcane 2022-23 Crop, and results of the analysis are summarized as below:

Indicative Price Policy Options based on:	Sugarcane Price at Mill-gate (Rs per 40 kgs)	
	Punjab	Sindh
1. Cost of production estimate	245.31	256.95
2. Indicative price for 2021-22 crop (Announced by the Provincial Government)	225.00	250.00
3. Sugarcane prices worked back from average prices of sugar assumed for different slabs:		
a) Rs. 85,000 per ton	231.51	239.24
b) Rs. 90,000 per ton	245.13	253.31
c) Rs. 95,000 per ton	258.75	267.38
d) Rs. 100,000 per ton	272.37	281.45
4. Average price received by cane growers for 2021-22Crop at mill gate (based on API Field Survey)	240.00	262.00
5. Import Parity based on average fob London price of white sugar at US $ 531.81/ton (Sept 2022).	520.22	538.10
6. Export Parity based on average fob London price of white sugar at US $ 531.81/ton (Sept 2022).	345.38	356.90

VIII. Recommendations for Indicative Price of Sugarcane

14. Notwithstanding the fact that the price of a commodity drops to the disadvantage of the growers during post-harvest period, particularly in case of a bumper crop, conversely, the growers of sugarcane got higher prices than the indicative price. The main reason of this remunerative price was the increased demand for sugarcane, mainly for the higher prices of

sugar in domestic as well in the international market. By virtue of this upward trend, Pakistan was able to produce surplus sugar which helped the market to stabilize. Introduction of track and traceability system by the Government also helped considerably in the documentation of the commodity.

15. The prevailing scenario particularly after the devastating floods leads to the conclusion that the prices of sugarcane would be moving upward in the country. The analysis of different economic parameters such as cost of production, parity prices of sugar, prices of sugarcane realized by the growers during 2021-22, domestic and international market prices of sugar, import of sugar, etc. also suggests in the same direction.

16. Moreover, the consistent increase in CPI during 2015-16 to 2021-22, indicates that the real value of the commodity is declining. Hence, it would be suggested that to ensure flow of smooth returns to the farmer, the inflationary trend needs to be controlled/slowed down. It is suggested that the Indicative price of the commodity be determined at a rewarding level, keeping a provision for fair level of margin for the grower to stay in the crop. Secondly, it is essential that the Indicative price is announced well before the start of sowing season, implementation is ensured in true spirit and the market distortions are minimized.

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SUGARCANE POLICY ANALYSIS FOR 2022-23 CROP

INTRODUCTION

Sugarcane is a valuable cash crop that contributes significantly to the economic well-being of Pakistan's farmers. Sugar is considered as an essential and basic commodity by consumers all around in the world. For sugar production, sugarcane is considered to be the primary raw material. In Pakistan, sugarcane cultivation approximately occupies 1.27 million hectares of land.

2. Sugarcane is one of the largest cash crops of Pakistan, as well as it is second largest agro-industry sector after textile industry. It generates significant income for all the stake holders. Pakistan plays a significant role in determining international price, demand, and supply and stocks position of sugar. Sugarcane is primarily grown for sugar production; however, it also produces numerous valuable by-products such as alcohol which is used in the pharmaceutical industry, ethanol which is used as fuel and exports, bagasse which is used in the paper and chip board industry and press mud used as rich source of organic matter and nutrient for crop production. It is an important source of income and employment for the farming community.

3. During the winter, the sugar mills use sugarcane waste to generate electricity and sell to the WAPDA. It is also a major source of livestock fodder. The sugar industry, located in the countryside, provides employment opportunities for rural labourers, as well as skilled and semi-skilled workers. Sugarcane farming and the sugar industry have made substantial contributions to rural development.

4. During the period 2011-12 to 2021-22, the annual growth rates of area, yield, and production of sugarcane crop in all provinces are positive. According to second estimates of Provincial Agriculture Departments (Crop Reporting Service), sugarcane production at the country level for the 2021-22 crop is reported at 88.759 million tons, reflecting an increase of 9.6 per cent over last year's production of 81.009 million tons. The increase in production is contributed by 9.2 percent expansion in area under the crop, while the yield had a miniscule role i.e 0.3% over the last year.

5. Pakistan holds a significant position among the world's sugarcane producing countries. According to World Statistics Year Book 2020, Pakistan ranked 5th in acreage and 4th in production, but it ranked 32nd in yield (69.76 tons/ha during 2021-22), which is close to the world average yield of 70.44 tons/ha. Peru has the highest yield in the world at 124 tons/ha, which is 77 percent higher than Pakistan. With remarkably similar soil and climate conditions, India achieves a sugarcane yield of 79.35 tons/ha, which is about 11% higher than Pakistan.

6. API conducts an annual field survey in the major producing districts of Punjab, Sindh, and Khyber Pakhtunkhwa. Detailed discussions about sugarcane production and marketing are taking place in this survey with growers, crop experts, and mill management. The updated custom hire rates of agriculture operations relating to the cost of production and marketing problems encountered by growers are gathered in order to prepare the Sugarcane Policy Analysis Report for the formulation of indicative price of sugarcane and for the policy advice by the Ministry of

National Food Security and Research. A summary of this analysis and report is also shared to provinces for the purpose of determining and implementing the sugarcane indicative price.

7. The Punjab government announced the indicative price of sugarcane at Rs 225 per 40 kg for 2021-22 crop. Throughout the season, the price of sugarcane fluctuated significantly. At the start of the season, prices were around 290/40 kg. Sugarcane prices gradually declined fluctuating between Rs 200 to 280 per 40 kg. Farmers received an average price of Rs 221/40 kg from middlemen, while the mode price was Rs 215/40 kg. Mill gate prices of cane ranged between Rs. 225 to 265 per 40 kg. Farmers reported an average price of Rs. 240/40 kg, with a mode of Rs 225/40 kg. The pending arrears against the sugar mills were also reported by the cane growers. Sugarcane is being cultivated as intercropping with other crops like rapeseed, maize, berseen (fodder) and wheat etc. Sugarcane grown with maize fodder was sold to Rs 44000 per acre. Berseen with sugarcane sold at Rs. 120,000 per acre. Production from intercropping of the wheat production with sugarcane is reported between 25 to 30 maund per acre.

8. To avoid the conflict between farmers and sugar industry, it is necessary to develop a contract between growers and sugar mills for supply of sugarcane on prefixed price. The sugar mills may help the farmers in production of sugarcane in the form of subsidized input supply. Agriculture Extension department in provinces should play its role actively and provide technical assistance particularly on new technologies to the growers at farm level, tremendous improvement can be achieved.

9. For the formulation of the Sugarcane Policy Analysis report, an annual meeting of API Committee on sugarcane was held on 6th September 2022, attended by researchers, progressive growers, representative of farmers associations, sugar industry and senior officers of provincial agriculture extension departments. The participants discussed at length issues concerning cultivation and marketing of sugarcane and the views expressed have been dully considered in formulating the recommendations.

2. SUGARCANE PLANTING AND HARVESTING SEASONS

10. Sugarcane is a tropical crop which requires temperature more than 20°C for proper germination and growth and two months of dry and cool weather towards maturity. In Pakistan, the climatic conditions allow for an annual sugarcane growing season of 8 to 10 months. Table-1 shows the recommended planting dates for sugarcane spring and autumn crops of sugarcane per province.

Table-1: Planting and Harvesting Times of Sugarcane by Province

Province	Planting Time	
	Spring Crop	**Autumn Crop**
Punjab	15th February to 3rd week of March	September
Sindh	1st February to 15th March	September to 15th October
Khyber Pakhtunkhwa	15th February to 3rd week of March	September
Harvesting Time		
Punjab, Sindh, Khyber Pakhtunkhwa	15th October to 1st March	

Source: Sugarcane Coordinator, NARC, Islamabad.

3. PROVINCIAL SHARES

11. The section supplemented by the graphical presentation describes Provincial shares in sugarcane area and production.

3.1 Area and Production

12. Table-2 shows the shares of sugarcane area and output of sugarcane from 2011-12 to 2013-14 and 2019-20 to 2021-22 as well as variations over the time.

Table-2: Comparison of Provincial Shares in Area and Production of Sugarcane: 2011-12 to 2013-14 and 2019-20 to 2021-22

Country/Province	Area			Production		
	Average 2011-12to 2013-14	Average 2019-20 to 2021-22	Change	Average 2011-12to 2013-14	Average 2019-20 to 2021-22	Change
	---------- Percent ----------					
Pakistan	**100.00**	**100.00**	**-**	**100.00**	**100.00**	**-**
Punjab	68.05	65.85	-3.2	68.34	69.57	1.8
Sindh	22.06	24.76	10.9	23.80	23.17	-2.7
Khyber Pakhtunkhwa/Balochistan	9.89	9.39	-5.6	7.86	7.25	-8.4

Source: Worked out from Annex-I.

13. Punjab, Sindh and Khyber Pakhtunkhwa/Balochistan share respectively 66, 25 and 9 percent in area and 70, 23 and 7 percent in production. Over the time, the share of Punjab has gone down by 3.2 percent in area while gained 1.8 percent up in production. In Sindh, area has been increased significantly; however, the production has been decreased. In case of Sindh area share is up by 10.9 percent and that of production is down by 2.7 percent. In the Khyber Pakhtunkhwa /Baluchistan, area share is down by 6.0 percent and 8.4 percent in production share. Provincial shares are also depicted in Figures 1 to 4.

4. IMPORTANT SUGARCANE PRODUCING DISTRICTS

14. Sugarcane is a high delta crop, grown in irrigated conditions. The districts which grow 100 thousand tons or more of sugarcane are, R.Y.Khan, Faisalabad, Sargodha, Muzaffargarh, Rajanpur, Jhang, Chiniot, T.T Singh, Bhakkar, Kasur, M.B Din, Bahawalpur, Layyah, Vehari, Bahawalnagar, D.G.Khan, Nankana Sahib, Okara, Khanewal, Khushab, Hafizabad, Lodhran, Multan, Mianwali, Sahiwal, Sheikhupura, Gujrat and Sialkot in Punjab and Ghotki, Thatta, Nawabshah, N.Feroze, Khairpur, Badin, TandoAllahyar, Tando Muhammad Khan, MirpurKhas, Matiari, Sanghar, Badin, Sukkur, Dadu and Hyderabad in Sindh while Charsadda, D.I Khan, Mardan, Peshawar, Malakand and Nowshera, from Khyber Pakhtunkhwa. These 48 districts; 28 from the Punjab, 14 from Sindh and 6 from Khyber Pakhtunkhwa collectively account for 99 per cent of the sugarcane area and production (Annex-III).

FIG-1: SHARES IN AREA

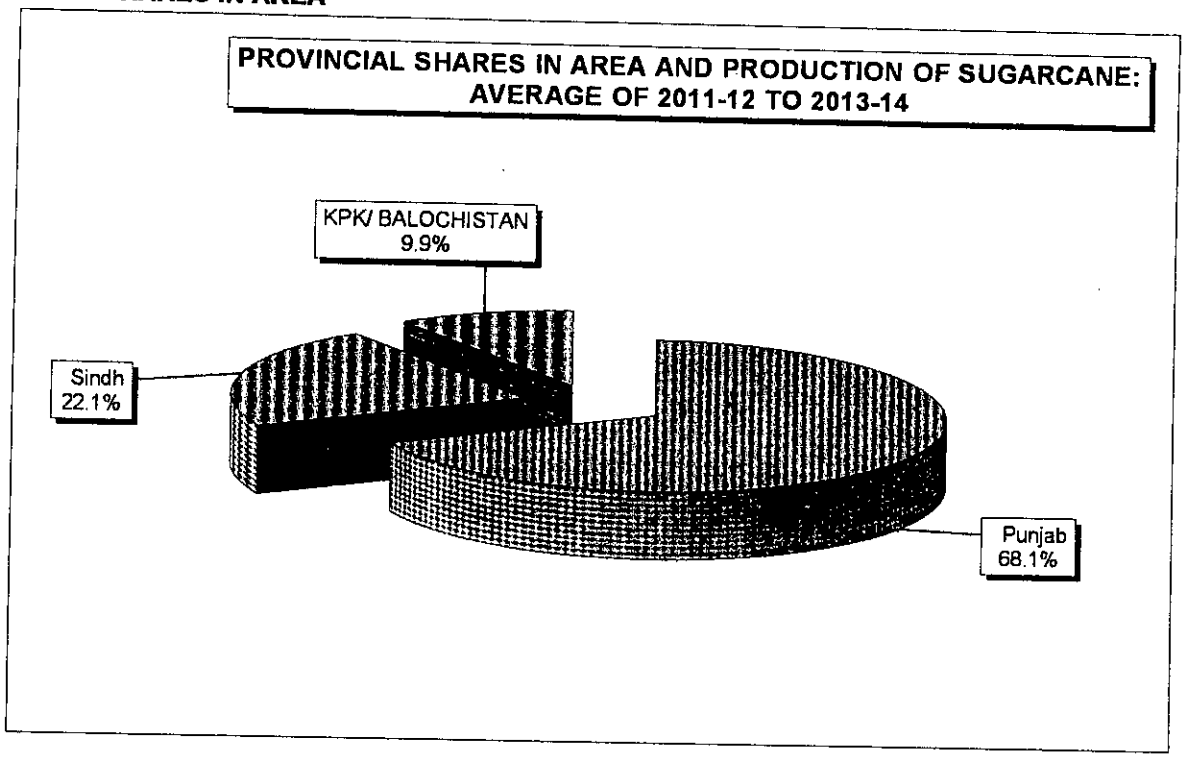
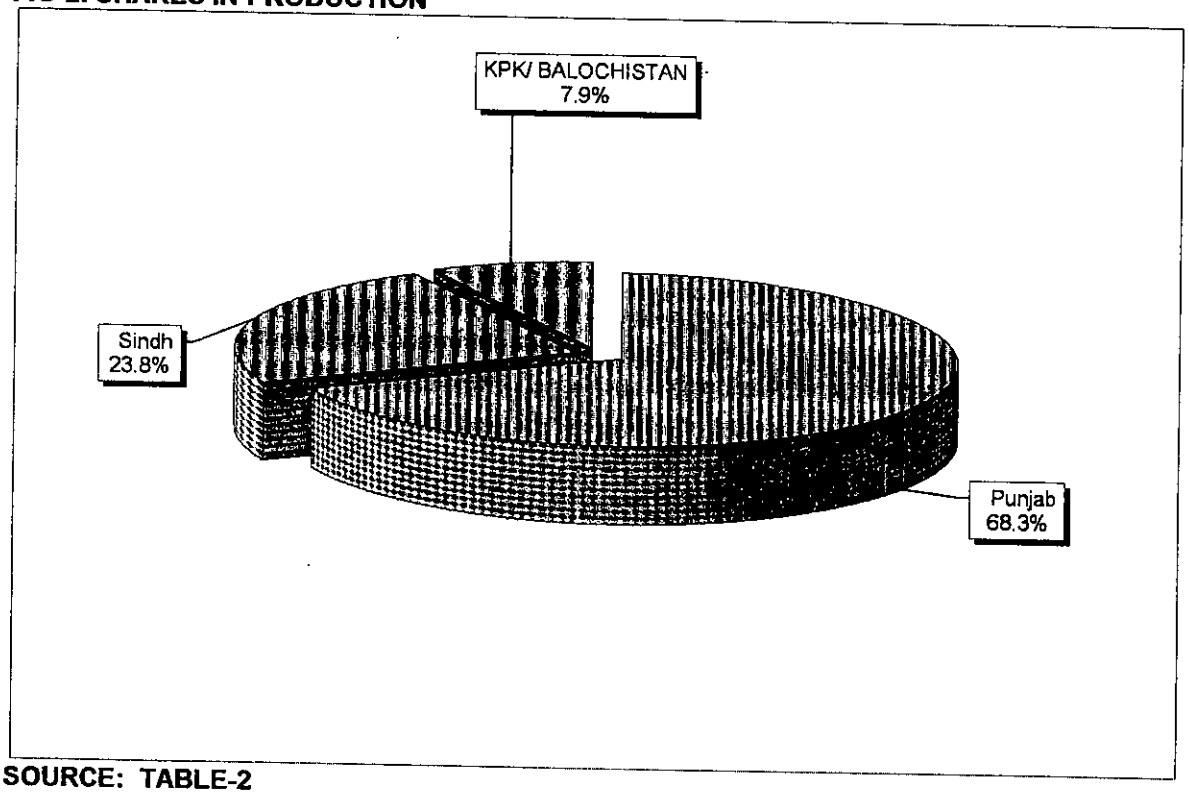


FIG-2: SHARES IN PRODUCTION



SOURCE: TABLE-2

FIG-3: SHARES IN AREA

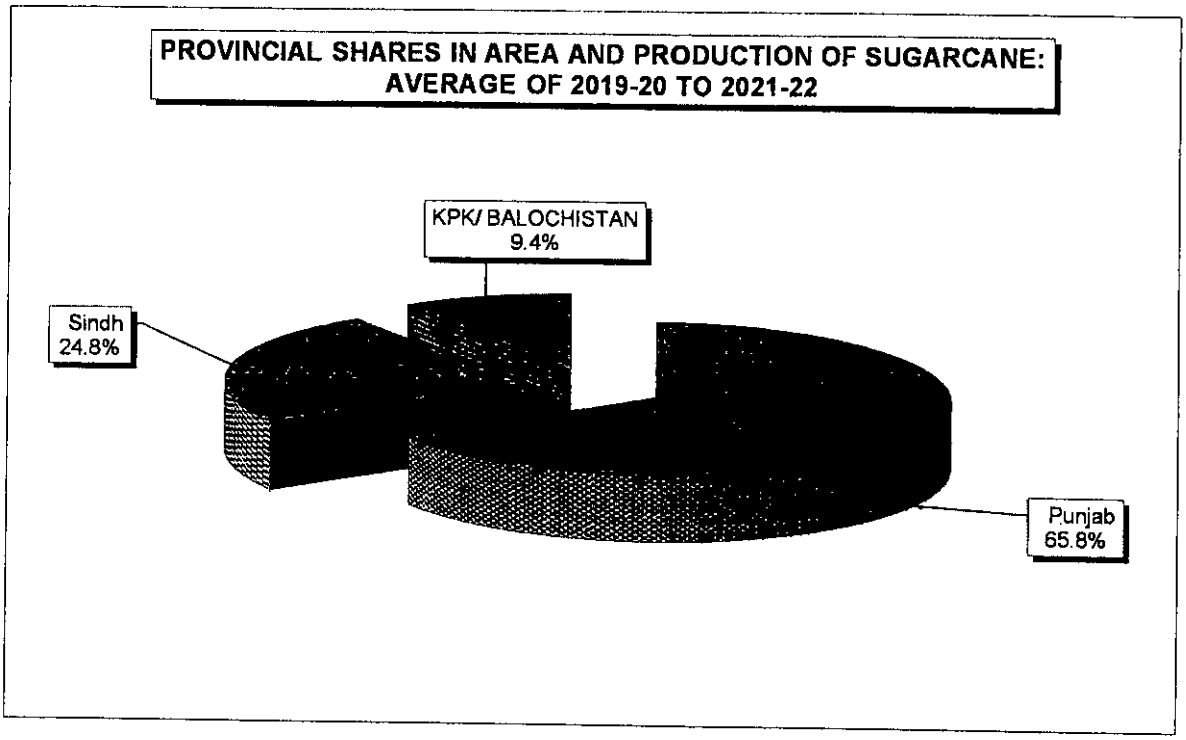
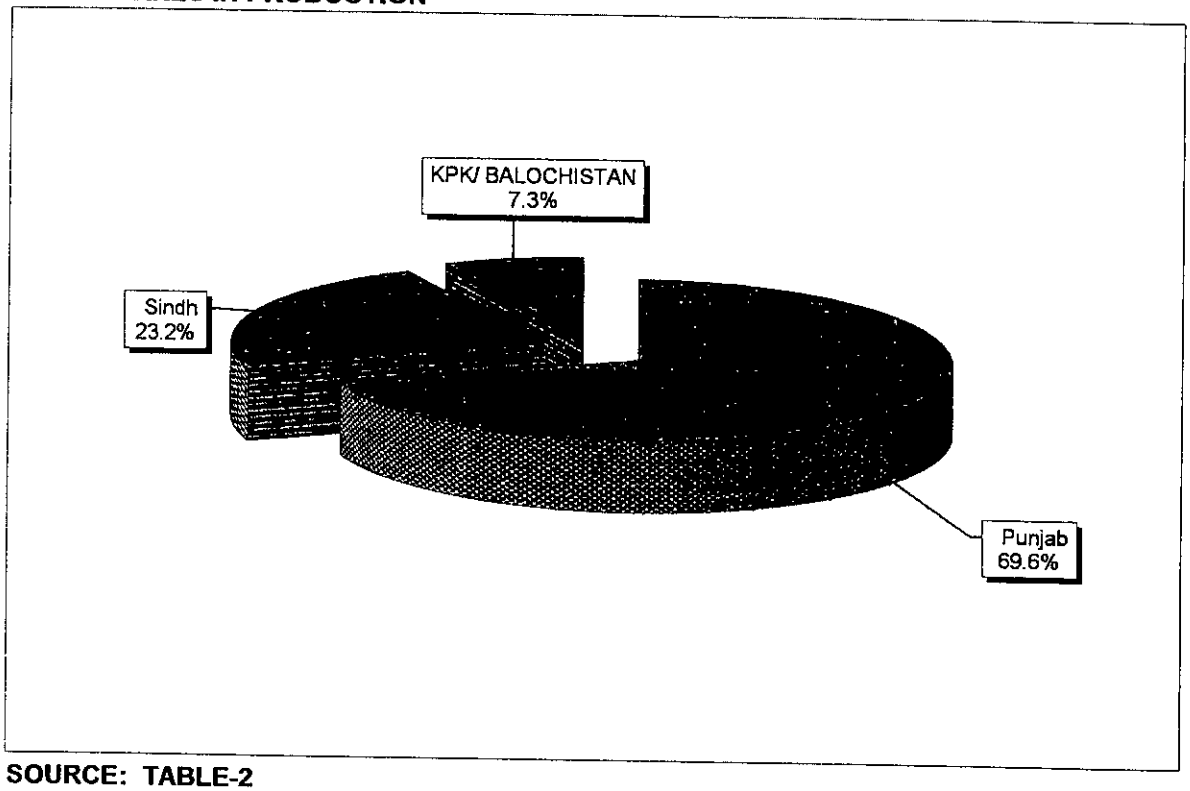


FIG-4: SHARES IN PRODUCTION



SOURCE: TABLE-2

15. The largest 10 districts including R.Y.Khan, Faisalabad, Sargodha, Muzaffargarh, Rajanpur, Jhang, Chiniot, in Punjab, and Ghotki, Thatta, Nawabshah, in Sindh collectively produce over 57 per cent of the total sugarcane in the country.

5. CHANGES IN AREA, YIELD AND PRODUCTION

16. Throughout the decade ending 2021-22, the area under sugarcane crop at country level ranged between 1,309.8 to 1,341.8 thousand hectares (2,569.4 and 3,315.6 thousand acres) and production from 58.397 to 83.333 million tons. Yield of sugarcane fluctuated between 55.09 to 70.34 tons per hectare (Annex-I and II).

17. Long-term and short-term changes in area, yield and production of sugarcane are discussed below:

5.1 Long-term Changes (Growth Rates):

18. During the last decade (2011-12 to 2021-22), the annual growth rates of area, yield and production of sugarcane crop in all provinces are positive. The growth trends in Balochistan have depicted the highest in terms of area and production. This potential indicates that re-location of a sugar mill in the area might greatly enhance sugarcane production, if the climate and water resources permit this preposition, without encroaching other important crops.

19. Sugarcane production in Pakistan increased by 3.1 percent each year throughout the time stated, owing to a 2.4 percent rise in yield and a 0.7 percent increase in area (Table-3).

Table-3: Average Annual Growth Rate of Area, Yield and Production of Sugarcane: 2011-12 to 2021-22

Country/Province	Area	Yield	Production
	Percent per annum		
Pakistan	0.7	2.4	3.1
Punjab	0.4	2.9	3.3
Sindh	2.1	1.0	3.1
Khyber Pakhtunkhwa	0.1	2.0	2.1
Baluchistan	2.8	1.0	3.8

Source: Worked out from Annex-I.

Note: The growth rates have been worked out by estimating the equation, $Y= (1+r)^x$ (OLS) from the data given in Annex-I.

20. Sugarcane production in Punjab during the period under reference has increased by 3.3 per cent per annum as a result of 2.9 per cent increase in yield, and the highest, 0.4 per cent expansion in area. Sugarcane production in Sindh has also increased by 3.1 per cent in production and to 2.1 per cent increase in area and 1.0 per cent improvement in yield.

21. In Khyber Pakhtunkhwa, sugarcane production also increased at 2.1 per cent per annum. This is mainly attributed to 0.1 per cent increase in area and 2.0 per cent improvement in yield.

5.2 Short-term Changes: 2020-21 Over 2021-22 Crops

22. According to Second estimates of Provincial Agriculture Departments (Crop Reporting Service), sugarcane production at country level for 2021-22 crop is reported at 88.759 million tons reflecting an increase of 9.6 per cent over the last year production of 81.009 million tons. Increase in production can be attributed largely to 9.2 per cent expansion in area (Table-4).

Table-4: Area, Yield and Production of Sugarcane: 2020-21 versus 2021-22 Crops

Country/ Province	Area		Changes	Yield		Changes	Production		Changes
	2020-21	2021-22		2020-21	2021-22		2020-21	2021-22	
	000 ha		Per cent	tons per ha		Per cent	000 tons		Per cent
Pakistan	1,165.0	1,272.4	9.2	69.5	69.8	0.3	81,009.1	88,758.5	9.6
Punjab	777.0	869.3	11.9	73.4	73.6	0.3	57,000.0	63,945.0	12.2
Sindh	279.7	295.2	5.5	65.6	64.9	-1.0	18,335.5	19,154.8	4.5
Khyber Pakhtunkhwa	107.4	107.2	-0.2	52.4	52.5	0.1	0.5	5,623.9	-0.1
Balochistan	0.92	0.70	-23.9	50.1	49.7	-0.8	46.1	34.8	-24.5

Source: Annex-I.

23. Sugarcane production for 2021-22 in Punjab is reported at 63.945 million tons which shows an increase of 12.2 per cent concluded the last year. The increase mainly risen due to 11.9 percent increase in area.

24. Sindh sugarcane production for 2021-22 crop, increased by 4.5 per cent ended the previous year. This appreciation is attributed mainly due to 5.5 per cent rise in area, the yield declined by 1.1 percent.

25. Production in Khyber Pakhtunkhwa, production slightly fell by 0.1 per cent due to 0.2 per cent declined in area, while a 0.1 per cent improvement is observed in yield.

26. The area in Balochistan has been reduced by 23.9 percent, and the yield has been declined by 0.8 percent resulting in a 24.5 percent fall in the production.

6. TARGETS VS ACHIEVEMENTS: 2021-22 CROP

27. The Federal Committee for Agriculture (FCA) recommended sugarcane production target for 2021-22 crop at 74.847 million tons. As per Second estimates of the Provincial Agriculture Departments, sugarcane production from 2021-22 crop is reported at 88.759 million tons (18.6 per cent higher than the target). This impact is due to 7.6 and 10.2 per cent achievement in area and yield, respectively (Table-5). Significant increase has been observed in Punjab in area, yield and production.

Table-5: Targets and Estimated Achievements of Area, Yield and Production of Sugarcane: 2021-22 Crop

Country/ Province	Area		Deviation from the target	Yield		Deviation from the target	Production		Deviation from the target
	Target	Achievement		Target	Achievement		Target	Achievement	
	--- 000 ha ---		Per cent	Tons/ha		Per cent	-- 000 tons --		Per cent
Pakistan	1,182.1	1,272.4	7.6	63.3	69.8	10.2	74,847.0	88,758.5	18.6
Punjab	761.0	869.3	14.2	65.7	73.6	12.0	50,000.0	63,945.0	27.9
Sindh	310.0	295.2	-4.8	61.3	64.9	5.9	19,000.0	19,154.8	0.8
Khyber Pakhtunkhwa	110.1	107.2	-2.6	52.7	52.5	-0.4	5,797.0	5,623.9	-3.0
Balochistan	1.0	0.7	-30.0	50.0	49.7	-0.6	50.0	34.8	-30.4

Sources:

1. For targets: Targets have been fixed by 17th meeting of FCA held on 7th October 2021, NFS&R, Islamabad
2. For achievements: Annex-II.

28. In Punjab province, sugarcane crop has surpassed the target in area and production by14.2 per cent and 27.9 per cent respectively. While in Sindh province despite falling short in area target by 4.8 per cent, the production exceeded the target by 0.8 per cent solely due to improvement of 5.9 per cent in yield. In Khyber Pakhtunkhwa all three indicators have fallen short by 2.6 per cent, 0.4 percent and 3 percent, respectively. Balochistan was also unsuccessful achieving targets and lagged in area, and production by 30.0 per cent, and 30.4 percent, respectively.

7. COST OF PRODUCTION OF SUGARCANE

29. Cost of production is an important factor in framing up suggestions for indicative price of the sugarcane crop. Its importance is well acknowledged due to wide spread impact of government policies on input prices. Different government policy initiatives may affect inflation and alter subsidy and tax structure for agricultural inputs, which eventually tend to change cost of production of the crops.

30. Agriculture Policy Institute every year collects primary data from the field on different elements to assess the cost of production. These estimates provide guidance in determining indicative price of the concerned crop.

31. Cost of production estimates of sugarcane for 2022-23 crop in the provinces of Punjab, Sindh and Khyber Pakhtunkhwa are determined using customary input-output parameters adopted within API.

32. In this section, different inputs like seed, fertilizer, sprays, number of irrigations (tube well and canal) and tractor run operations made for preparing soil and sowing seed and the hoeing, etc, have been analysed for the estimation of cost of production for 2022-23 sugarcane crop. Their physical usages (quantities) are those revised for 2022-23 along with the respective prices and hiring rates for the above referred tractor operations in the major sugarcane producing districts/regions.

33. Consolidated summary of cost of production of sugarcane for 2022-23 crop for the provinces of Punjab, Sindh and Khyber Pakhtunkhwa are produced in Table-6 to Table-8 while background data are placed in Annex-IV, Annex-V and Annex-VI, respectively.

34. In the following paragraphs, peculiar features of the cost of production estimates as mentioned above are described for comparison with the previous crop estimates.

7.1 Cost of different inputs and operations in Punjab, Sindh and Khyber Pakhtunkhwa

35. Following paragraphs present decomposition of the cost of production into its constituent parts to assess main ingredients for the upcoming season 2022-23. Table-6 produces the data for 2021-22 and prospectively for 2022-23.

36. It is visible from data in Table-6 (column-5) that in **Punjab**, land rent with 28% would be the major cost component during 2022-23, followed by fertilizers and farmyard manure including transportation and application at 21.37%. Third major item is Seed & sowing operations 14.6% while cost of harvesting, stripping, binding and loading of cane stands at (10.91%) of total cost of cultivation. 'Other costs' would make about 8.53% of the total., Land and seed bed preparation is about 7.65% and Irrigation is 5.77% while the interculture and plant protection make 3.13%.

37. Component wise cost of production in **Sindh** (Table-6) indicates that land rent is about to make maximum part of total cost of cultivation of sugarcane, estimated to take about 26.50%. Next higher item would be fertilizers and farmyard manure including transportation and application 21.96%, followed by 'seed and sowing operations with 17.12%, including application 'Other costs' which include mark-up on capital, management charges, land tax, land revenue, Road Cess, etc are likely to carry about 9.28% of the cost of cultivation in 2022-23, Land and seed bed preparation make 7.25%, Harvesting, stripping, binding and loading of cane are about 7.07%. Rest of the items like Plant protection, Interculture and Irrigation show a share of approximately 10.82%, combined.

38. During 2022-23 crop year major constituents of cost of cultivation of sugarcane in Khyber Pakhtunkhwa are land rent 27.94 %, fertilizer and FYM including TPT 23.22 %, seed and sowing operation 18.42%.'Other costs' would make about 9.19% of the total. Last column of Table-6 shows difference in each component over the last year, which also supports the above findings.

Table-6: Cost on major items of cultivating Sugarcane: 2021-22 versus 2022-23 Crop

Summary of cost of production estimates for sugarcane in Punjab					
Major operation	**2021-22**	**Share**	**2022-23**	**Share**	**Change over 2021-22**
	Rs/acre	%	Rs/acre	%	Difference
1. Land and seed bed preparation	8,950	6.61	13,325	7.65	4,375
2. Seed and sowing operations	19,800	14.62	25,500	14.6	5,700
3 Plant protection and interculture	4,400	3.25	5,450	3.13	1,050
4. Irrigation	9,325	6.89	10,050	5.77	725
5. Fertilizer & FYM, incl TP & app	22,890	16.9	37,205	21.37	14,315
6. Land rent	43,333	32	48,750	28	5,417
7. Harvesting, stripping, binding, loading	15,840	11.7	19,000	10.91	3,160
8. Other costs	11,162	8.24	14,858	8.53	3,696
9. Gross cost of cultivation	135,435	100	174,138	100	38,703
10 Subsidy on DAP +value of tops	2,400	-	2900	-	500
11 Net cost of cultivation	133,035	-	171,238	-	38,203
12 Yield (kgs/acre)	720		760		40
13 Cost of Production at mill gate (Rs/40 kgs)	204.32		245.31		41

Summary of cost of production estimates for sugarcane in Sindh					
Major operation	**2021-22**	**Share**	**2022-23**	**Share**	**Change over 2021-22**
	Rs/acre	%	Rs/acre	%	Difference
1. Land and seed bed preparation	9,374	7.19	11,850	7.25	2,476
2. Seed and sowing operations	21,600	16.57	28,000	17.12	6,400
3. Irrigation	4,078	3.13	5,642	3.45	1,564
4 Plant protection and interculture	9,465	7.26	12,050	7.37	2,585
5. Fertilizer & FYM inclu T&app	22,317	17.12	35,912	21.96	13,595
6. Land rent	40,625	31.16	43,333	26.5	2,708
7. Harvesting, stripping, binding, loading	11,475	8.8	11,560	7.07	85
8. Other costs	11,456	8.79	15,177	9.28	3,721
9. Gross cost of cultivation	130,392	100	163,524	100	33,132
10 Subsidy on DAP /value of tops	2,400		2400		0
11 Net cost of cultivation	127,992	100	161,124	100	33,132
12 Yield (kgs/acre)	675		680		5
13 Cost of Production at mill gate (kgs/40 kgs)	209.12		256.95		48

Summary of cost of production estimates for sugarcane in Khyber Pakhtunkhwa					
Major operation	**2021-22**	**Share**	**2022-23**	**Share**	**Change over 2021-22**
	Rs/acre	%	Rs/acre	%	Difference
1. Land and seed bed preparation	7,350	7.05	11,312	8.33	3,962
2. Seed and sowing operations	19,800	19	25,000	18.42	5,200
3. Irrigation	1,250	1.2	1,650	1.22	400
4 Plant protection and interculture	3,350	3.21	3,750	2.76	400
5. Fertilizer & FYM inclu T & app	20,025	19.2	31,512	23.22	11,487
6. Land rent	32,500	31.16	37,917	27.94	5,417
7. Harvesting, stripping, binding, loading	10,600	10.2	12,100	8.92	1,500
8. Other costs	9,430	9.04	12,479	9.19	3,049
9. Gross cost of cultivation	104,305	100	135,720	100	31,415
10 Subsidy on DAP/value of tops	2400		2900		500
11 Net cost of cultivation	101,905	100	132,820	100	30,915
12 Yield (kgs/acre)	530		550		20
13 Cost of Production at mill gate (Rs/40 kgs)	203.77		254.99		51

Source: Annex-IV,V,VI

- **Punjab**

39. From the data presented in Table-7 below, it may be seen that the unit cost of cultivating one acre of sugarcane inclusive of land rent during 2022-23 in Punjab province is likely to be Rs. 171.238. After incorporating the subsidy on fertilizers at Rs. 900/bag and value of tops at Rs. 2000/acre, this ultimately ends in cultivation cost/40 kg at farm level as Rs 225.31/40 kg with land rent and Rs 161.17 without land rent. By adding marketing cost @ Rs20.00/40 kg to these estimates, the cost of production per 40 kg of sugarcane at the mill gate estimates to Rs 245.31 with land rent and Rs181.17/40 kg without land rent.

40. Main reasons for rise in cost of cultivation of sugarcane in Punjab include the increase in land rent and fertilizer prices.

Table–7: Average Farmer's Cost of Production in Punjab: 2021-22 versus 2022-23

	Item	Unit	2021-22	2022-23
	Punjab			
1.	Gross cost of cultivation	Rs/acre	135,435	174,138
	a) Subsidy on DAP	Rs/bag	900	900
	b) Value of tops	Rs/acre	1500	2000
2.	Total cost of cultivation	Rs./ acre	133,035	171,238
3.	Yield	40 kg/ acre	720	760
4.	Cost of production at farm level			
	a) With land rent	Rs./ 40 kg	184.77	225.31
	b) Without land rent	"	124.59	161.17
5.	Marketing charges	"	19.50	20.00
6.	Cost of production at mill gate			
	c) With land rent	Rs./ 40 kg	204.27	245.31
	d) Without land rent	"	144.09	181.17

Source: Annex-IV.

- **Sindh**

41. For 2022-23 crop season, total cost of cultivating one acre of sugarcane in Sindh is expected to be Rs 161,124 (Table-8). During 2022-23 crop seasons, the major components of the cost of cultivation of sugarcane in Sindh, have followed the same pattern as of the Punjab.

42. In view of an average yield of 680 mund per acre, farm level cost of cultivation of sugarcane works out at Rs 236.95per 40 kg (Table-8). Adding marketing cost @ 20.00/40 kg, mill gate cost of production comes to Rs 256.95 per 40 kg. It is Rs 47.02higher than the last year.

43. While without land rent costs are concerned, these are 173.22 Rs /40 kg at the farm level and Rs193.22/40 kg at the mill gate in 2022-23.

Table–8: Average Farmer's Cost of Production in Sindh: 2021-22 versus 2022-23

	Item	Unit	2021-22	2022-23
	SINDH			
1.	Gross cost of cultivation	Rs/acre	130,392	163,524
	c) Subsidy on DAP	Rs/bag	900	900
	d) Value of tops	Rs/acre	1500	1500
2.	Total cost of cultivation	Rs./ acre	127,992	161,124
3.	Yield	40 kg/ acre	675	680
4.	Cost of production at farm level			
	e) With land rent	Rs./ 40 kg	189.62	236.95
	f) Without land rent	"	129.43	173.22
5.	Marketing charges	Rs./ 40 kg	19.50	20.00
6.	Cost of production at mill gate			
	g) With land rent	Rs./ 40 kg	209.12	256.95
	h) Without land rent	"	148.93	193.22

Source: Annex-V

- **Khyber Pakhtunkhwa**

44. For 2022-23 crop season, total cost of cultivating one acre of sugarcane in Sindh is expected to be Rs 132,820 (Table-8). During 2022-23 crop season, the major components of the cost of cultivation of sugarcane in Khyber Pakhtunkhwa, have followed the same pattern as of the Punjab and Sindh.

45. In view of an average yield of 550 mund per acre, farm level cost of cultivation of sugarcane works out at Rs 241.49 per 40 kg (Table-9). Adding marketing cost @ 13.50/40 kg, mill gate cost of production comes to Rs 254.99 per 40 kg. It is Rs 51.22 higher than the last year.

46. While without land rent costs are concerned, these are Rs 172.55/40 kg at the farm level and Rs 186.05/40 kg at the mill gate in 2022-23.

Table–9: Average Farmer's Cost of Production in Khyber Pakhtunkhwa 2021-22 versus 2022-23

	Item	Unit	2021-22	2022-23
	KHYBER PAKHTUNKHWA			
1.	Gross cost of cultivation	Rs/acre	104,305	135,720
	a) Subsidy on DAP	Rs/bag	900.00	900.00
	b) Value of tops	Rs/acre	1500	2000
2.	Total cost of cultivation	Rs./ acre	101,905	132,820
3.	Yield	40 kg/ acre	530	550
4.	Cost of production at farm level			
	a) With land rent	Rs./ 40 kg	192.27	241.49
	b) Without land rent	"	130.95	172.55
5.	Marketing charges	Rs./ 40 kg	11.50	13.50
6.	Cost of production at mill gate			
	a) With land rent	Rs./ 40 kg	203.77	254.99
	b) Without land rent	"	142.45	186.05

Source: Annex-VI

8. NOMINAL AND REAL INDICATIVE / MARKET PRICES OF SUGARCANE

47. The Real price of a commodity is the price achieved by removing the inflationary effect from its nominal price. The resultant price of that commodity reflects its real value. It represents an increase or decrease in the purchasing power of the respective commodity against the base year level. In the following text, an analysis of the indicative and market prices of sugarcane has been carried out. This analysis is based on the prices of sugarcane during 2015-16 to 2021-22. The discussion below indicates the province-wise trends in nominal and real terms.

8.1 Nominal and Real Indicative and Market Prices of Sugarcane in Punjab

48. The analysis of indicative and market prices of sugarcane for the Punjab province during 2015-16 to 2021-22 is given in the Table-10.

49. The nominal indicative price of sugarcane in the Punjab has been increased by 25 per cent from Rs 180 to Rs 225 per 40 kgs between 2015-16 and 2021-22. During the period under review, the Consumer Price Index (CPI), the most commonly used indicator for measurement of inflation in the economy, has escalated by 58 per cent. Thus consistently declining trend is observed in real indicative prices of sugarcane against the base year level. The real indicative price remained lower than the nominal indicative price since 2016-17 mainly due to this increasing CPI dropping to Rs. 142.40/40 kg, a devaluation of 37 percent during 2021-22.

Table-10: Nominal and Real Indicative & Market Prices of Sugarcane Realized by the Growers in the Punjab: 2015-16 to 2021-22

Crop year	Nominal Prices		Consumer Price Index (CPI)***	Real Prices	
	Indicative *	Market **		Indicative	Market
	---- Rs per 40 kgs ----		2015-16=100	---- Rs per 40 kgs ----	
1	2	3	4	5=(2/4)x100	6=(3/4)x100
2015-16	180	180	100.00	180.00	180.00
2016-17	180	180	104.81	171.74	171.74
2017-18	180	145	109.72	164.05	132.15
2018-19	180	200	116.35	154.71	171.90
2019-20	190	220	130.33	145.78	168.36
2020-21	200	250	140.06	143.69	178.49
2021-22	225	240	158.00	142.40	151.90

Notes: * Indicative price of sugarcane at mill-gate fixed by the Provincial Government.
**Prices of sugarcane actually realized by the growers reported during the API's field survey.
***CPI Base year 2015-16.

Sources: - 1. Price Policy Report for Sugarcane by API (various issues).
2. Pakistan Economic Survey, 2021-22

50. As far the nominal market price of sugarcane is concerned, the price have shown an upward trend except 2017-18.The market price averaged at Rs 240 per 40 kg in 2021-22, which is slightly less than the last year. The real market price remained below the nominal market price during the entire period under review.

8.2 Nominal and Real Indicative Prices of Sugarcane in Sindh

51. The nominal and real indicative and market prices of sugarcane in Sindh for the period 2015-16 to 2021-22 are displayed in Table-11.

52. During the period, nominal indicative price in Sindh gradually increased from Rs 172 per 40 kg in 2015-16 to Rs 250 per 40 kg in 2021-22. However, the nominal market price dropped to the lowest level of Rs. 130/40 kgs in 2017-18 which was a market distortion. Between 2015-16 and 2021-22, the nominal indicative price increased by 45.34 percent. Conversely, the real indicative price of sugarcane during this period presents a continuous downward trend except a slight improvement in 2021-22 to Rs. 158.22 per 40 kg.

53. The nominal market price of sugarcane has been observed rising at 37.17 per cent during the period. Higher trend in CPI impacted the real market price of sugarcane in Sindh province, recorded at 165.82 per 40 kgs in 2021-22. The indicators show that real market price remained below the nominal market price throughout the period. The real market price deteriorated 7.1 percent in 2021-22 as compared to previous year despite a 5 percent increase in nominal market price.

54. It may be observed from the above data that CPI consistently increased during the reference period. Nominal prices have also evidenced a continuous improvement. The higher CPI resulted lower the real value of the commodity, whether at indicative or the Market price. Hence, it may be concluded that to ensure flow of smooth returns to farmer, the inflationary trend needs to be controlled. The real market prices are deteriorating 7.1 percent in 2021-22 as compared to previous year.

Table–11: Nominal and Real Indicative & Market Prices of Sugarcane Realized by the Growers in Sindh: 2015-16 to 2021-22

Crop year	Nominal Prices		Consumer Price Index (CPI)	Real Prices	
	Indicative*	Market**		Indicative	Market
	---- Rs per 40 kgs ----		2015-16=100	---- Rs per 40 kgs ----	
1	2	3	4	5=(2/4)x100	6=(3/4)x100
2015-16	172	191	100.00	172.00	191.00
2016-17	182	182	104.81	173.65	173.65
2017-18	181	130	109.72	164.97	118.48
2018-19	182	215	116.35	156.42	184.79
2019-20	192	220	130.33	147.32	168.80
2020-21	202	250	140.06	144.22	178.49
2021-22	250	262	158.00	158.22	165.82

Notes: * Indicative price of sugarcane at the mill gate fixed by the Provincial Govt.
** Prices of sugarcane actually realized by the growers collected during the API field survey.

Sources: - 1. Price Policy Report for Sugarcane by API for market price.
2. Pakistan Economic Survey, 2021-22 for (CPI).

9. COMPARATIVE ECONOMICS OF SUGARCANE AND COMPETING CROPS

55. Resource allocation among the competing enterprises is primarily governed by certain key economic considerations reflected in their gross cost, gross income, gross margin, net income, and output-input ratio, etc.

56. Sugarcane is planted in the irrigated regions of the country and being an annual crop, it competes for land, water and other farm resources with both 'kharif' and 'rabi' crops. Economics of sugarcane and competing crops/ crop combinations has been analyzed in terms of output prices received by growers and input prices paid by growers during the 2021-22 crop year. Detail of the analysis is presented for the Punjab and Sindh provinces in Annex-VII. While a brief summary pertaining to various economic indicators is shown in Table-12 and Table-13 and the analysis is briefly discussed in the following paragraphs.

Table-12: Economics of Sugarcane and Competing Crops at prices realized by the growers for 2021-22 crop in Punjab

Competing crops/ combinations	Output/ input ratio	Gross revenue per		
		Rupee of purchased inputs cost	Day of crop duration	Acre inch of irrigation water used
		---------- Rupees ----------		
1. Sugarcane	1.25	3.45	421	3,458
2. Cotton + wheat	1.35	3.85	539	5,711
3. Cotton + sunflower	1.67	4.44	627	5,559
4. Cotton +Canola	1.65	5.12	564	6,286
5. Basmati + wheat	1.17	2.63	456	2,150
6. Basmati+ sunflower	1.52	3.25	558	2,511
7. Basmatti+Canola	1.49	3.55	490	2,483
8. IRRI + wheat	1.17	2.88	469	2,091
9. IRRI + sunflower	1.52	3.51	570	2,442
10. IRRI+Canola	1.49	3.90	502	2,408

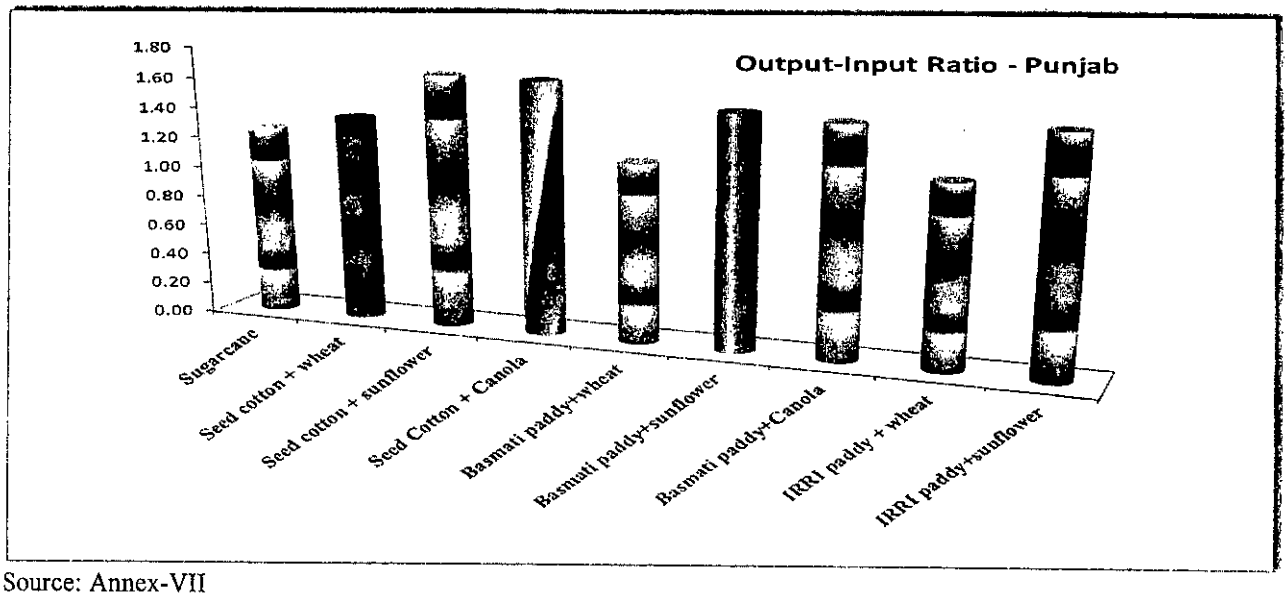
Source: Annex-VII

Punjab

57. Table 12 above indicates that growers' returns to overall investment, based on the average market prices, remained lower for Sugarcane than for the Cotton combinations. Cotton combinations out-competed Sugarcane and performed better in terms of all the economic criteria adopted in the analysis for 2021-22. However, Sugarcane out-competed both Basmati and IRRI combinations with wheat, showing an edge over the later in terms of output/input ratio and other indicators except crop duration. Sugarcane also performed poor than rice and oilseed, combination, except in irrigation water. In terms of revenue per day of crop duration, sugarcane comes at the bottom of all the alternative crop combinations.

58. During last two years, sugarcane farmers were reported receiving relatively better prices, mainly with the intervention of the provincial Government and the international market situation due to the Covid-19.

Fig-5: Output-Input Ratio of Sugarcane in Punjab



Source: Annex-VII

Sindh

59. As in Punjab, Sugarcane in Sindh generally lags behind the competing crops in terms of output/input ratio and crop duration. Sugarcane is also out-competed by cotton combinations in terms of revenue per unit of water used and purchased inputs, except a slight edge on sunflower. Sugarcane performed better then the combinations of IRRI+Wheat and IRRI+sunflower, marginally, in terms of returns to overall investment and irrigation water..

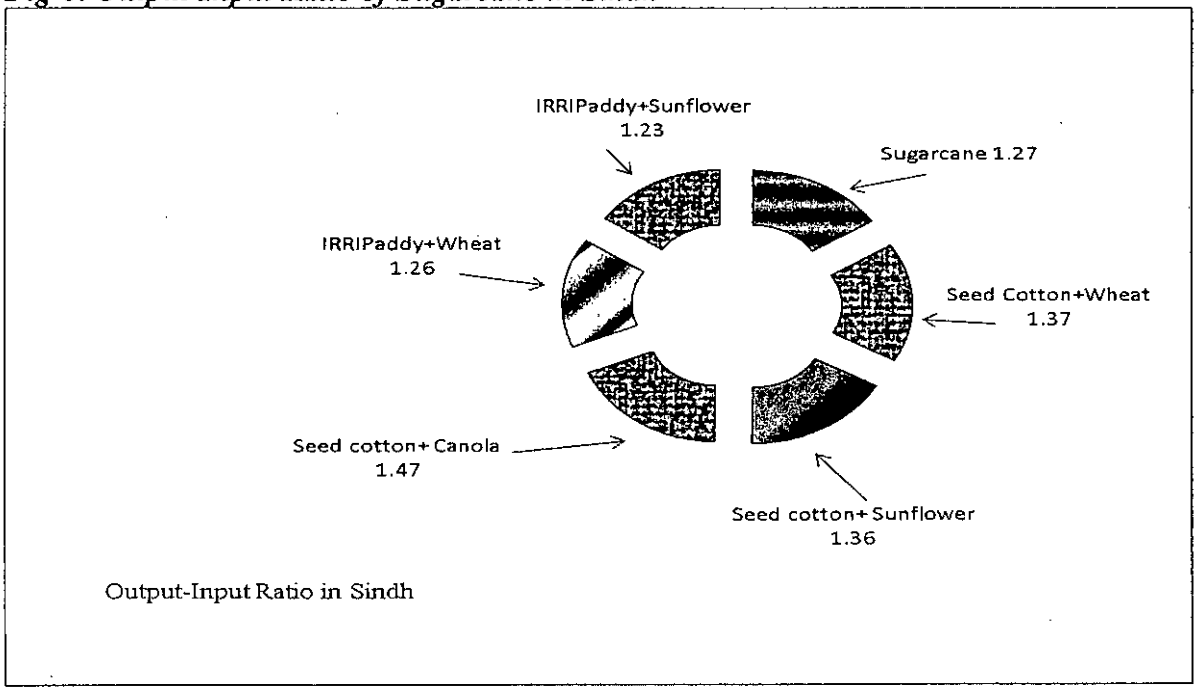
Table-13: Economics of Sugarcane and Competing Crops at prices realized by the growers for 2021-22 Crop in Sindh

Crop/ crop combination	Output-input ratio	Gross revenue per		
		Rupee of purchased inputs cost	Day of crop duration	Acre inch of irrigation water used
		---------- Rupees ----------		
1. Sugarcane	1.27	3.74	333	2,286
2. Cotton + wheat	1.37	4.07	580	6,958
3. Cotton + sunflower	1.36	3.67	483	4,709
4. Cotton + Canola	1.47	4.78	512	6,446
5. IRRI + wheat	1.26	3.57	460	2,433
6. IRRI + sunflower	1.23	3.36	403	1,859
7. IRRI + Canola	1.36	4.25	435	2,268

Source: Annex-VII

60. Sugarcane also performed better than IRRI combinations with wheat and sunflower in terms of returns to purchased inputs and crop duration. Its performance remained low as compared to Canola combination with IRRI in context of all the economic criteria, except irrigation water.

Fig-6: Output-Input Ratio of Sugarcane in Sindh



Source: Annex-VII

9.1 Economics of Sugarcane: Inter Provincial Comparison

61. In view of its longer duration, sugarcane crop in Sindh province requires more water and other inputs as compared to Punjab.

62. The cost incurred on purchased inputs other than chemical fertilizers is relatively lower in Sindh i.e. 15.25 percent as compared to the Punjab. However, irrigation water is applied on higher side in Sindh (48 percent). The crop duration is longer in Sindh by 24 percent as compared to Punjab.

63. Chemical fertilizers are used on a lower scale in Sindh by 6.38 percent in nitrogenous, however, more by 2.14 percent in phosphate ingredients. Despite increased input applications and resource allocation, Sindh's yield is lower than Punjab by approximately 6.25 percent. One of the major factors reported is climate change, which is impacting agricultural productivity adversely

Table-14: Input Use Level and Yield of Sugarcane in Sindh VS Punjab: 2021-22 Crop

Item	Unit	Sindh	Punjab	Difference of the Sindh province over Punjab (%)
Crop duration	Crop day	488	394	23.86
Irrigation water	Acre inch	71	48	47.92
Purchased inputs other than fertilizer	Rs./ acre	22,818.0	26,925.0	(15.25)
Fertilizer Use:				
• N	Nutrients kg/acre	76.3	81.50	(-6.38)
• P	"	57.2	56	2.14
Crop yield	40 kg/ acre	675	720	(-6.25)

10. IMPACT OF INCREASE IN SUGAR PRICE ON CONSUMER PRICE INDEX (CPI)

64. Sugar is one of the important items in the average household budget. Sugar is also included in the basket of goods used in estimating the Consumer Price Index (CPI). Any change in sugar price affects the household budget and the CPI. The impact of change in the price of sugar has been worked out against the CPI on the basis of three consumption patterns, i.e. Balance Sheet Method, HIES Consumption, and World average consumption. The summary of these results is given in Table-15.

10.1 Impact on CPI

65. The Pakistan Bureau of Statistics (PBS) has estimated the changes in CPI as a result of increase in sugar price over the base price of Rs 88.62 per Kg. It is evident from the Table-14 that every increase of Re 1 per kg over the average price of Rs 88.62 per kg is expected to raise the CPI by 11.94 percent, provided other things remaining the same. Accordingly, the CPI is likely to increase from 11.94 per cent to 12.04 per cent, if sugar price is increased by Rs 5 and Rs 10 per kg.

Table-15: Impact of Increase in Sugar Price on CPI and Household Expenditure

Sugar price	Rise in CPI	Change in CPI	Increase in annual expenditure on the basis of average per capita consumption of sugar					
			Balance sheet method by API		HIES		World average	
			25.17 kgs/annum		15.36 kgs/annum		21.40 kgs/annum	
			Per person	Per house hold	Per person	Per house hold	Per person	Per house hold
Rs/kg		**Percent**	---------- **Rupees** ----------					
	Base price 88.62* March 2022							
89.62	11.94	-	25.17	59.58	15.36	97.38	21.40	135.68
90.62	11.95	0.01	50.34	319.16	30.72	194.76	42.80	271.36
91.62	11.96	0.02	75.51	478.74	46.08	292.15	64.20	407.04
92.62	11.97	0.03	100.68	638.32	61.44	389.53	85.60	542.72
93.62	11.99	0.04	125.85	797.90	76.8	486.91	107.00	678.40
94.62	12.00	0.05	151.05	957.48	92.16	584.29	128.40	814.08
95.62	12.01	0.06	176.19	1117.06	107.52	681.68	149.80	949.76
96.62	12.02	0.07	201.36	1276.64	122.88	779.06	171.20	1085.44
97.62	12.03	0.08	226.53	1436.22	138.24	876.44	192.60	1221.12
98.62	12.04	0.09	251.70	1595.80	153.6	973.82	214.00	1356.80

Note: * Average Price for the month of March, 2022 was Rs.88.62 per kg
Average size of household comprises 6.34 members (2018-19)

Sources: 1. For CPI, Pakistan Bureau of Statistics (PBS), Islamabad
2. Annex-XII (Per capita of availability of sugarcane).

10.2 Impact on Household Expenditure

66. According to the Household Integrated Economic Survey (HIES) 2018-19 by the PBS, average household in Pakistan consists of 6.34 members. On the basis of three scenarios as discussed earlier, the impact of selected increases in sugar price on the average Household expenditure has been presented in table above. It may be seen that every increase of Re 1 in sugar price over the average level of 88.62 per kg would raise the CPI by 0.01 percent. In addition, the per head expenditure would increase by Rs 25.17, and average household expenditure would increase by Rs 159.58 using the balance sheet method by API. While this increase would be Rs. 15.36/person and Rs.97.38 per household, if the consumption pattern of the HIES are applied. However, based on global average consumption, this increase will be Rs 21.40 per person and Rs 135.68 per household, respectively, with rise in sugar price by Re 1 per kg, provided other things remaining same. Accordingly, an increase of Rs 2 and Rs 5 over the base level would increase per capita expenditure by Rs 50.34, Rs 30.72, and Rs 42.8, respectively for the three scenarios. The household expenditure will accordingly increase by Rs 797.9, 486.91, and 678.4, respectively, at Rs 5 per kg.

11. ECONOMIC EFFICIENCY OF SUGARCANE PRODUCTION

67. Measurement of the economic efficiency of a crop requires measurement of the performance of different resources employed in the production of that crop. Briefly, it helps assess justification for putting national resources into production of that crop.

68. There are three widely accepted measures of economic efficiency, namely, Nominal Protection Coefficient (NPC), Effective Protection Co-efficient (EPC) and Domestic Resource Cost Co-efficient (DRC). These efficiency measures are studied both from an export as well as import perspective. Analysis in an export context is based on the export parity price of the concerned crop, while import substitution ability of the crop is analyzed using import parity price of that crop.

69. Sugar is an important food item in Pakistan. Sugarcane provides the raw material for manufacturing sugar. Accordingly, it is very necessary to study resource use efficiency of the crop.

70. In resource use efficiency, the cumulative effect of cost of production of the crop and its import and export parity prices are compared against the established economic efficiency yardsticks, i.e., Nominal Protection Coefficient (NPC), Effective Protection Coefficient (EPC), and Domestic Resource Cost (DRC) Coefficients.

71. Efficiency is a comparison of crop revenues against their cost of production. Though profit is a very important consideration from a farmer's point of view to sustain a crop, at the same time, the viability of a crop to justify national resources (land, labour, capital, entrepreneurship skills) employed in its production is also equally important from a social point of view. In the former case, the cost of production and domestic private market price of the crop are applied and the inputs used in its production; while for the latter, we convert private (market) prices into social prices with the help of corresponding import and export parity prices of the crop.

72. In the following paragraphs above mentioned three parameters of efficiency i.e. NPC, EPC and DRC are described in more detail.

11.1 Nominal Protection Coefficient (NPC)

73. The NPC is the ratio of the domestic market price to the social price of a commodity. It examines the impact of domestic market price of the crop, ignoring distortions in input prices. As a rule of thumb, if NPC is greater than one, it means that local producers are protected through the produce pricing policy. If it is less than one, it implies implicit taxation on growers rather than protection for them. Implicit taxation on a crop indicates an outflow of resources from that crop to other sectors of the economy.

74. Empirical estimates of NPCs for sugarcane are provided in Table 16 below. Before describing Nominal Protection Coefficients (NPCs) under import and export scenarios, it seems pertinent to refer to fundamental procedures of determining the price of sugarcane equivalent to the international price.

75. For this analysis, NPC estimates are estimated under import and export scenarios for both Punjab and Sindh provinces. For import scenario analysis, the corresponding import parity price and for export scenario analysis, the relevant export parity prices of sugarcane in Pakistan are used.

76. Under the import scenario, we calculate this price by converting cif (international price) at Karachi port into domestic currency and then by adding port handling charges and other incidentals to it to shift imported sugar to sugarcane producing districts of Punjab and Sindh.

77. It may be observed from data produced in Table-16 that the NPCs for both Punjab and Sindh under import as well as export situations claim greater than one throughout the period except 2019-20 and 2021-22 in import of both Punjab and Sindh province under analysis. It implies that sugarcane growers are receiving relatively higher price for their cane than the corresponding parity price. However, it is important to note that these coefficients are calculated assuming Rs 250-300/40 Kg price of sugarcane received by the growers whereas it is commonly observed during the cane disposal season that farmers sell their consignments to the Mill/middlemen where they get
price greater than Rs 250-300/40 Kg. It has been revealed during the field surveys that farmers sell their produce to mill gate relatively at higher price. Normally Mill/middle man price is 9-10% greater than the indicative price. Its reason is that the sugarcane production was less than the last year. Thus if we estimate NPC values on the basis of Mill/middleman price, NPC values would be around one which may approximate domestic sugar price to international price.

Table - 16 Nominal Protection Coefficients for Sugarcane in Punjab and Sindh

Year	Punjab		Sindh	
	NPC		NPC	
	Under import scenario	Under export scenario	Under import scenario	Under export scenario
2016-17	1.14	1.88	1.24	1.65
2017-18	1.31	1.77	1.26	1.70
2018-19	1.05	2.39	1.03	2.28
2019-20	0.96	1.77	0.92	1.69
2020-21	1.18	1.96	1.08	1.77
2021-22	0.66	1.04	0.70	1.09

Source: For NPC, Annex-VIII to XI

78. However, the above coefficients show that sugarcane growers seem protected from price volatility by the indicative price of sugarcane. It may be asked why sugarcane growers get this price protection. A valid explanation may be that sugar, being an important food item, needs to be adequately available in the market. An indicative price helps to continue sugarcane cultivation. Another argument may be that if Pakistan becomes dependent on imported sugar, occasional shifts in the international price of sugar may increase Pakistan's import burden.

11.2 Effective Protection Coefficient (EPC)

79. Unlike NPC, EPC is the ratio of the difference between revenue and cost of tradable inputs at private prices and difference between revenue and tradable inputs cost at social prices. Thus, EPC is an indicator of the net incentive or disincentive effect of all policies affecting the prices of tradable inputs (seed, fertilizer, pesticides, tractor run operations, tube well irrigations), and output.

80. The same rule of thumb applies to EPC as it does to NPC coefficients. If EPC is higher than one, it means domestic growers of the crop have some degree of protection/ support through prices of inputs or price of output. This implies growers' profit is higher than it would be without government intervention (price support). On the other hand, if EPC is less than one, it indicates that the net effect of input and output prices reduces grower profit. In the earlier case, the growers are policy-protected, while in the latter they are implicitly taxed, which discourages domestic production.

Table-17: Effective Protection Coefficient for Sugarcane in Punjab and Sindh

Year	EPC			
	Punjab		Sindh	
	Under the import scenario	Under the export scenario	Under the import scenario	Under the export scenario
2016-17	1.13	2.41	1.24	1.78
2017-18	1.44	2.30	1.25	1.83
2018-19	1.06	11.27	0.97	2.98
2019-20	0.91	2.85	0.83	1.92
2020-21	1.24	2.85	1.03	1.97
2021-22	0.57	1.04	0.61	1.05

Source: Estimated from Annex-IX and X.

81. Table-17 provides EPC values for Punjab and Sindh provinces under import and export scenarios. All values are found to be higher than one except 2019–20 and 2021–22 in the import scenario. Respective values of EPC higher than one mean that input/output prices are induced to produce more sugarcane in the country. From the referred EPC values, it may be concluded that domestic production of sugar is relatively better for domestic consumption than for export because EPC values under export scenario analysis are much higher than those derived under import scenario analysis.

11.3 Domestic Resource Cost Coefficient (DRC)

82. Domestic Resource Cost (DRC) coefficient shows the social cost of non-traded inputs (domestic resources like labour, interest on capital employed in the crop, management cost, harvesting charges, cost of farmyard manure, land rent etc) used in producing the commodity. In DRC, the numerator is the opportunity cost of non-tradable factors at social prices while the denominator is the value-added (crop revenue) at social prices. If the value of DRC is less than one, it indicates comparative advantage in domestic production of the crop. Its reason is that cost

of non-tradable domestic factors like hired labour, interest on capital, farmyard manure, transportation, canal water, land rent, managerial services, land revenue and Drainage Cess is less than the corresponding import cost of these factors.

Table-18: Domestic Resource Cost Coefficients (DRCs) for Sugarcane in Punjab and Sindh Provinces.

Year	Under the import situation		Under the export situation	
[1]	Punjab [2]	Sindh [3]	Punjab [4]	Sindh [5]
2016-17	0.45	0.75	0.95	1.07
2017-18	0.56	0.81	0.90	1.18
2018-19	0.46	0.62	0.58	1.91
2019-20	0.40	0.54	1.26	1.23
2020-21	0.41	0.52	0.95	0.99
2021-22	0.23	0.35	0.41	0.57

Sources: 1. Import situation estimates derived from Annex-VIII and Annex-X,
2. Export situation estimates derived from Annex-IX and Annex-XI.

83. It is observed from table-18 that DRC values under import scenario analysis are less than one throughout analysis. However, these have a mixed trend under export scenario analysis. Findings in the above table support that Punjab has an advantage in producing sugarcane for domestic consumption of sugar and we may save foreign exchange by substituting sugar import

12. DOMESTIC DEMAND, SUPPLY, STOCK AND PRICES OF SUGAR

12.1 Domestic Demand, Supply and Stocks

84. By virtue of the highest ever crop i.e 88.65 million metric tons of sugarcane the country produced 7921 million tons of sugar. After accounting for the carryover stocks of 0.55 thousand tons and accounting for the imports and exports of sugar, the total sugar availability for 2021-22 is estimated at 8233million tons. Three sugar consumption patterns were used for the calculation of the domestic requirement; i) based on balance sheet method for the period 2018-19 to 2020-21, the per capita availability of sugar of estimated at 25.17 kgs; ii) Sugar consumption of 15.36 kgs per annum, based on the Household Integrated Survey (HIES) 2018-19; and iii) Sugar consumption of 21.40 kgs per annum, based on the world average (Annex-XII). On the basis of the balance sheet method, the total domestic requirement for a population of 237.28 million has been worked out at 6473 thousand tons for 2021–22.

Table-19: Domestic Requirement Situation of Sugar for consumption year 2022-23

S.No.	Items	Per capita consumption of sugar kgs/annum		
		Balance Sheet Method	HIES Data	World Average consumption
		27.28	15.36	21.40
		-------- Thousand tons----------		
1	Opening stocks as on October 2021	0.52	0.52	0.52
2	Production for 2021-22 crop	7,921	7,921	7,921
3	Imports 2021-22	312.39	312.39	312.39
4	Export	0	0	0
5	Total availability	5,950.39	5,950.39	5,950.39
6	Population (Millions)	237.28	237.28	237.28
7	Requirement on the basis of per capita consumption	6,473	3,644.62	5077.80

Sources:
i. For production and Stocks; Ministry of Industries.
ii. For import and export, M/o Commerce, Government of Pakistan.
iii. For world average consumption, isosugar.org
iv. For population, M/o NFS&R.

12.2 Behavior of Sugar Prices in Domestic Market

85. The monthly average wholesale prices of sugar prevailing in major domestic markets of Lahore, Faisalabad, Karachi, Hyderabad and Peshawar markets during 2021 and 2022 (Jan - Oct) are presented Annex-XIII while for the last 12 years in Annex-XIV.

86. During 2021, average monthly wholesale prices ranged between Rs 8,300 per 100 kgs in Hyderabad markets during the month of January 2021 and Rs 11,625 per 100 kgs in Peshawar during November 2021. During 2022 (Jan-Oct), lowest monthly wholesale prices were observed in Hyderabad market in the month of May 2022 at Rs 7700 per 100 kgs and the highest price was reported in Peshawar Market during the months of Jan-Feb 2022 at Rs 9,250 per 100 kgs. The overall monthly average sugar price at the national level ranged between Rs 8,238 and Rs 10,777 per 100 kgs during 2021-22.

13. WORLD SUPPLY, DEMAND, STOCKS, TRADE AND PRICES OF SUGAR

13.1 Supply, Demand, Stocks and Trade

87. The data on world balance sheet of sugar (raw equivalent) for the period of 2019-20 to 2021-22 are presented in Table-20.

Table-20: World Balance Sheet of Sugar (Raw Equivalent): 2020-21 to 2022-23 (October - September)

Item	2020-21	2021-22 Estimated	2022-23 Forecast	Change 2022-23 over 2021-22
	----------Million tones----------			
1. Opening stocks	97.60	95.90	103.9	8.34
2. Production	169.90	173.70	179.6	2.6
3. Total supply (item 1+2)	267.50	269.60	283.5	5.1
4. Disappearance (consumption)	170.1	174.50	174.7	0.6
5. Stock adjustment *	-0.30	-0.30	-0.30	-
6. End year stocks (3-4+5)	95.90	94.80	108.5	14.5
7. Trade (Export)	60.80	60.50	61.2	1.8

Note: * Including adjustment for unknown net trade.
Source: Food Outlook, FAO, November 2021.

88. According to the Food Outlook, November, 2022 by FAO, world sugar production is estimated at 173.30 million tons during 2021-22, which is 1.70 million tons (2.6 per cent) higher than the last year's level 167.90 million tons. With opening stocks of 95.70 million tons, global sugar supply in 2021–22 is estimated to be 269.60 million tons, 0.78 percent greater than in 2020-21. The world's consumption in 2021-22 is estimated at 174.5 million tons, 2.6 percent higher than the last year's level of 170.1 million tons. End-of-year stocks in 2021-22 are estimated at 94.80 million tons, 1.1 percent lower than last year due to a slight decrease in opening stocks in consumption.

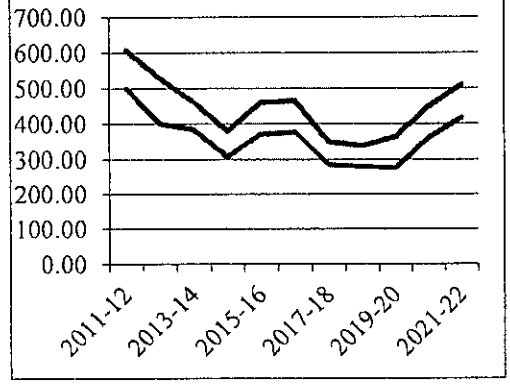
89. World sugar production during 2022-23 is forecasted at 179.6 million tons, which is 5.9 million tons, (3.4 percent) higher than last year's production. Accounting for the opening stocks of 103.9 million tons, global supply of sugar in 2022-23 has been projected at 283.5 million tons, 5.1 per cent higher than in 2021-22. World consumption in 2022-23 is projected at 174.7 million tons, 0.6 per cent higher than last year. The end-of-year stocks are projected to increase to 108.5 million tons, or 14.5 percent, due to lower consumption. If these forecasts come true, the price of sugar in the international market may decrease.

13.2 International Prices of Sugar

90. International prices of raw (fob Caribbean ports) and white (fob London) sugar from 2011-12 to 2021-22 are presented in Annex-XV while their graphical movement shown in Fig-7.

91. Prices of both raw and white sugar have shown a volatile pattern and fluctuated widely during the period from 2011-12 to 2021-22. During this period, the price of raw sugar (Caribbean port) averaged US $499.96 per ton in 2011-12. However,

Fig-7: International Prices of Raw Sugar



the price of raw sugar started to decrease continuously and reached US $307.69 per ton during 2014-15. The next couple of years, prices increased slightly and averaged at US $376.40 in 2016-17, but again started decreasing and averaged at US $276.23 per ton, touching the lowest level of price during the period under review. During the following year, 202-21, the price increased to US$360.74 per ton. In the current season 2021–22 (Oct-Apr), a continued upward trend is being observed and prices have increased significantly to $ 416.57 per ton. It is the second highest level of price after 2011-12.

92. The pattern followed by the prices of white sugar during the period under reference has been similar to that of raw sugar, as described above. The difference between the average annual price of raw and white sugar ranged between $57.37 per tons and $128.58 per ton. Sugar production is among the most energy-intensive industries and is especially reliant in the world on gas, prices of which have soared this year as key producer Russia has sharply restricted supply. Secondly, high food inflation in all over the world has increased the prices of food items including sugar. Thirdly the prices of packaging material exerted the price of sugar.

14. IMPORT AND EXPORT PARITY PRICES OF SUGARCANE

93. Estimation of the import parity price of a commodity is helpful in determining the opportunity cost of resources used in its domestic production, while the export parity prices are helpful in ascertaining its competitiveness in the international market. Since Pakistan has been an importer of sugar in some years and an exporter in others, both the import and export parity prices of sugarcane have been worked out for analyzing price policy options for the next crop season.

94. Both the import and export parity prices have been calculated on the basis of white sugar price (fob London). Detailed calculations in this connection are given in Annexes-XVI and XVII, while the results are summarized in Table-21.

Table-21: Import/Export Parity Prices of Sugarcane as Worked Back from Average fob (London) Prices of Sugar

Average fob London prices of white sugar per tons	Sugarcane prices (Rs/40 kgs)	
	Punjab	Sindh
Import parity		
US $ 537.97 (April 2022)	399.57	412.90
US $ 509.27, 2020-21 (Oct-April)	381.42	394.15
US $ 382.90 (2019-20 to 2020-21)	301.52	311.58
Export parity		
US $ 537.97 (April 2022)	267.98	276.93
US $ 509.27, 2020-21 (Oct-April)	250.42	258.78
US $ 382.90 (2019-20 to 2020-21)	173.09	178.86

Source Annexes –XVI and XVII

15. MILL-GATE PRICES OF SUGARCANE BASED ON DIFFERENT SLAB OF SUGAR PRICE IN DOMESTIC WHOLESALE MARKETS OF THE COUNTRY DURING 2021-22.

95. This analysis is based on actual sucrose recovery as reported by the provincial sugarcane commissioners; the ratio of the cost of cane to processing cost has been estimated at 79.80:2020 for Punjab and 80.668:19.32 for Sindh and sales tax at 17 percent. A summary of sugarcane prices estimated under this scenario from various slabs of wholesale prices of sugar is presented in Table-22 while the details are given in Annex-XVIII.

Table-22: Sugarcane Prices worked back from Expected Wholesale Prices of Sugar during 2021-22

Wholesale prices of sugar (Rs /Ton)	Sugarcane prices (Rs/40 Kgs)	
	Punjab	Sindh
Rs 85,000	231.51	239.24
Rs 90,000	245.13	253.31
Rs 95,000	258.75	267.38
Rs 100,000	272.37	281.45

Source Annex-XVII

16. USE OF SUGARCANE CESS FUND

96. Sugarcane Development Cess Fund has been collected from sugarcane grower and sugar mills on equal basis. The province wise rate of sugarcane cess fund is as under:

Provinces	Growers	Sugar mills
	----------Rs per 40 kgs----------	
Punjab	1.5	1.5
Sindh	0.25	0.25
Khyber Pakhtunkhwa	0.50	0.50

97. The objective of this collection was aimed/ meant for the construction and improvement of roads in the sugar mills areas. They should also be utilized for research and development of sugarcane crop. The Province-wise estimated Sugarcane Development Cess Fund on the basis of cane crushed during 2020-21 as under:

Table-23: Province-wise estimated Cess fund Generated on the basis of Sugarcane Crushed during 2021-22

Province	Cane Crushed Million tons	Rate of Cess Fund Rs	Total Cess Million Rs.
Punjab	39.76	3.0	298.20
Sindh	15.25	0.5	19.41
Khyber Pakhtunkhwa	3.32	1.0	8.30

98. The above mentioned table reveals that enormous amount of sugarcane cess fund is being collected every year, which remained unutilized due to lack of proper coordination, planning and decision making. The Provincial Cane Commissioners are mainly responsible for regulating the affairs relating to development, marketing and processing of sugarcane in their respective provinces.

99. The former Agriculture Prices Commission (APCom) presently the Agriculture Policy Institute (API) has been suggesting in the Price Policy Reports that the sugarcane cess fund, which is aimed/meant for the construction and improvement of roads in the sugar mills areas, should also be utilized for research and development of the sugarcane crop.

100. To strengthen sugarcane research in the Punjab, the Government of Punjab has allocated 10% of the Sugarcane Cess Fund to the Sugarcane Research and Development Board (SRDB), Punjab. The SRDB is utilising that cess fund for both sugarcane research & development and also includes operational expenditures of the SRDB. A brief description of SRDB's achievements and contributions in the field of sugarcane research is as under:

Description	Period	Amount (Rs)
CESS amount received	2015-2018	780 million
Amount of CESS fund In-Process	2018-2020	700 million
Amount received/receivable	2020-21	292 million

16.1 Key Achievements by Using the CESS Fund Received

During 2020-21 by the SRDB:

i. Import of Germplasm / Promising Clones / True Seed-Fuzz) from Brazil, Srilanka and China whereas import of germplasm from USA is under process.
ii. 8 projects amounting to (Rs 82.72 million) awarded on sugarcane research and development.
iii. Quarterly publication of Pakistan Sugar Journal
iv. Draft Center of Excellence on sugarcane
v. Input on Report of Sugar Sector Reforms Committee
vi. Development of seed farm under Project of National Program for enhancing sugarcane profitability.
vii. Recommendations for Growth and Equity Strategy (2021-23)-market development and reforms.

17. SUGARCANE CROP RESEARCH AND DEVELOPMENT IN PAKISTAN

- **Sindh**

101. The National Sugar and Tropical Horticulture Research Institute (NSTHRI), Thatta is an apex public sector organization working under umbrella of Pakistan Agriculture Research Council (PARC) on development and release of sugarcane varieties along with production technologies.

102. The Institute has overall developed 4 commercial sugarcane varieties for general cultivation in the Sindh. Varieties developed in the last ten years with characteristics are as under:

Table-24: Varieties Developed by Pakistan Agriculture Research Council (PARC) National Sugar and Tropical Horticulture Research Institute (NSTHRI), Thatta in Last Ten Years with their Characteristics

S.No	Variety	Year of Release	Main characteristics
1	Thatta-10	2004	▪ It is medium maturing variety ▪ Avg. yield potential: 180-200 t ha^{-1} ▪ Avg. yield: 150 t ha^{-1} ▪ Sugar recovery: 12.15% ▪ Ratooning ability: Good
2	Thatta-2109	2016	▪ It is early maturing variety ▪ Avg. yield potential: 160-180t ha^{-1} ▪ Avg. yield: 140 t ha^{-1} ▪ Sugar recovery: 13.5% ▪ Ratooning ability: Good
3	Thatta-326	2016	▪ It is early maturing variety ▪ Avg. yield potential: 180-200t ha^{-1} ▪ Avg. yield: 150 t ha^{-1} ▪ Sugar recovery: 12.25% ▪ Ratooning ability: Good
4	YT-55-Thatta	2018	▪ It is early maturing variety ▪ Avg. yield potential: 160-180 t ha^{-1} ▪ Avg. yield: 140 t ha^{-1} ▪ Sugar recovery: 12.5% ▪ Ratooning ability: Good

Source: PARC.

- **Punjab**

103. Faisalabad's Sugarcane Research Institute (SRI) is an important public sector agency dedicated to the research and release of sugarcane varieties as well as production technologies.

104. The Institute has overall developed 24 commercial sugarcane varieties for general cultivation in the Punjab. These varieties occupied more than 95% of sugarcane cultivated area in the province. Varieties developed in the last ten years with characteristics are as under:

Table-25: Varieties Developed by Sugar Research Institute (SRI) in Last Ten Years with their Characteristics

S.No	Variety	Year of Release	Main characteristics
1	CPF 246	2011	• It is medium maturing variety • Avg. yield potential: 1600 t ha^{-1} ▪ Avg. yield: 1200 t ha^{-1} ▪ Sugar recovery: 12.15% ▪ Ratooning ability: Good ▪ 2083 t ha^{-1} cane yield was reported in sugarcane yield competition in the Punjab-2012
2	CPF 247	2011	• It is medium maturing variety • Avg. yield potential: 1500 t ha^{-1} ▪ Avg. yield: 1200 t ha^{-1} ▪ Sugar recovery: 12.25% ▪ Ratooning ability: Good ▪ Also good for light soils and non-lodging variety
3	CPF 248	2014	• It is medium maturing variety • Avg. yield potential: 1500 t ha^{-1} ▪ Avg. yield: 1200 t ha^{-1} ▪ Sugar recovery: 12.71% ▪ Ratooning ability: Good
4	CPF 249	2016	• It is medium maturing variety • Avg. yield potential: 1650 t ha^{-1} ▪ Avg. yield: 1200 t ha^{-1} ▪ Sugar recovery: 12.46% ▪ Ratooning ability: Good ▪ Also good for saline soils and having highest yield potential

Source: SRI/PARC.

- **Khyber Pakhtunkhwa**

105. The Crops Research Institute in Mardan is an apex public sector agency that works on sugarcane variety creation and release, as well as production technology.

106. The Institute has overall developed 4 new commercial sugarcane varieties for general cultivation in the Province. Varieties developed in the last ten years with characteristics are as under:

Table-26: Varieties Developed by Crops Research Institute, Mardan in Last Ten Years with their Characteristics

S.No	Variety	Year of Release	Main characteristics
1	Israr Shaheed SC	2017	• Maturing: Early • Avg. yield potential: 97.23 t ha^{-1} • Avg. yield: 90.0 t ha^{-1} • Sugar recovery: 13.40% • Ratooning ability: Good
2	Abdul Qayum	2017	• Maturing: Early • Avg. yield potential: 113.73 t ha^{-1} • Avg. yield: 89.00 t ha^{-1} • Sugar recovery: 13.69% • Ratooning ability: Good
3	Mardan 2021	2021	• Maturing: Early • Avg. yield potential: 95.41 t ha^{-1} • Avg. yield: 87.00 t ha^{-1} • Sugar recovery: 12.71% • Ratooning ability: Good
4	Gul Rehman	2021	• Maturing: Early • Avg. yield potential: 1650 t ha^{-1} • Avg. yield: 85.00 t ha^{-1} • Sugar recovery: 12.46% • Ratooning ability: Good

Source: PARC.

18. MARKETING OF SUGARCANE

107. Sugarcane is one of Pakistan's most important cash crops, planted across the country. As it cannot be stored after harvesting, it is to be processed either into gur/khandsari at the farms or crushed by sugar mills for sugar manufacture. So its marketing plays an important role in this respect. These problems have been present in the sugar market for a long time, but the density of the problems may increase or decrease according to crop size. To have up-to-date information in this respect, API conducted a mini survey in the main sugarcane producing areas of Punjab, Sindh and Khyber Pakhtunkhwa. On the basis of survey results and discussion in the API Committee meetings for sugarcane, the main issues/problems faced by the farming community are briefly discussed below.

18.1 Delayed Payments

108. Delayed payment to the growers is a persistent feature in the sugar cane marketing. The sugar industry, at the beginning of the season, generally made payments to growers within two weeks as mentioned in the Sugar Factor Control Act. However, as the season progresses to the end, the payments are delayed by months and, in some cases, in bumper crops, they are delayed by seasons. Mills are of the view that this happens due to liquidity problems. Although, the during 2021-22, the crop size was 88.76 million tons, all times higher in the history. However, in spite of bumper crop prices, they did not decrease significantly, and all the above-mentioned complaints of delayed payments were relatively low. The main reason is the continuous supply of sugarcane from Punjab to Sindh due to high prices of sugarcane in Sindh which offset the impact of the bumper crop. The second reason is the presence of middleman.

18.2 Presence of Middlemen

109. Although the middlemen are paying less than the sugar mills, at Rs 5 to 15 per 40 kg varying from farmer to farmer, the presence of middlemen has been rampant all over the country, especially in Punjab and Sindh. Middleman is paying less than sugar mills but the farmers are satisfied with the prompt payment. Many farmers have cultivated sugarcane on less than one acre, and it is not economical to sell it at the mill gate and wait for payment. Therefore, they are happy in presence of a middleman. Common farmers are in favour of the presence of a middleman as a second buyer. However, it is reported by farmers that due to the volatile pattern of sugarcane prices in the early season, the middlemen have lost the money, especially those traders who have made contracts on advance payment before the start of season on high prices. As a result, they have lost the advance payment, which ranged between Rs 50,000 to 100,000 per acre.

18.3 Underweighment and Undue Deductions

110. Underweighment of cane at the purchase centres and mill gates is the regular complaint of cane growers. The supervisory committees are also constituted by the government, comprising government officers, representatives of growers and representatives of sugarmill management. The complaints of underweighment and unlawful deduction are regular complaints of growers. The weighbridges and scales installed at the purchase centres do not record the correct weight. Supervisory committees are expected to be effective and vigilant in combating these malpractices. The mechanism of farmers' complaints and action taken by the supervisory committees may be developed on scientific basis, and complaints and action taken by the committees may be published.

18.4 Contract between Farmers and Sugar Mills

111. Sugarcane is an important cash crop and source of raw material to the second largest agro based industry. The relationship between farmer and sugar millers are always conflicting particularly the price of produce and weighment has been observed contrary to the benefit of each other. It is necessary to develop a contract between growers and sugar mills for supply of sugarcane on prefixed price. The sugar mills may help the farmers in production of sugarcane in the form of cheap input supply.

18.5 Intercropping

112. Sugarcane is being cultivated as intercropping with other crops like rape seed, maize, berseen (fodder) and wheat etc. During API survey in Punjab, a farmer Mr. Muhktiar Ghuman informed the survey team the he cultivated 12 acre sugarcane with maiz (fodder) and sold at Rs 44000 per acre. He also cultivated berseen with sugarcane in 5 acres in the month of February and sold at Rs 120,000 per acre. The wheat production with sugarcane is reported from 25 to 30 maund per acre. In Sindh Onion and tomatoes are widely intercropped with sugarcane. A specific survey for revenue generated by intercropping may be conducted and incorporated in the cost of production because the land rent is used for whole year for sugarcane crop estimations.

18.6 Provision of Seed of Approved Varieties

113. The sugarcane seed is required in bulk quantity, its harvesting, transportation and planting is carried out at same time and cannot be stored/ packed. Its rate of multiplication is hardly 1:10 as compared to 1:40 for wheat. The production, multiplication and distribution of quality seed of high yielding varieties at Institute level was not exist. After de-zoning, sugar mills also have stopped their cane development activities including the supply of improved seed to the growers. Resultantly, farmers generally use their commercial crop as seed without its treatment against diseases.

114. In this regards, the API in its reports, continuously suggested to take the measure for growing cane of high sucrose varieties, the Provincial Agriculture Departments should launch an aggressive campaign for educating the growers regarding the sowing of improved varieties and discouraging the cultivation of unapproved varieties. Sugar mills should establish/ revive their Cane Development Programmes either individually or collectively. These centers in collaboration with the progressive growers and sugarcane researchers should develop the sugarcane seed according to climate change. The responsibility of production, multiplication and distribution of High Yielding Variety (HYV)/quality seed of sugarcane may be assigned to concerned authorities.

115. The availability of healthy seeds of approved sugarcane varieties to sugarcane growers is a big issue in the current prevailing yield gap. There was no seed standard for sugarcane seed production available prior to 2016. However, after the implementation of the Seed Act 2016, the Sugarcane Research Institute, Faisalabad (SRI) took up the matter and seed standards were approved with the consultation of the Federal Seed Certification & Registration Department, Islamabad.

116. The SRI is producing a limited quantity (about 10 acres annually) of quality seed (pre-basic/ basic) which is available for multiplication/ certified seed production by the sugar mills and seed farms. There is a dire need to strengthen extension activities by the government and sugar mills for cultivation of only approved varieties and discourage or ban un-approved or out-dated sugarcane varieties from provincial/national sugarcane agriculture. The sugar mills and research institutions may play their roles to enhance the production quality as mentioned above to improve the per acre yield at the country's level.

18.7 Low Plant Population

117. Lack of an adequate plant population remains an important factor in the low productivity of sugarcane. Research on sugarcane has found that even good quality seed does not provide more than 60 per cent germination. In general, 80-100 maunds of seed of thin and 100-120 maunds of thick varieties of cane are recommended for cultivating one acre.

118. Sugarcane sowing and harvesting operations are still manual, labour intensive and time consuming operations which reduce the per acre sugarcane yield due to poor germination and less plant population in the acre. Manually harvesting of sugarcane affects the ratoon crop and also reduces the sugar content in sugarcane. The use of sugarcane planter and harvester will eliminate the ridger operation, increase the plant population and better germination thus results in increased in per acre yield. Sugarcane harvester will reduce harvesting time which will increase the sugar recovery. Both these implements are highly costly, especially the harvester. Therefore, it is suggested that the government, with the collaboration of the sugar industry, may purchase the implements and provide them to growers on a rent basis. The sugarcane cess fund may be allocated for three years to purchase these impalements and provided to growers by constituting a committee.

18.8 Amendments in Sugar Factories Control Act, 1950

119. After de-zoning and emerging issues, many changes have occurred in the cane marketing system and the functioning of Sugar Factories Control Act, 1950 has become less effective. Keeping in view the current needs, it is essential that the Act may be amended in the light of emerging issues, especially for the promotion of contract system between growers & the mills.

18.9 Value-Addition and Vertical Integration in Sugar Industry

120. In view of the decreasing trend in the world prices of sugar and large-scale investments in the domestic sugar industry, it is imperative to improve the efficiency of resource use in sugarcane production and its processing. To improve productivity in sugar processing, the requirement is not only to improve efficiency but also value addition through vertical integration. In the wake of fast approaching globalization and WTO requirements, the sugar industry would also have to go into value-adding business and growers would also get their share of returns.

18.10 Balanced Use of Fertilizers

121. Chemical fertilizers play an important role in enhancing crop productivity, but the real key to getting maximum returns from the investment in fertilizers is their balanced and timely application. Overtime, though fertilizer use has increased, due to the widening of the NP ratio, productivity gains have been sub-optimal. The survey reports on use of fertilizers have shown that only a small fraction of cane growers have adopted balanced use of fertilizers. This imbalance in nutrient application adversely affects the per hectare yield of sugarcane as well as the quality of the produce. The Agriculture Extension Department may be called in to educate the growers on the balanced use of fertilizer. It is imperative to use the fertilizer according to soil conditions.

19. SUGARCANE YIELD AMONG COMPETING COUNTRIES

122. During 2020 global sugarcane crop has occupied an area of around 26,467 thousand hectares globally and production 1,869,715 thousand tons. The world top 26 producing countries contribute 93.34 per cent of total area and 89.11 per cent of total production as narrated in Table-27.

Table-27: MAJOR SUGARCANE PRODUCING COUNTRIES AREA OF THE WORLD: 2020 CROP

S.No.	Country	Area (000)ha	Per cent Share in World area
1	Brazil	10,014	37.84
2	India	4,790	18.10
3	Thailand	1,834	6.93
4	China, mainland	1,360	5.14
5	**Pakistan**	**1,165**	**4.40**
6	Mexico	777	2.94
7	Argentina	502	1.89
8	Indonesia	421	1.59
9	Philippines	399	1.51
10	United States of America	383	1.45
11	Colombia	371	1.40
12	Australia	366	1.38
13	Cuba	319	1.21
14	South Africa	283	1.07
15	Guatemala	251	0.95
16	Viet Nam	185	0.70
17	Bolivia (Plurinational State of)	180	0.68
18	Myanmar	180	0.68
19	Ecuador	139	0.53
20	Cameroon	137	0.52
21	Egypt	136	0.51
22	Dominican Republic	124	0.47
23	Paraguay	105	0.40
24	Madagascar	95	0.36
25	Cambodia	95	0.36
26	Iran (Islamic Republic of)	93	0.35
	Total of 26 countries	**24705**	**93.34**
	World Total 92 countries	**26467**	**100.00**

Source: World statistics year book 2020

123. In terms of sugarcane area and production Brazil is on the top with 10014 thousand hectares and 757,117 tons production followed by India with 4790 thousand hectares in area and 870,500 tons in production. Pakistan lies at 5th number (4.4 per cent share) with 1165 thousand hectares (Table-28).

Table-28: MAJOR SUGARCANE PRODUCING COUNTRIES PRODUCTION OF THE WORLD: 2020 CROP

S.No.	Country	Production in (000)tons	Per cent Share in World area
1	Brazil	757,117	40.49
2	India	370,500	19.82
3	China, mainland	108,121	5.78
4	**Pakistan**	**81,009**	**4.33**
5	Thailand	74,968	4.01
6	Mexico	53,953	2.89
7	United States of America	32,749	1.75
8	Australia	30,283	1.62
9	Indonesia	28,914	1.55
10	Guatemala	28,350	1.52
11	Colombia	24,650	1.32
12	Philippines	24,399	1.30
13	South Africa	18,220	0.97
14	Argentina	18,046	0.97
15	Egypt	14,914	0.80
16	Cuba	13,895	0.74
17	Myanmar	11,886	0.64
18	Viet Nam	11,535	0.62
19	Ecuador	11,016	0.59
20	Peru	10469	0.56
21	Bolivia (Plurinational State of)	10,094	0.54
22	Nicaragua	8,585	0.46
23	Iran (Islamic Republic of)	7,827	0.42
24	El Salvador	7,694	0.41
25	Paraguay	7,431	0.40
26	**Kenya**	6,800	0.36
	Total of 26 countries	**1666193**	**89.11**
	World Total 92 countries	**1869715**	**100.00**

Source: World statistics year book 2020

124. In terms of yield tons/hectare, Peru lies at the top with 123.76 tons per hectare, followed by Senegal with 114.19 tons per hectare and Guatemala, Egypt with 112.94, and 109.82 tons per

hectare consistently. It is an unfortunate situation that Pakistan ranks 32nd in terms of yield at 69.53 tons per hectare, which is nearly the international average of 870.64 tons/ha, while India ranks 20th with 77.35 tons per hectare, which is 9.50% higher than the international average with nearly the same soil and climatic conditions.

Table-29: YIELD PER HECTARE OF MAJOR SUGARCANE PRODUCING COUNTRIES IN THE WORLD: 2020 CROP

S.No.	Country	**Yield (tons)ha**	S.No.	Country	**Yield (tons)ha**
1	Peru	123.76	25	Costa Rica	74.65
2	Senegal	114.19	26	Panama	74.23
3	Guatemala	112.94	27	Mali	72.76
4	Egypt	109.82	28	Uganda	71.02
5	Nicaragua	109.79	29	Paraguay	70.77
6	Malawi	108.02	30	Sierra Leone	69.74
7	Zambia	103.52	31	United Republic of Tanzania	69.73
8	Burkina Faso	102.63	32	**Pakistan**	69.53
9	Chad	100.43	33	Mexico	69.42
10	Eswatini	97.39	34	Indonesia	68.76
11	El Salvador	92.91	35	Burundi	68.09
12	French Polynesia	89.70	36	Morocco	67.37
13	United States of America	85.40	37	China, Taiwan Province of	66.56
14	Honduras	84.71	38	Colombia	66.50
15	Iran (Islamic Republic of)	84.28	39	Myanmar	66.07
16	Australia	82.65	40	Haiti	65.16
17	Cost d'Ivoire	81.64	41	South Africa	64.48
18	China, mainland	79.50	42	Lao People's Democratic Republic	63.58
19	Ecuador	79.02	43	Gabon	62.68
20	India	77.35	44	Viet Nam	62.20
21	Zimbabwe	76.58	45	Philippines	61.14
22	Kenya	75.72	46	Mauritius	59.96
23	Brazil	75.60	47	Sri Lanka	59.26
24	Sudan	74.78	48	**Uruguay**	59.12
				World average	**70.64**

Source: World statistics year book 2020

20. ACKNOWLEDGEMENT

125. The technical contribution and professional efforts of the following staff members are highly appreciated in completion of Sugarcane Policy Report for 2022-23 Crop:

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ANNEX-I

PROVINCE-WISE AREA, PRODUCTION AND YIELD OF SUGARCANE IN PAKISTAN: 2011-12 TO 2021-22

YEAR	PUNJAB	SINDH	KPK	BALOCHISTAN	PAKISTAN
AREA	---------- 000 hectares ----------				
2011-12	761.20	189.70	105.90	0.70	1,057.50
2012-13	767.70	253.70	106.70	0.65	1,128.75
2013-14	756.80	297.60	117.40	0.67	1,172.47
2014-15	710.60	316.70	112.50	0.66	1,140.46
2015-16	705.40	312.80	112.70	0.70	1,131.60
2016-17	777.80	320.50	118.60	0.66	1,217.56
2017-18	859.10	333.30	148.50	0.86	1,341.76
2018-19	710.60	279.50	111.00	0.87	1,101.97
2019-20	643.40	286.10	109.40	0.89	1,039.79
2020-21	777.00	279.70	107.40	0.92	1,165.02
2021-22	869.30	295.20	107.20	0.70	1,272.40
YIELD	---------- Tons per hectare ----------				
2011-12	56.35	56.87	44.23	44.86	55.22
2012-13	55.99	62.93	44.71	48.46	56.48
2013-14	57.75	61.70	45.67	48.06	57.54
2014-15	57.80	52.46	45.40	47.42	55.09
2015-16	59.50	57.49	48.79	45.29	57.87
2016-17	63.79	63.05	47.46	48.17	61.99
2017-18	64.10	61.84	51.25	50.47	62.11
2018-19	63.19	59.72	49.84	50.92	60.96
2019-20	67.37	60.24	52.60	50.79	63.84
2020-21	73.36	65.55	52.40	50.11	69.53
2021-22	73.56	64.89	52.46	49.71	69.76
PRODUCTIO	---------- 000 Tons ----------				
2011-12	42,893.00	10,788.30	4,684.30	31.40	58,397.00
2012-13	42,982.00	15,966.20	4,770.20	31.50	63,749.90
2013-14	43,704.00	18,362.50	5,361.40	32.20	67,460.10
2014-15	41,074.00	16,613.80	5,107.00	31.30	62,826.10
2015-16	41,968.20	17,984.30	5,498.30	31.70	65,482.50
2016-17	49,613.00	20,208.90	5,628.70	31.60	75,482.20
2017-18	55,067.50	20,611.90	7,610.00	43.40	83,332.80
2018-19	44,906.30	16,691.30	5,532.00	44.30	67,173.90
2019-20	43,346.60	17,233.80	5,754.00	45.20	66,379.60
2020-21	57,000.00	18,335.50	5,627.50	46.10	81,009.10
2021-22	63,945.00	19,154.80	5,623.90	34.80	88,758.50

Sources:

1- For 2011-12 to 2019-20 : Previous Policy of Sugarcane for 2019-20 crop

2- For 2020-21: Final estimates provided by concerned Provincial Agriculture Department.

3- For 2021-22: Second estimate of Punjab, Sindh, KPK and Balochistan provided by concerned Provincial Agriculture Departments.

ANNEX-II

PROVINCE-WISE AREA, PRODUCTION AND YIELD OF SUGARCANE IN PAKISTAN: 2011-12 TO 2021-22

YEAR	PUNJAB	SINDH	KPK	BALOCHISTAN	PAKISTAN
AREA	----------	----------	**000 acres**	----------	----------
2011-12	1,881.00	468.77	261.69	1.73	2,613.19
2012-13	1,897.06	626.92	263.67	1.61	2,789.25
2013-14	1,870.13	735.40	290.11	1.66	2,897.29
2014-15	1,755.96	782.60	278.00	1.63	2,818.19
2015-16	1,743.11	772.96	278.49	1.73	2,796.30
2016-17	1,922.02	791.99	293.07	1.62	3,008.70
2017-18	2,122.92	823.62	366.96	2.13	3,315.62
2018-19	1,755.96	690.67	274.29	2.15	2,723.08
2019-20	1,589.91	706.98	270.34	2.20	2,569.43
2020-21	1,920.04	691.17	265.40	2.27	2,878.88
2021-22	2,148.13	729.47	264.90	1.73	3,144.23
YIELD	----------	----------	**Tonnes per acre**	----------	----------
2011-12	22.80	23.01	17.90	18.15	22.35
2012-13	22.66	25.47	18.09	19.61	22.86
2013-14	23.37	24.97	18.48	19.45	23.28
2014-15	23.39	21.23	18.37	19.19	22.29
2015-16	24.08	23.27	19.74	18.33	23.42
2016-17	25.81	25.52	19.21	19.49	25.09
2017-18	25.94	25.03	20.74	20.42	25.13
2018-19	25.57	24.17	20.17	20.61	24.67
2019-20	27.26	24.38	21.28	20.55	25.83
2020-21	29.69	26.53	21.20	20.28	28.14
2021-22	29.77	26.26	21.23	20.12	28.23
PRODUCTIO	----------	----------	**000 Tonnes**	----------	----------
2011-12	42,893.00	10,788.30	4,684.30	31.40	58,397.00
2012-13	42,982.00	15,966.20	4,770.20	31.50	63,749.90
2013-14	43,704.00	18,362.50	5,361.40	32.20	67,460.10
2014-15	41,074.00	16,613.80	5,107.00	31.30	62,826.10
2015-16	41,968.20	17,984.30	5,498.30	31.70	65,482.50
2016-17	49,613.00	20,208.90	5,628.70	31.60	75,482.20
2017-18	55,067.50	20,611.90	7,610.00	43.40	83,332.80
2018-19	44,906.30	16,691.30	5,532.00	44.30	67,173.90
2019-20	43,346.60	17,233.80	5,754.00	45.20	66,379.60
2020-21	57,000.00	18,335.50	5,627.50	46.10	81,009.10
2021-22	63,945.00	19,154.80	5,623.90	34.80	88,758.50

Sources:

1- For 2011-12 to 2019-20 : Previous Policy of Sugarcane for 2019-20 crop

2- For 2020-21: Final estimates provided by concerned Provincial Agriculture Departments

3- For 2021-22: Second estimate of Punjab, Sindh, KPK and Balochistan provided by concerned Provincial Agriculture Departments.

ANNEX-III

DISTRICT-WISE AREA, YIELD AND PRODUCTION OF SUGARCANE
AVERAGE OF 2019-20 TO 2021-22

Sr. No	Province/ Districts/ Agency	Area	Production	Total Production	Yield	Sr. No	Province/ Districts/ Agency	Area	Production	Total Production	Yield ton/ha
	PUNJAB						**KHYBER PAKHTUNKHWA**				
1	R.Y.Khan	174.60	13,424.33	17.05	76.89	1	Charsadda	30.63	1782.06	2.26	58.18
2	Faisalabad	85.36	6,138.34	7.80	71.91	2	D.I.Khan	24.04	1528.72	1.94	63.59
3	Sargodha	61.25	4,428.46	5.63	72.30	3	Mardan	29.92	1284.49	1.63	42.93
4	Rajanpur	46.12	3,907.27	4.96	84.72	4	Peshawar	10.68	554.21	0.70	51.89
5	Jhang	55.99	3,687.70	4.68	65.86	5	Malakand	4.87	194.30	0.25	39.89
6	Muzaffargarh	48.90	3,615.41	4.59	73.94	6	Nowshera	3.44	175.73	0.22	51.13
7	Chiniot	43.43	3,270.37	4.15	75.30	7	Swabi	2.25	87.98	0.11	39.10
8	T.T.Singh	32.79	2,288.30	2.91	69.78	8	Bannu	0.42	19.38	0.02	46.13
9	Bhakkar	31.90	2,038.34	2.59	63.90	9	Khyber AG.	0.67	16.04	0.02	23.90
10	Bahawalpur	19.88	1,463.11	1.86	73.60	10	Tank	0.57	12.42	0.02	21.92
11	M.B.Din	22.54	1,361.88	1.73	60.43	11	Mohmand AG.	0.15	4.93	0.01	32.10
12	Kasur	21.55	1,344.66	1.71	62.40	12	Kohat	0.06	2.02	0.00	34.88
13	Layyah	17.47	1,179.84	1.50	67.53	13	Bunir	0.06	1.92	0.00	32.83
14	Vehari	15.02	1,069.90	1.36	71.24	14	Haripur	0.04	1.41	0.00	31.47
15	Bahawalnagar	13.01	938.13	1.19	72.10	15	F.R.D.I.Khan	0.12	1.13	0.00	9.77
16	D.G.Khan	9.42	665.75	0.85	70.64	16	Hangu	0.02	0.61	0.00	35.21
17	Nankana Sahib	9.37	600.96	0.76	64.16	17	F.R Hasan Khel	0.02	0.54	0.00	28.57
18	Okara	9.78	599.47	0.76	61.27	18	F.R.Peshawar	0.05	0.47	0.00	9.88
19	Khushab	6.70	394.35	0.50	58.83	19	Lakki Marwat	0.00	0.13	0.00	39.22
20	Khanewal	6.33	379.51	0.48	59.98						
21	Hafizabad	5.35	356.91	0.45	66.76						
22	Lodhran	4.44	303.25	0.39	68.34						
23	Mianwali	3.90	256.19	0.33	65.75						
24	Sahiwal	3.04	197.42	0.25	64.90						
25	Multan	3.10	195.90	0.25	63.27						
26	Sheikhupura	2.22	148.94	0.19	67.13						
27	Gujrat	2.63	119.53	0.15	45.53						
28	Sialkot	1.80	105.09	0.13	58.32						
29	Pakpattan	1.52	92.92	0.12	61.16						
30	Gujranwala	1.48	80.83	0.10	54.58						
31	Narowal	1.52	62.60	0.08	41.20						
32	Lahore	0.70	43.39	0.06	62.33						
33	Jhelum	0.12	4.83	0.01	38.90						
	Sub Total	**763.22**	**54,763.87**	**69.57**	**71.75**		**Sub Total**	**108.01**	**5,668.48**	**7.20**	**52.48**
Sr. N		**SINDH**				**Sr. No**		**BALOCHISTAN**			
1	Ghotki	59.25	4,025.60	5.11	67.94	1	Sibi	0.59	29.20	0.04	49.37
2	Thatta	36.83	2,434.93	3.09	66.12	2	Jaffarabad	0.23	12.32	0.02	52.88
3	Nawabshah	34.56	2,385.46	3.03	69.03	3	Lasbela	0.01	0.56	0.00	51.27
4	Khairpur	22.82	1,510.36	1.92	66.18						
5	N.Feroze	22.64	1,472.19	1.87	65.02						
6	Tando Allahyar	18.86	1,207.70	1.53	64.03						
7	Mirpurkhas	16.82	911.30	1.16	54.17						
8	Tando Muhammad	13.42	864.03	1.10	64.39						
9	Matiari	12.50	834.44	1.06	66.75						
10	Sanghar	13.45	829.86	1.05	61.70						
11	Badin	13.86	628.26	0.80	45.32						
12	Sukkur	6.99	383.69	0.49	54.87						
13	Dadu	6.48	291.57	0.37	44.96						
14	Hyderabad	5.28	290.42	0.37	55.00						
15	Unerkot	1.39	64.39	0.08	46.28						
16	Larkana	0.71	50.71	0.06	71.28						
17	Jamshoro	0.45	20.79	0.03	46.05						
18	Tharparkar	0.30	15.29	0.02	51.74						
19	Kashmore	0.17	9.92	0.01	58.72						
20	Shikarpur	0.11	6.23	0.01	56.85						
21	Shadadkot	0.05	2.74	0.00	53.21						
22	Jacobabad	0.04	1.51	0.00	40.53						
	Sub Total	**286.99**	**18,241.40**	**23.17**	**63.56**		**Sub Total**	**0.84**	**42.09**	**0.05**	**50.37**
							Pak Total	**1,159.06**	**78,715.84**	**100.00**	**67.91**

Notes:
1. Area: 000 ha, Prod: 000 tonnes, Yeild: tonnes/hectare
4. Data have been arranged in decending order of production.
5. Percentage shares are calculated on the basis of country total.

Sources:
1- MNFS&R, Islamabad
2- Respected Agriculture Provincial Departments

ANNEX-IV

AVERAGE FARMER'S COST OF PRODUCTION ESTIMATES OF SUGARCANE IN PUNJAB

S. No	Operations / Inputs	Unit	Average No. of units/ acre	2021-22 crop		2022-23 crop		Change in 2022-23 over 2021-22
				Cost per unit	Cost per acre	Cost per unit	Cost per acre	
1	2	3	4	5	6=4*5	7	8=4*7	9=8-6
1	Land preparation:					Rupees		
	1.1 Deep ploughing	No.	0.500	2,000.00	1,000.00	3,000.00	1,500.00	500.00
	1.2 Rotavator/disc plough used	No.	1.000	1,750.00	1,750.00	3,000.00	3,000.00	1,250.00
	1.3 Ploughing	No.	3.000	1,000.00	3,000.00	1,500.00	4,500.00	1,500.00
	1.4 Planking	No.	1.000	500.00	500.00	750.00	750.00	250.00
	1.5 Levelling	Hour	0.500	1,300.00	650.00	1,800.00	900.00	250.00
2	Seed bed preparation:							
	2.1 Ploughing	No	0.750	1,000.00	750.00	1,500.00	1,125.00	375.00
	2.2 Ridge making with tractor	Hour	0.500	1,000.00	500.00	1,500.00	750.00	250.00
	2.3 Clearing soil at ends of ridges (labor charges)	M. day	1.000	800.00	800.00	800.00	800.00	-
3	Seed and sowing operations:							
	3.1 Seed used	Marlas/ acre	10.000	1,500.00	15,000.00	2,000.00	20,000.00	5,000.00
	stripping, making of sets for seed, transport and sowing	Rs./ acre	1.000	4,800.00	4,800.00	5,500.00	5,500.00	700.00
4	Irrigation:							
	4.1 Canal	Irrig/acre			250.00		250.00	
	4.2 Tubewell	Irrig/acre	7.000	925.00	6,475.00	1,000.00	7,000.00	525.00
	4.3 Mixed	Irrig/acre	2.000	500.00	1,000.00	600.00	1,200.00	200.00
	cleaning	M. days/ acre	2.000	800.00	1,600.00	800.00	1,600.00	-
5	Interculture/ hoeing:							
	5.1 Manual hoeing on contract	No. of hoeings	1.000	1,300.00	1,300.00	1,500.00	1,500.00	200.00
	5.2 With tractor	Hour/acre	0.500	1,000.00	500.00	1,500.00	750.00	250.00
6	Plant protection including application cost :							
	6.1 weedicide	No. of appli	1.000	1,200.00	1,200.00	1,500.00	1,500.00	300.00
	6.2 Sprays	"	1.000	1,000.00	1,000.00	1,300.00	1,300.00	300.00
	6.3 Application cost	Rs./appli/acre	0.500	800.00	400.00	800.00	400.00	-
7	Farm Yard Manure including transport and application cost	No. of trolleys	0.250	4,000.00	1,000.00	4,500.00	1,125.00	125.00
8	Fertilizers: (bags) :							
	8.1 DAP	No. of bags	2.000	7,100.00	14,200.00	12,150.00	24,300.00	10,100.00
	8.2 Urea	"	2.000	1,800.00	3,600.00	2,250.00	4,500.00	900.00
	8.3 NP	"	0.250	3,600.00	1,800.00	8,200.00	2,050.00	250.00
	8.4 CAN	"	0.250	1,500.00	375.00	2,070.00	517.50	142.50
	8.5 SOP	"	0.250	4,800.00	1,200.00	16,000.00	4,000.00	2,800.00
	8.6 Fertilizer transport and application cost	"	4.750	90.00	450.00	150.00	712.50	262.50
9	Traded inputs' cost (Item 1 to 8 minus Item 4.1)	Rs./acre			64,850.00		91,280.00	26,430.00
10	Mark up on item 9 @ 12% per annum	"	1.083		8,430.50		11,866.40	3,435.90
11	Land rent	Rs/acre/13 months	1.083	40,000.00	43,333.33	45,000.00	48,750.00	5,416.67
12	Other Costs: i) Average weighted land tax	Rs/acre/13months	1.000		132.00		132.00	-
	ii) Management charges	Rs/acre/13months	1.083		2,600.00	2640	2,860.00	260.00
13	Crop harvesting, stripping, binding, loading, etc.	Rs./40 Kg		22.00	15,840.00	25.00	19,000.00	3,160.00
14	Gross cost of cultivation	Rs./acre			135,435.83		174,138.40	38,702.57
15	Sunsidy on DAP fertilizer	Rs/bag			900.00		900.00	-
16	Value of tops	Rs/acre			1,500.00		2,000.00	500.00
17	Net cost of cultivation	Rs/acre			133,035.83		171,238.40	38,202.57
18	Yield	40Kg/acre			720.00		760.00	40.00
19	Cost of production							
	19.1 At farm level including land rent	Rs./40 Kg			184.77		225.31	40.54
	19.2 At farm level excluding land rent	Rs./40 Kg			124.59		161.17	36.58
18	Marketing cost :							
	18.1 Transportation	Rs./40 Kg			18.00		18.50	0.50
	18.2 Road Cess	Rs./40 Kg			1.50		1.50	-
19	Cost of production :							
	19.1 At mill gate including land rent	Rs./40 Kg			204.27		245.31	41.04
	19.2 At mill gate Excluding land rent	Rs./40 Kg			144.09		181.17	37.08

Sources:

1 For rates/ prices of inputs, API field survey , 2021-22

2 For input rates, field surveys of API for respective years.

ANNEX-V

AVERAGE FARMER'S COST OF PRODUCTION ESTIMATES OF SUGARCANE IN SINDH

S. No	Operations / Inputs	Unit	Average No. of units/used acre	2021-22 crop		2022-23 crop		Change in 2022-23 over 2021-22
				Cost per unit	Cost per acre	Cost per unit	Cost per acre	
1	2	3	4	5	6 =4x5	7	8 =7x4	9=8-6
1	**Land preparation:**				Rupees			
	1.1 Deep ploughing	No	0.500	2,000.00	1,000.00	3,000.00	1,500.00	500.00
	1.2 Ploughing	No	3.000	1,275.00	3,825.00	1,500.00	4,500.00	675.00
	1.3 Planking	No	1.000	637.50	637.50	750.00	750.00	112.50
	1.5 Laser Levelling	"	1.000	1,325.00	1,325.00	1,800.00	1,800.00	475.00
2	**Seed bed preparation**							
	2.1 Ploughing	No	1.000	1,275.00	1,275.00	1,500.00	1,500.00	225.00
	2.2 Ridge making with tractor	Hrs.	0.500	1,325.00	662.50	2,000.00	1,000.00	337.50
	2.3 Clearing soil at ends of ridges	M. day	1.000	650.00	650.00	800.00	800.00	150.00
3	**Seed and sowing operations:**							
	3.1 Seed used	40 Kgs	80.000	200.00	17,800.00	300.00	24,000.00	6,200.00
	3.2 Contract sowing including harvesting, stripping, making of sets, transport and sowing	Rs./ acre			3,800.00		4,000.00	200.00
4	**Irrigation**							
	4.1 Canal	Irrigs./acre	18.000		250.00		250.00	-
	4.2 Private tubewell (RS./irrigation)	Irrigs./acre	1.000	800.00	800.00	1,200.00	1,200.00	400.00
	4.3 Mixed	Irrigs./acre	2.160	800.00	1,728.00	1,200.00	2,592.00	864.00
	4.4 Labour for irrigation and water course cleaning	M. day	2.000	650.00	1,300.00	800.00	1,600.00	300.00
5	**Interculture/ hoeing**							
	5.1 Manual	M. day	2.000	2,200.00	4,400.00	2,300.00	4,600.00	200.00
	5.2 Hoeing with tractor	No	1.800	1,325.00	2,385.00	2,000.00	3,600.00	1,215.00
6	Plant protection including application cost							
	6.1 weedicide	No. of sprays	1.000	1,100.00	1,100.00	1,500.00	1,500.00	400.00
	6.2 Sprays	"	1.200	950.00	1,140.00	1,500.00	1,800.00	660.00
	6.3 Application cost	Rs/acre	2.200	200.00	440.00	250.00	550.00	110.00
7	Farm Yard Manure including transport & application cost (50%)	No	0.320	2,100.00	672.00	4,500.00	1,440.00	768.00
8	Fertilizers: (bags)							
	8.1 DAP	No	2.000	7,100.00	14,200.00	12,150.00	24,300.00	10,100.00
	8.2 Urea	"	2.000	1,900.00	3,800.00	2,250.00	4,500.00	700.00
	8.3 NP	"	0.250	3,150.00	1,764.00	8,200.00	2,050.00	286.00
	8.4 CAN	"	0.250	1,550.00	465.00	2,100.00	525.00	60.00
	8.5 SOP	"	0.150	4,300.00	860.00	16,000.00	2,400.00	1,540.00
	8.6 Fertilizer transport and application cost	"	4.650	110.00	556.60	150.00	697.50	140.90
9	Traded inputs cost (Item 1 to 8-Item 4.1)	Rs./acre			66,585.60		93,204.50	26,618.90
10	Mark up on item 9 @ 12% per annum for 13 months	"			8,656.13		12,116.59	3,460.46
11	Land rent	"	1.08	37,500.00	40,625.00	40,000.00	43,333.33	2,708.33
12	Average weighted land tax	Rs/acre	1.00		200.00		200.00	-
13	Management charges	"	1.08		2,600.00		2,860.00	260.00
14	Crop harvesting, stripping, binding, loading, etc.	Rs./ 40 Kg		17.00	11,475.00	17.00	11,560.00	85.00
15	Total cost of cultivation	Rs./ acre			130,391.73		163,524.42	33,132.69
16	Sunsidy on DAP fertilizer	Rs/bag			900.00		900.00	
17	Value of tops	Rs/acre			1,500.00		1,500.00	
18	Net cost of cultivation	Rs/acre			127,991.73		161,124.42	
19	Yield	40 Kg/acre			675.00		680.00	5.00
20	Cost of production at farm level:							
	20.1 Including land rent	Rs./ 40 Kg			189.62		236.95	47.33
	20.2 Excluding land rent	Rs./ 40 Kg			129.43		173.22	43.79
21	Marketing cost :							
	21.1 Transport	Rs./40 Kg			18.00		18.50	0.50
	21.2 Road Cess	Rs./40 Kg			1.50		1.50	-
22	Cost of production at mill gate:							
	22.1 Including land rent	Rs./ 40 Kg			209.12		**256.95**	47.83
	22.2 Excluding land rent	Rs./ 40 Kg			148.93		193.22	44.29

Sources:

1 For input usage, API field survey , 2021-22

2 For input rates, field surveys of API for respective years.

2: For input rates, field surveys of API for respective years

ANNEX-VI

AVERAGE FARMER'S COST OF PRODUCTION ESTIMATES OF SUGARCANE IN KHYBER PAKHTUNKHA

S. No	Operations / Inputs	Unit	Average No. of units/ acre	2021-22 crop		2022-23 crop		Change in 2022-23 over 2021-22
				Cost per unit	Cost per acre	Cost per unit	Cost per acre	
1	2	3	4	5	6 =4*5	7	8 =4*7	9=8-6
1	Land preparation:				Rupees			
	1.1 Deep ploughing	No.	0.500	2,000.00	1,000.00	3,000.00	1,500.00	500.00
	1.2 Rotavator/disc plough used	No.	0.500	1,750.00	875.00	3,000.00	1,500.00	625.00
	1.3 Ploughing	No.	2.500	1,000.00	2,500.00	1,500.00	3,750.00	1,250.00
	1.4 Planking	No.	0.250	500.00	125.00	750.00	187.50	62.50
	1.5 Laser Levelling	Hour	1.000	1,100.00	1,100.00	1,800.00	1,800.00	700.00
2	Seed bed preparation:							
	2.1 Ploughing	No	0.750	1,000.00	750.00	1,500.00	1,125.00	375.00
	2.2 Ridge making with tractor	Hour	0.500	1,000.00	500.00	1,500.00	750.00	250.00
	2.3 Clearing soil at ends of ridges (labor charges)	M. day	1.000	500.00	500.00	700.00	700.00	200.00
3	Seed and sowing operations:							
	3.1 Seed used	Marlas/ acre	10.000	1,500.00	15,000.00	2,000.00	20,000.00	5,000.00
	stripping, making of sets for seed, transport and sowing	Rs./ acre	1.000	4,800.00	4,800.00	5,000.00	5,000.00	200.00
4	Irrigation:							
	4.1 Canal	Irrig/acre			250.00		250.00	
	4.2 Tubewell	Irrig/acre	7.000	-	-	-	-	-
	4.3 Mixed	Irrig/acre	2.000	-	-	-	-	-
	4.4 Labour for irrigation and water course cleaning	M. days/ acre	2.000	500.00	1,000.00	700.00	1,400.00	400.00
5	Interculture/ hoeing:							
	5.1 Manual hoeing on contract	No. of hoeings	1.000	1,300.00	1,300.00	1,400.00	1,400.00	100.00
	5.2 With tractor	Hour/acre	0.500		-		-	-
6	Plant protection including application cost :							
	6.1 weedicide	No. of appli	1.000	800.00	800.00	1,000.00	1,000.00	200.00
	6.2 Sprays	"	1.000	800.00	1,000.00	1,000.00	1,000.00	-
	6.3 Application cost	Rs./appli/acre	0.500	500.00	250.00	700.00	350.00	100.00
7	Farm Yard Manure including transport and application cost	No. of trolleys	0.250	6,000.00	1,500.00	6,500.00	1,625.00	125.00
8	Fertilizers: (bags) :							
	8.1 DAP	No. of bags	2.000	7,100.00	14,200.00	12,150.00	24,300.00	10,100.00
	8.2 Urea	"	2.000	1,800.00	3,600.00	2,250.00	4,500.00	900.00
	8.3 NP	"	0.250	-	-	-	-	-
	8.4 CAN	"	0.250	-	-	-	-	-
	8.5 Other	"	0.250	1,000.00	250.00	1,500.00	375.00	125.00
	8.6 Fertilizer transport and application cost	"	4.750	100.00	475.00	150.00	712.50	237.50
9	Traded inputs' cost (Item 1 to 8 minus Item 4.1)	Rs./acre			51,525.00		72,975.00	21,450.00
10	Mark up on item 9 @ 12% per annum	"	1.083		6,698.25		9,486.75	2,788.50
11	Land rent	Rs/acre/13 months	1.083	30,000	32,500.00	35,000	37,916.67	5,416.67
12	Other Costs: i) Average weighted land tax	Rs/acre/13months	1.000		132.00		132.00	-
	ii) Management charges	Rs/acre/13months	1.083	2,400	2,600.00	2640	2,860.00	260.00
13	Crop harvesting, stripping, binding, loading, etc.	Rs./40 Kg		20.00	10,600.00	22.00	12,100.00	1,500.00
14	Gross cost of cultivation	Rs./acre			104,305.25		135,720.42	31,415.17
15	Sunsidy on DAP fertilizer	Rs/bag			900.00		900.00	-
16	Value of tops	Rs/acre			1,500.00		2,000.00	500.00
17	Net cost of cultivation	Rs/acre			101,905.25		132,820.42	30,915.17
18	Yield	40Kg/acre			530.00		550.00	20.00
19	Cost of production							
	19.1 At farm level including land rent	Rs./40 Kg			192.27		241.49	49.22
	19.2 At farm level excluding land rent	Rs./40 Kg			130.95		172.55	41.60
18	Marketing cost :							
	18.1 Transportation	Rs./40 Kg			10.00		12.00	2.00
	18.2 Road Cess	Rs./40 Kg			1.50		1.50	-
19	Cost of production :							
	19.1 At mill gate including land rent	Rs./40 Kg			203.77		254.99	51.22
	19.2 At mill gate Excluding land rent	Rs./40 Kg			142.45		186.05	43.60

Source:

1 For rates/ prices of inputs, API field survey , 2021-22

2 For input rates, field surveys of API for respective years.

ANNEX-VII

ECONOMICS OF SUGARCANE AND COMPETING CROPS AT PRICES REALIZED BY THE GROWERS: 2021-22 CROP

Sr. No	Province/crops/crop combination	Crop duration	Water used	Gross cost	Cost of purchased inputs	Gross revenue	Gross margin	Net income	Output - input ratio	Revenue per		
										Rupee of purchased inputs	Crop day	Acre inch of water used
		Days	Acre inches	.....Rupees per acre.....					Ratio	.....Rupees.....		
	1	2	3	4	5	6	7=6-5	8=6-4	9=6/4	10=6/5	11=6/2	12=6/3
	Punjab											
1	Sugarcane	394	48	133,068	48,100	165,960	117,860	32,892	1.25	3.45	421	3,458
2	Seed Cotton	210	22	84,502	30,416	119,120	88,704	34,618	1.41	3.92	567	5,415
3	Basmati Paddy	180	58	69,585	37,172	75,425	38,253	5,840	1.08	2.03	419	1,300
4	IRRI Paddy	180	62	72,721	33,748	79,700	45,952	6,979	1.10	2.36	443	1,285
5	Wheat	150	12	59,081	20,017	75,069	55,052	15,988	1.27	3.75	500	6,256
6	Sunflower (spring)	180	22	62,272	24,678	125,454	100,776	63,182	2.01	5.08	697	5,702
7	Canola	180	13	48,426	12,530	100,874	88,344	52,447	2.08	8.05	560	7,760
8	Seed Cotton + Wheat	360	34	143,583	50,433	194,189	143,756	50,606	1.35	3.85	539	5,711
9	Seed Cotton+Sunflower	390	44	146,774	55,094	244,574	189,480	97,800	1.67	4.44	627	5,559
10	Seed Cotton + Canola	390	35	132,929	42,946	219,994	177,048	87,065	1.65	5.12	564	6,286
11	Basmati Paddy+Wheat	330	70	128,665	57,189	150,494	93,305	21,829	1.17	2.63	456	2,150
12	Basmati Paddy+Sunflower	360	80	131,856	61,850	200,879	139,029	69,023	1.52	3.25	558	2,511
13	Basmati paddy+Canola	360	71	118,011	49,702	176,299	126,597	58,288	1.49	3.55	490	2,483
14	IRRI Paddy + Wheat	330	74	131,802	53,765	154,769	101,004	22,967	1.17	2.88	469	2,091
15	IRRI Paddy+Sunflower	360	84	134,993	58,426	205,154	146,728	70,161	1.52	3.51	570	2,442
16	IRRI paddy+Canola	360	75	121,148	46,278	180,574	134,296	59,426	1.49	3.90	502	2,408
	Sindh											
1	Sugarcane	488	71	127,429	43,442	162,338	118,896	34,909	1.27	3.74	333	2,286
2	Seed Cotton	210	18	88,942	29,911	127,561	97,650	38,619	1.43	4.26	607	7,087
3	IRRI Paddy	180	56	67,854	24,881	84,245	59,364	16,391	1.24	3.39	468	1,504
4	Wheat	150	12	63,478	21,439	81,185	59,746	17,707	1.28	3.79	541	6,765
5	Sunflower (spring)	180	22	49,629	18,308	60,789	42,481	11,160	1.22	3.32	338	2,763
6	Canola	180	13	47,322	11,910	72,263	60,353	24,941	1.53	6.07	401	5,559
7	Seed Cotton + Wheat	360	30	152,420	51,350	208,746	157,396	56,326	1.37	4.07	580	6,958
8	Seed Cotton+Sunflower	390	40	138,571	51,350	188,350	137,000	49,779	1.36	3.67	483	4,709
9	Seed cotton+Canola	390	31	136,264	41,821	199,824	158,003	63,560	1.47	4.78	512	6,446
10	IRRI Paddy+ Wheat	360	68	131,332	46,320	165,430	119,110	34,098	1.26	3.57	460	2,433
11	IRRI Paddy+Sunflower	360	78	117,483	43,189	145,034	101,845	27,551	1.23	3.36	403	1,859
12	IRRI paddy+Canola	360	69	115,176	36,791	156,508	119,716	41,332	1.36	4.25	435	2,268

Notes for Annex -VII:

1. The economic analysis presented in the above exercise is based on the input-output prices applicable for 2021-22 crops.

2. The data regarding input-output parameters have been adopted from the API's price policy papers for sugarcane, seed cotton, rice paddy and wheat, 2021-22 crops. However, the relevant data for sunflower and canola were adopted from the last support price policy for non-traditional oilseeds 2000-01 crops, with necessary adjustments in input prices for updating costs and incomes for the 2021-22 crops. To incorporate the escalations in input prices, which occurred during the growing period of 2021-22 crops, some marginal revisions/updates have been incorporated.

3. Water use has been estimated from the number of irrigations as reported in the cost of production estimates of the respective crops assuming each irrigation of 3 inches and 'rauni' of 4 inches.

4. The following prices as realized by the growers for different crops are adopted for the analysis:

   4.1 The support price of Wheat is Rs 2200 per 40 kgs, as maintained by the Punjab and Rs 2200 by Sindh for 2021-22 crop, have been adopted for the current analysis.

   4.2 The wholesale market prices of basmati paddy and IRRI paddy during the post- harvest period in major producer area markets have averaged at Rs 2015 and Rs 1514 per 40 kgs, respectively. While, the average price of IRRI paddy in Sindh is reported at Rs 1519 per 40 kgs.

   4.3 The wholesale market prices of seed cotton during the post-harvest months of 2021-22 in the main producer area markets have averaged at Rs 5996 per 40 kgs in the Punjab and Rs 5797 Sindh.

   4.4 The price of Sunflower crops has been reported hovering around Rs 4500/40 kgs and Rs 4500/40 kgs for Canola during 2021-22.

   4.5 The average market prices of sugarcane as realized by the farmers are taken for the analysis i.eRs 250 per 40 kgs in the Punjab and 260 per 40 kgs in Sindh. However, the prices notified by the provincial governments were lower i.eRs 225 and 250 respectively for Punjab and Sindh.

5. The market prices have been adjusted for the marketing expenses to make them effective at the farm level. These expenses amount to Rs 19.5 per 40 kgs in Punjab and Sindh for sugarcane, Rs 40 for seed cotton in Punjab and Sindh, Rs 60 for rice paddy in Punjab and Sindh, and for wheat and oilseeds, Rs 40 in Punjab and Rs 45 in Sindh.

6.	Gross income	=	(Yield per acre multiplied by price of principal produce at farm gate) plus (value of by-products per acre).
7.	Cost of purchased inputs	=	Cost incurred on seed and related items, fertilizer, supplementary irrigation including labour, canal water rate, pesticides and weedicides.
8.	Gross margin	=	Gross income minus cost of purchased inputs.
9.	Net income	=	Gross income minus gross cost.
10.	Output-input ratio	=	Gross income divided by gross cost
11.	Revenue per rupee of purchased inputs cost	=	Gross income divided by cost of purchased inputs
12.	Revenue per crop day	=	Gross income divided by crop duration in days.
13.	Revenue per acre-inch of water used	=	Gross income divided by irrigation water used in acre inches.

ANNEX-VIII

GROSS REVENUE OF SUGARCANE, TRADED INPUTS AND DOMESTIC FACTOR COST PUNJAB ESTIMATED ON THE BASIS OF PRIVATE AND SOCIAL PRICES (BASIS - IMPORT PARITY PRICE OF SUGAR)

Description	Revenue	Traded Inputs Cost	Domestic Factor Cost	Profit
	---------- Rupees per acre ----------			
2017-18				
Private Prices	108,000	26,369	54,348	27,283
Social Prices	82,386	25,769	31,873	24,745
Transfers	25,614	600	22,476	2,538
2018-19				
Private Prices	118,710	44,975	60,812	12,923
Social Prices	112,768	43,173	31,731	37,864
Transfers	5,942	1,802	29,081	-24,941
2019-20				
Private Prices	130,840	46,475	69,712	14,652
Social Prices	136,741	44,217	37,191	55,334
Transfers	-5,902	2,259	32,521	-40,682
2020-21				
Private Prices	175,000	46,884	75,902	52,214
Social Prices	148,162	44,491	42,742	60,929
Transfers	26,838	2,393	33,160	-8,715
2021-22				
Private Prices	172,800	52,803	80,233	39,764
Social Prices	260,582	50,656	47,565	162,361
Transfers	-87,782	2,147	32,668	-122,597

ANNEX-IX

GROSS REVENUE OF SUGARCANE, TRADED INPUTS AND DOMESTIC FACTOR COST PUNJAB ESTIMATED ON THE BASIS OF PRIVATE AND SOCIAL PRICES (BASIS - EXPORT PARITY PRICE OF SUGAR)

Description	Revenue	Traded Inputs Cost	Domestic Factor Cost	Profit
	---------- Rupees per acre ----------			
2017-18				
Private Prices	108,000	26,369	54,348	27,283
Social Prices	61,188	25,769	31,873	3,547
Transfers	46,812	600	22,476	23,736
2018-19				
Private Prices	118,710	44,975	60,812	12,923
Social Prices	49,713	43,173	31,731	-25,191
Transfers	68,997	1,802	29,081	38,114
2019-20				
Private Prices	130,840	46,475	69,712	14,652
Social Prices	73,842	44,217	37,191	-7,566
Transfers	56,998	2,259	32,521	22,218
2020-21				
Private Prices	175,000	46,884	75,902	52,214
Social Prices	89,474	44,491	42,742	2,241
Transfers	85,526	2,393	33,160	49,973
2021-22				
Private Prices	172,800	52,803	80,233	39,764
Social Prices	166,262	50,656	47,565	68,041
Transfers	6,538	2,147	32,668	-28,277

ANNEX-X

GROSS REVENUE OF SUGARCANE, TRADED INPUTS AND DOMESTIC FACTOR COST SINDH ESTIMATED ON THE BASIS OF PRIVATE AND SOCIAL PRICES (BASIS - IMPORT PARITY PRICE OF SUGAR)

Description	Revenue	Traded Inputs Cost	Domestic Factor Cost	Profit
	---------- Rupees per acre ----------			
2017-18				
Private Prices	134,356	35,922	63,783	34,652
Social Prices	108,986	30,330	63,688	14,968
Transfers	25,370	5,592	95	19,684
2018-19				
Private Prices	140,590	44,029	61,758	34,803
Social Prices	136,628	36,742	62,026	37,860
Transfers	3,962	7,287	-268	-3,057
2019-20				
Private Prices	145,106	46,429	63,544	35,132
Social Prices	157,209	38,760	63,376	55,073
Transfers	-12,103	7,670	168	-19,941
2020-21				
Private Prices	186,220	47,201	68,895	70,124
Social Prices	173,760	39,414	69,394	64,952
Transfers	12,460	7,788	-499	5,172
2021-22				
Private Prices	186,825	52,753	75,239	58,833
Social Prices	262,864	44,054	75,994	142,816
Transfers	-76,039	8,699	-755	-83,983

ANNEX-XI

GROSS REVENUE OF SUGARCANE, TRADED INPUTS AND DOMESTIC FACTOR COST SINDH ESTIMATED ON THE BASIS OF PRIVATE AND SOCIAL PRICES (BASIS - EXPORT PARITY PRICE OF SUGAR)

Description	Revenue	Traded Inputs Cost	Domestic Factor Cost	Profit
	---------- Rupees per acre ----------			
2017-18				
Private Prices	134,356	35,922	63,783	34,652
Social Prices	84,149	30,330	63,688	-9,868
Transfers	50,207	5,592	95	44,520
2018-19				
Private Prices	140,590	44,029	61,758	34,803
Social Prices	69,169	36,742	62,026	-29,599
Transfers	71,421	7,287	-268	64,402
2019-20				
Private Prices	145,106	46,429	63,544	35,132
Social Prices	90,107	38,760	63,376	-12,029
Transfers	54,999	7,670	168	47,161
2020-21				
Private Prices	186,220	47,201	68,895	70,124
Social Prices	109,836	39,414	69,394	1,028
Transfers	76,384	7,788	-499	69,096
2021-22				
Private Prices	193,375	52,753	75,239	65,383
Social Prices	177,471	44,054	75,994	57,423
Transfers	15,904	8,699	-755	7,960

ANNEX - XII

PER CAPITA AVAILABILITY (CONSUMPTION OF SUGAR: 2018-19 TO 2020-21

(October - September)

Sr. No	Items	2018-19	2019-20	2020-21
		----------Thousands tons----------		
1	Opening stocks as on 1st October	1,495	2,060	68
2	Production	5,267	4,875	5,601
3	Imports	7	36	281
4	Export	619	73	-
5	Closing stocks as on 30th September	2,060	68	52
6	Net availability (item 1+2+3-4-5)	4,090	6,830	5,898
		----------Million----------		
7	Population*	218.31	222.23	226.52
		----------Kgs per annum----------		
8	Per capita availability (consumption)	18.73	30.73	26.04
9	Average per capita availability			
	Average (2018-19 to 2020-21)		25.17	

Note: * It includes the population of Pakistan, AJ&K, GB and Afghan Refugees.

Sources:

1. For stocks and production: Pakistan Sugar Mills Association, Islamabad.
2. For import and export: M/o Commerce, Government of Pakistan.
3. For population of Pakistan: Economic Survey, 2020-21.

ANNEX - XII-A

PER CAPITA AVAILABILITY (CONSUMPTION OF SUGAR): 2019-20 TO 2021-22

(October - September)

Sr. No	Items	2019-20	2020-21	2021-22
		----------Thousands tons----------		
1	Opening stocks as on 1st October	2,060	68	52
2	Production	4,875	5,601	7,921
3	Imports	36	281	312
4	Export	73	-	-
5	Closing stocks as on 30th September	68	52	2,335
6	Net availability (item 1+2+3-4-5)	6,830	5,898	5,950
7	Population*	222.23	226.52	237.28
8	Per capita availability (consumption)	30.73	26.04	25.08
9	Average per capita availability Average (2019-20 to 2021-22)		27.28	

Note: * It includes the population of Pakistan, AJ&K and GB.

Sources:

1. For stocks and production: Dashboard, M/o NFS&R, Islamabad.
2. For import and export: M/o Commerce, Government of Pakistan.
3. For population of Pakistan: Economic Survey, 2020-21.

ANNEX- XIII

DOMESTIC AVERAGE WHOLESALE PRICES OF SUGAR IN MAJOR DOMESTIC MARKETS: 2021 AND 2022

Month	Lahore	Fasilabad	Karachi	Hyderabad	Peshawar	Average
2021		---------- Rupees per 100 kgs----------				
January	8,707	8,578	8,500	8,300	8,450	**8,507**
February	9,018	8,828	8,900	8,625	8,998	**8,874**
March	9,121	9,490	9,300	9,075	9,425	**9,282**
April	9,121	8,794	9,100	8,825	9,425	**9,053**
May	9,500	8,809	9,400	9,100	9,300	**9,222**
June	9,500	9,380	9,400	9,125	9,400	**9,361**
July	9,542	9,897	10,300	10,100	10,000	**9,968**
August	10,500	10,339	10,400	10,200	10,375	**10,363**
September	10,500	10,490	10,200	10,000	10,600	**10,358**
October	9,111	9,350	12,000	11,800	11,625	**10,777**
November	8,700	8,793	8,700	8,400	9,450	**8,809**
December	**9,393**	**9,341**	**9,655**	**9,414**	**9,732**	**9,507**
Average	**9,402**	**9,376**	**9,100**	**8,842**	**9,739**	**9,479**
2022						
January	8,700	8,786	8,700	8,400	9,250	**8,912**
February	8,700	8,389	8,200	7,900	9,250	**8,780**
March	8,700	8,217	8,100	7,900	9,000	**8,639**
April	8,371	8,067	8,100	7,900	8,750	**8,238**
May	8,250	8,058	7,900	7,700	8,650	**8,112**
June	8,200	8,258	8,300	8,100	8,350	**8,242**
July	8,325	8,273	8,320	8,140	8,300	**8,272**
August	8,500	8,235	8,200	8,040	8,280	**8,251**
September	8,500	8,234	7,900	7,720	8,094	**8,090**
October	8,976	8,659	8,922	8,582	8,929	**8,814**
Average	**8,464**	**8,292**	**8,264**	**8,038**	**8,793**	**8,456**

Source:

i. Agriculture Marketing Information Services, Lahore, Punjab
ii. Bureau of Supply and Prices, Karachi
iii. Agriculture Marketing S ervices, KPK

ANNEX-XIV

AVERAGE WHOLESALE PRICES OF SUGAR IN MAJOR DOMESTIC MARKETS: 2008-09 TO 2020-21 (October-September)

Year	Lahore	Fasilabad	Karachi	Hyderabad	Peshawar	Average	Increase(+) decrease(-) in average price over
	---------- Rupees per 100 kgs----------						Percent
2009-10	6,203	6,161	6,138	6,084	6,276	6,173	-
2010-11	6,848	6,706	6,687	6,895	6,993	6,826	10.58
2011-12	5,326	5,256	5,055	5,374	5,350	5,272	-22.75
2012-13	5,117	5,084	4,977	4,947	4,772	4,979	-5.56
2013-14	4,942	4,949	5,050	5,314	5,113	5,074	1.89
2014-15	5,726	5,634	5,463	5,529	5,564	5,583	10.04
2015-16	6,198	6,098	5,975	5,933	6,750	6,191	10.88
2016-17	6,032	5,889	6,044	6,006	6,419	6,078	-1.82
2017-18	4,977	5,008	5,008	4,931	4,874	4,960	-18.40
2018-19	5,600	5,883	5,934	5,835	6,127	5,876	18.47
2019-20	7,737	7,734	7,671	7,515	6,578	7,447	26.74
2020-21	9,402	9,376	9,100	8,842	9,739	9,479	27.29
2021-22 (Oct-Mar)	8,700	8,464			9,167	8,777	-7.41

Sources: 1. Agruculture Marketing Information Services, Punjab, Lahore.
2. Agriculture Marketing Services, Sindh, Hyderabad.
3. Agriculture Marketing Services, Peshawar, KPK.

ANNEX-XV

AVERAGE INTERNATIONAL PRICES OF SUGAR: 2011-12 to 2021-22 (OCTOBER-SEPTEMBER)

Years (Oct-Sep)	ISA Daily price of Raw (Fob and stowed Caribbean ports in bul		London Daily price of W (Fob and stowed Europ ports in bags of 50 kgs		Difference between White and raw sugar prices		
	US Cents/lb	US$/ tonne	US Cents/ lb	US$/ tonne	US Cents/lb	US$/ tonne	Percent of white Sugar
2011-12	22.68	499.96	27.54	607.20	4.86	107.23	17.66
2012-13	18.12	399.56	23.96	528.15	5.83	128.58	24.35
2013-14	17.42	384.02	20.96	461.99	3.54	77.97	16.88
2014-15	13.96	307.69	17.19	378.98	3.23	71.29	18.81
2015-16	16.56	370.19	20.89	460.45	3.23	71.29	18.81
2016-17	17.07	376.40	20.76	464.16	3.68	87.75	17.75
2017-18	12.96	285.62	15.84	349.12	2.88	63.50	18.19
2018-19	12.72	280.46	15.32	337.84	2.60	57.37	16.98
2019-20	12.53	276.23	16.46	362.80	3.93	86.56	23.86
2020-21	16.36	360.74	20.32	448.07	3.96	87.33	19.49
2021-22	18.90	416.57	23.10	509.27	4.20	92.70	18.20
Oct	19.24	424.16	23.03	507.72	3.79	83.56	16.46
Nov	19.42	428.13	23.11	509.50	3.69	81.37	15.97
Dec	18.85	415.56	22.62	498.73	3.77	83.17	16.68
Jan	18.2	401.23	22.42	494.37	4.22	93.14	18.84
Feb	17.86	393.74	22.14	488.18	4.28	94.44	19.35
Mar	19.05	419.97	23.97	528.43	4.92	108.46	20.52
Apr	19.65	433.20	24.40	537.97	4.75	104.77	19.47

Source: International Sugar Organization (ISO), London.

ANNEX-XVI

IMPORT PARITY PRICES OF SUGARCANE AT MILL-GATE ON THE BASIS OF FOB (LONDON) PRICE OF WHITE SUGAR

Sr. No	Item	During					
		2022 (April)		2021-22 (Oct-April)		2019-20 to 2020-21	
		US $ per tonne					
1.	Average fob (London) price	537.97		509.27		382.90	
2.	Freight charges upto Karachi	60		60		60	
3.	C & f cost at Karachi port	598		569		443	
4.	Exchange rate (Rs/$) As May 6, 2022	186.50		186.50		186.50	
		Rs per tonne					
5.	C & f cost at Karachi port (Pak rupees)	111,521		106,169		82,601	
6.	Marine insurance @ 0.2 % of c & f cost	223		212		165	
7.	Cif cost at Karachi port	111,744		106,381		82,766	
8	Landing charges @1% of Cif Value	1,117		1,064		828	
9	L.C opening charges @0.02% of C&f Value	22		21		17	
10	Stevedoring Charges	1,300		1,300		1,300	
11	Provision of shortage & unforeseen losses @0.05% of C&F	56		53		41	
12	Survey & lab testing, weight ment wharfage and Clearing & forwarded charges	163		163		163	
		8		8		8	
13	TCP's Commission @ 0.75 % of C&F	836		796		620	
14	Transport charges for up country	5,000		5,000		5,000	
15	Incidetal charges incured on imported sugar	8,503		8,405		7,976	
16	Ex-mill/ market cost of imported sugar	120,247		114,787		90,742	
		Punjab	Sindh	Punjab	Sindh	Punjab	Sindh
17	Processing cost of sugar (a)	24,290	23,232	23,187	22,177	18,330	17,531
18	Value of cane to produce one tonne of sugar (item 16-item 17)	95,957	97,016	91,600	92,610	72,412	73,211
19	Provincial base sugar recovery (Percent) (b)	10.41	10.64	10.41	10.64	10.41	10.64
20	Qunatity of cane in tonnes required to produce on tonne of sugar ((100/ item 19)	9.61	9.40	9.61	9.40	9.61	9.40
21	Price of one tonne of sugarcane (item 18/item 20)	9,989.17	10,322.46	9,535.53	9,853.68	7,538.10	7,789.62
22	Price of 40 kgs of cane	399.57	412.90	381.42	394.15	301.52	311.58

Notes:

(a). Ratio of cost of cane to processing cost has been estimated at 79.80:20.20 for Punjab and 80.68:19.32 for Sindh as calculated in the S.R.O No 1259(I) 2021 by NFS&R.

(b). Respective Provincial Cane Commissioners.

Sources:

i) For average fob (London) price: International sugar Organisation.

ii) For freight, incidentals and duties: Trading Corporation of Pakistan, Karachi.

ANNEX-XVII

EXPORT PARITY PRICES OF SUGARCANE AT MILL-GATE ON THE BASIS OF (FOB LONDON) PRICES OF WHITE SUGAR

Sr. No	Item	During					
		April 2022		2021-22 (Oct-April)		2019-20 to 2020-21	
		US $ per tonne					
1.	Average fob (London) price	537.97		509.27		382.90	
2.	Exchange rate (Rs/$) as on May 6, 2022	186.50		186.50		186.50	
		Rs. per tonne					
3.	Average fob Karachi price (assuming equivalent to fob London price)	100,331		94,979		71,411	
4.	Transport charges from interior Sindh to port, special packing, inspection transit insurance, loading and unloading, clearing and forwarding and port terminal charges	18,000		18,000		18,000	
5	Bank commission @ 1.25 % of fob price	1,254		1,187		893	
6.	Inspection charges	429		429		429	
7.	Ex-mill price of sugar (item 3 minus items 4 through 6)	80,648		75,363		52,089	
		Punjab	Sindh	Punjab	Sindh	Punjab	Sindh
8	Processing cost of sugar (a)	16,291	15,581	15,223	14,560	10,522	10,064
9	Value of cane to produce one tonne of sugar (item 7-item 8)	64,357	65,067	60,139	60,803	41,567	42,026
10	Provincial base sugar recovery **(Percent) (b)**	10.41	10.64	10.41	10.64	10.41	10.64
11	Quntity of cane in tonnes required to produce one tonne of sugar ((100/ item 10)	9.61	9.40	9.61	9.40	9.61	9.40
12	Price of one tonne of sugarcane (item 9/ item 11)	6,700	6,923	6,261	6,469	4,327	4,472
13	**Price of 40 kgs of cane**	**267.98**	**276.93**	**250.42**	**258.78**	**173.09**	**178.86**

(a) Ratio of cost of cane to processing cost has been estimated at 79.80:20.20 for Punjab and 80.68:19.32for Sindh as calculated in theS.R.O No 1259(I) 2021 by NFS&R.

(b) Respective Provincial Cane Commissioners.

Sources:

i) For average fob (London) price: International sugar Organisation.

ii) For freight, incidentals and duties: Trading Corporation of Pakistan, Karachi.

ANNEX-XVIII

MILL-GATE PRICES OF SUGARCANE WORKED BACK FROM THE EXPECTED WHOLESALE MARKET PRICES OF SUGAR DURING 2021-22

Sr.No	Item	WORKED BACK PRICES OF SUGAECANE							
		Rupees per ton							
1.	Average wholesale market prices of sugar	85,000		90,000		95,000		100,000	
2.	Wholesale dealer margin @5% on net price	3,484		3,689		3,893		4,098	
3.	Sales Tax @ 17%	11,844		12,541		13,238		13,934	
4.	Net price of sugar (items 1-2-3)	69,672		73,770		77,869		81,967	
		Punjab	Sindh	Punjab	Sindh	Punjab	Sindh	Punjab	Sindh
5	Processing cost of sugar (a)	14,074	13,461	14,902	14,252	15,730	15,044	16,557	15,836
6	Value of cane to produce one tonne of sugar (item 4-item 5)	55,598	56,211	58,869	59,518	62,139	62,825	65,410	66,131
7	Provincial base sugar recovery (per cent)(b)	10	11	10	11	10	11	10	11
8	Qunatity of cane in tonnes required to produce one tonne of sugar ((100/ item 7)	10	9	10	9	10	9	10	9
9	Price of one tonne of sugarcane (item 6/item 8)	5,788	5,981	6,128	6,333	6,469	6,685	6,809	7,036
10	Price of 40 kgs of cane	232	239	245	253	259	267	272	281

(a) Ratio of cost of cane to processing cost has been estimated at 79.80:20.20 for Punjab and 80.68:19.32 for Sindh as calculated in the S.R.O No 1259(I) 2021 by NFS&R.

(b) Respective Provincial Cane Commissioners.

For FED: FBR, Islamabad.