

Analysis Of Marketing Constraints Faced By Cotton Growers In The Core Cotton Zone Of Pakistan Using The Principal Component Analysis Approach

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Abstract

Cotton is a cash crop in Pakistan which supports the textile industry in particular and the livelihood of thousands of people in Pakistan. The profitability of the cotton crop is decreasing over the years and farmers are found not getting the right price of their produce in the market. Farmers have to face varying extent of marketing challenges. To explore those challenges empirically a quantitative survey was conducted with 392 cotton growers in the district of Rahim Yar Khan, Punjab province. Data were collected using face-to-face interviews on a structured interview schedule whereas collected data were analyzed using Statistical Package for Social Sciences (SPSS). We divided results into three sections (i) demographic profile of respondents (ii) marketing challenges (iii) Principal component factor analysis. The demographic profile revealed that the mean age was 40.47 years, education was 7.98 years, land size was 25.38 and the area under cotton cultivation was 13.07 acres. Inflation ($\bar{x}=4.653$), fluctuation in the prices of inputs ($\bar{x}=4.507$), non-availability of mechanical pickers ($\bar{x}=4.456$), middleman monopoly ($\bar{x}=4.392$) and the illiteracy rate among farmers ($\bar{x}=4.239$) were top ranked marketing challenges. Whereas, PCA showed that (i) ineffective marketing system (34.32%) (ii) poor quality of cotton (15.81%) (iii) high cost of production (11.33%) (iv) inflation (9.53%) and (v) lack of incentives (9.41) were the leading contributors in making marketing ineffective. There is a need to increase the support price, ensure the right price in the market, limit the role of the middle man and provide farmers with incentives for clean cotton production.

Keywords: Marketing system, challenges, inflation, cost of production, profitability, clean cotton.

INTRODUCTION

The cotton industry holds paramount significance within Pakistan's agricultural landscape, serving as a cornerstone of the nation's economy and rural livelihoods. The agricultural sector, which accounts for 22.9 percent of the GDP and generates 37.4 percent of total employment,

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saw cotton making a modest contribution. Whereas, cotton's share in GDP stood at 0.3 percent, while its contribution to the value added in agriculture was 1.4 percent (Government of Pakistan, 2023). Furthermore, cotton serves as a vital raw material for Pakistan's textile sector, the country's largest manufacturing industry and a key driver of exports. Thus, the success and sustainability of the cotton industry are intricately linked to Pakistan's overall economic prosperity and social development, making it imperative to address challenges and constraints faced by cotton growers to ensure the industry's continued growth and resilience (Ullah et al., 2016).

The core cotton zone in Pakistan holds paramount importance for cotton cultivation due to its unique combination of climatic conditions, soil quality, and irrigation infrastructure, which create an optimal environment for cotton production. Encompassing regions such as Punjab and Sindh provinces, this area accounts for the majority of the country's cotton output. The fertile lands and favourable climate of the core cotton zone facilitate high yields and quality cotton production, making it a vital hub for meeting both domestic demand and export requirements. The core cotton zone in Pakistan is important as it positively affects profit and productivity while reducing input costs can improve farming practices and socio-economic status (Ahmad, 2017). The core cotton zone in Pakistan extends across nearly 3 million hectares and serves as the backbone of the economy, fulfilling 17.7% of its demand for edible oils (Malik and Ahsan, 2016). The core cotton zone in Pakistan is essential for the country's economy, as it involves various inputs from land preparation to picking and marketing, with land rent accounting for 28.566% of total costs (Ali et al., 2012). The core cotton zone in Pakistan contributes significantly to the country's cotton production, providing 18.1% of its edible oil needs and meeting 5.5 million tonnes of total demand for edible oil by 2030 (Khalid et al., 2023).

The cotton sector significantly contributes to Pakistan's economy, playing a pivotal role in its agricultural and industrial landscape. In terms of exports, cotton and cotton-based products constitute a significant portion of Pakistan's export earnings, with the country being one of the leading exporters of raw cotton and cotton yarn in the international market. Pakistan has a comparative and competitive advantage in cotton exports, contributing 5.5 % to agriculture value addition and 1% to GDP (Maqbool et al., 2019). Pakistan is a top ten cotton-producing country, contributing to the global economy with a yearly significant economic impact of at least \$600 billion (Khan et al., 2020). Bt cotton in Pakistan provides health and environmental benefits valued at US\$ 79 per acre, along with average gross margin gains of US\$ 204, for an aggregate benefit of US\$ 283 per acre (Kousar and Qaim, 2013). Pakistan is the fourth-largest producer of cotton, contributing significantly to the economy with an average yield of 570.99 kg.hm² (Razzaq et al., 2021). Cotton is an export-earning crop and provides raw material for the local textile industry, supporting over 1000 ginning factories and 400 textile mills in Pakistan (Khan et al., 2016). Therefore, the cotton industry serves as a key input for Pakistan's textile sector, the country's largest manufacturing industry and a major contributor to its exports and foreign exchange earnings. Therefore, the continued growth and sustainability of the cotton sector are vital for Pakistan's economic development, poverty alleviation, and overall prosperity.

The success of cotton farming hinges significantly on effective marketing strategies, underscoring the pivotal role of marketing in this agricultural sector. Effective marketing is crucial for the success of cotton production, as it is interrelated with technical, institutional, and policy aspects of cotton production and marketing (Gillham et al., 1995). Effective marketing in cotton production depends on reducing production costs and product net cost reduction, which are crucial for raising productivity and profitability (Alojonovich, 2017). Beyond cultivating high-quality cotton, farmers must navigate the complexities of market dynamics to ensure profitability and sustainability. Marketing encompasses various activities, including market analysis, pricing, promotion, distribution, and customer engagement, all of

which are essential for connecting cotton producers with buyers and end-users. Effective marketing enables farmers to capitalize on market opportunities, optimize returns on their investments, and mitigate risks associated with fluctuating market conditions, such as price volatility and demand fluctuations. Technological advancements in India's agriculture sector, such as high-yield varieties, mechanization, and area, contribute to a higher share of the international cotton market compared to Pakistan (Shabbir and Yaqoob, 2019).

Marketing constraints can exert a profound impact on the profitability and sustainability of cotton cultivation, posing significant challenges to farmers and stakeholders throughout the supply chain. These constraints encompass various factors, including inadequate market access, price volatility, limited market information, inadequate infrastructure, and inefficiencies in value chain management. Such constraints can hinder farmers' ability to secure fair prices for their produce, leading to reduced profitability and income instability. Cotton farmers face marketing constraints including a lack of regulated markets, price fluctuations, high input costs, labour shortages, and challenges with market information and technical advice (Darandale et al., 2014; Yadav et al., 2018; Das et al., 2022). Consequently, these marketing constraints not only undermine the financial viability of cotton cultivation but also pose challenges to its long-term sustainability, potentially discouraging investment in the sector and hampering its growth and competitiveness within the global market. Addressing these constraints is essential to enhancing the resilience and profitability of cotton farming and ensuring its continued contribution to agricultural development and economic prosperity.

The need for empirical analysis to identify and address specific marketing challenges faced by cotton growers arises from the complexity and dynamic nature of agricultural markets. While anecdotal evidence and expert opinions can provide insights into the challenges encountered by farmers, empirical analysis offers a systematic and data-driven approach to understanding the underlying factors influencing market dynamics. The key objective of this study was to explore the critical marketing challenges faced by the cotton growers. In addition, the study was focused on applying Principal Component factor Analysis to examine the most critical marketing factors.

METHODOLOGY

Study area

The southern zone of Punjab is known as cotton cotton-producing region including top cotton-growing districts such as (i) Muzaffargarh (ii) Multan (iii) Bahawalnagar (iv) Bahawalpur (v) Vehari (vi) Rahim Yar Khan (vii) Dera Ghazi Khan (viii) Layyah (ix) Sahiwal. This study was conducted in the purposively selected district of Rahim Yar Khan which is the leading district where not only cotton area has decreased significantly but on the other hand, the area under sugarcane cultivation is increasing at the pace of the expense of the cotton area.

District Rahim Yar Khan is a core cotton zone in Punjab Pakistan, with an estimated benefit-cost ratio of 1.238 (Ahmad, 2017). District Rahim Yar Khan is a leading cotton-producing district in Punjab, Pakistan, and has been hit hard by the paradigm shift of cotton crops due to economic, production, natural, marketing, and policy factors (Shahzad et al., 2021).

Population estimation

District Rahim Yar Khan consists of a total of four tehsils named as Rahim Yar Khan, Liaquat Pur, Khan Pur and Sadiqabad. All the cotton growers in the district who were the part of Cotton Farmers Survey Rahim Yar Khan (2020) were considered as the population for this study. This survey had a total of 20498 cotton farmers. According to the survey, out of 20498 farmers, Tehsil Sadiqabad, Khan Pur, Liaquat Pur and Rahim Yar Khan have 4745, 1467, 11627 and 2659 farmers, respectively.

Sample selection

Regarding sample size, from the population of 20498, a sample size of 392 cotton farmers was drawn while following the formula of Yamane (1967). A stratified proportionate sampling technique was used to draw sample size from each tehsil of the district. In this way, 91, 28, 222 and 51 cotton farmers were chosen from the tehsils Sadiqabad, Khan Pur, Liaqat Pur and Rahim Yar Khan respectively. Respondents were selected through a random sampling technique as the available list of cotton farmers served as the sampling frame.

Instrumentation, data collection and data analysis

The interview schedule was used as the data collection tool. The tool was prepared well in line with the objectives of the study. The instrument was pre-tested on 20 cotton growers in District Rahim Yar Khan. Using the Cronbach Alpha method value appeared as 0.862, which endorsed the reliability of the instrument. Data were collected through face-to-face techniques from the study participants and Statistical Package for Social Sciences (SPSS) was used for data analysis.

Principal Component Factor Analysis (PCA)

PCA reduces the dimensionality of multivariate data while preserving as much relevant information as possible (Billard and Diday, 2007). PCA is important because it extracts important information from a data set, representing it as new orthogonal variables called principal components, and displaying the pattern of similarity of observations and variables as points in maps (Abdi and Williams, 2010). PCA reduces the dimensionality of datasets, increasing interpretability while minimizing information loss, making it an adaptive data analysis technique (Jolliffe and Cadima, 2016). Pertinent to this justification, we applied PCA to the fourteen variables included in the model.

RESULTS

The results of this study are categorized into three key sections (i) demographic profile of respondents (ii) marketing factors and (iii) Principal Component Factor (PCA) analysis.

Demographic profile

Age, education land size, Area under cotton cultivation, area under sugarcane cultivation, and production of cotton and sugarcane were the major demographic attributes explored by the respondents. The obtained information is detailed in Figure 1.

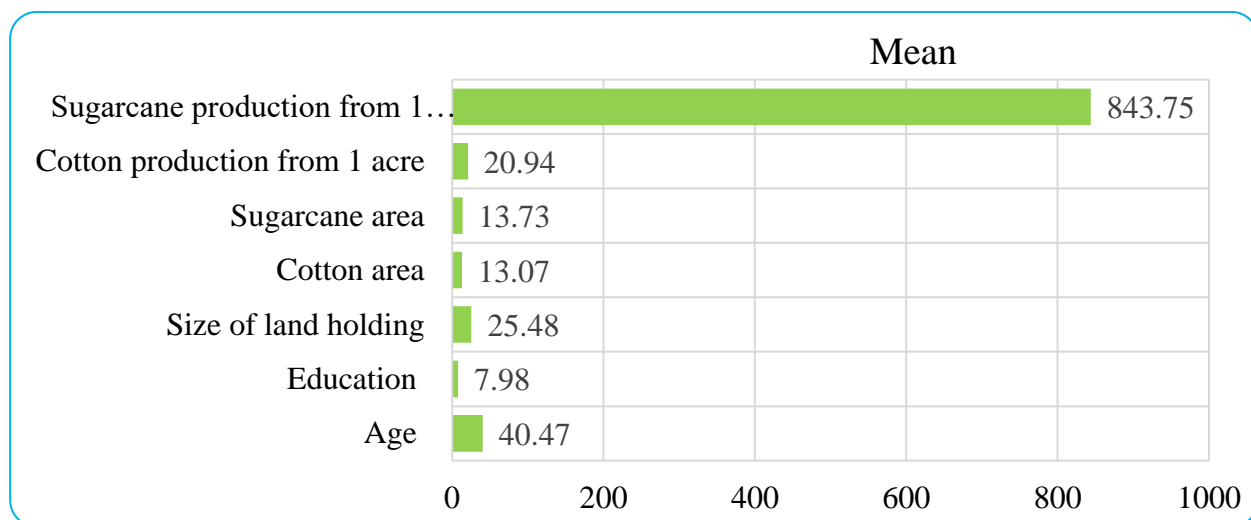


Figure 1. Demographic profile of respondents.

Figure 1 shows that the mean age of the respondents was 40.47 years and the mean educational years were 7.98. As far as land size was concerned, the mean land size was 25.48 acres. The average area devoted to cotton cultivation was 13.07 acres and to sugarcane area, it was 13.73 acres. The average production of cotton from one acre was 20.94 mounds and 843.75 for the sugarcane crop.

Marketing factors

Marketing factors significantly influence cotton production and the overall livelihood of cotton farmers. Fluctuations in the prices of essential inputs like fertilizer, seeds, and pesticides can lead to increased production costs, affecting the profitability of cotton farming. Inflation, which is a common issue in many economies, can erode the purchasing power of farmers, making it challenging for them to afford the necessary inputs (Karimov, 2014). Respondents explored the different marketing factors behind the failure of cotton crops and collected data are reported in Table 2.

Table 1. Marketing factors faced by the cotton growers.

Market-related factors	Mean	Weighted Score	Range
Inflation	4.635±0.737	1817	V. High
Fluctuations in the prices of inputs like fertilizer/seed/pesticides etc.	4.507±0.901	1767	V. High
Non-availability of mechanical pickers	4.456±0.634	1747	V. High
Middleman monopoly	4.392±0.814	1722	V. High
The illiteracy rate among farmers	4.239±0.901	1662	V. High
High cost of transportation	4.214±0.520	1652	V. High
Lack of main cotton market in the area	4.177±0.787	1625	High
Fluctuations in market rates of cotton	4.114±0.988	1613	High
High costs of picking	4.055±0.856	1468	High
No premium for quality cotton	4.053±0.827	1589	High
Distant markets	4.053±0.760	1589	High
Contamination in cotton during picking	4.017±0.709	1575	High
Contamination during transportation	3.790±0.569	1486	High

Non-availability of skilled pickers	3.461±0.964	1357	High
Grand Mean	4.154±0.7833		

Scale: 1.00-1.80: V. low 1.81-2.60: Low 2.61-3.40: Medium 3.41- 4.20: High 4.21-5.00: V. High

Table 1 describes the key insights into the marketing factors that farmers perceived as contributing highly (Grand Mean: 4.154) to the failure of their cotton crop. The grand mean average of fourteen factors attributed to marketing played a very high level role in affecting cotton production as perceived by the cotton growers.

Among various factors, inflation was ranked first with a mean of 4.635 and a weighted score of 1817, indicating a very high level of contribution to cotton crop failure. Fluctuations in the prices of inputs like fertilizer/seed/pesticides secured the second rank with a mean of 4.507 and a weighted score of 1767. Farmers were significantly concerned about the impact of input price volatility on their cotton production. Fluctuation in the prices and availability of the inputs was directly associated with inflation. Non-availability of mechanical pickers was ranked third with a mean of 4.456 and a weighted score of 1747. The extent of these factors was tending towards strongly agree.

Of the various marketing factors, the middleman monopoly was ranked fourth with a mean of 4.392 and a weighted score of 1722. Farmers reported the dominance of middlemen in the marketing system of cotton. Farmers believed that due to middle monopoly farmers more often get the lower prices while marketing their produce. The illiteracy rate among farmers was another significant factor ranked fifth with a mean of 4.239 and a weighted score of 1662. Pertinent to illiteracy farmers were less familiar with the alternate marketing options and were also unable to comprehend the marketing complexities.

The following factors, in order of ranking, include high cost of transportation (sixth), lack of the main cotton market in the area (seventh), fluctuations in market rates of cotton (eighth), high costs of picking (ninth), no premium for quality cotton (tenth), distant markets (eleventh), contamination in cotton during picking (twelfth), contamination during transportation (thirteenth) and non-availability of skilled pickers (fourteenth). These factors had medium to high levels of contribution to cotton failure. The ranking of the marketing factors is portrayed in Figure 2.

Rank	Factors	Mean
1	Inflation	4.635
2	Fluctuations in the prices of inputs like fertilizer/seed/pesticides etc.	4.507
3	Non-availability of mechanical pickers	4.456
4	Middleman monopoly	4.392
5	The illiteracy rate among farmers	4.239
6	High cost of transportation	4.214
7	Lack of main cotton market in the area	4.177
8	Fluctuations in market rates of cotton	4.114
9	High costs of picking	4.055
10	No premium for quality cotton	4.053
11	Distant markets	4.053
12	Contamination in cotton during picking	4.017
13	Contamination during transportation	3.79
14	Non-availability of skilled pickers	3.461

Figure 2. Mean-based ranking of marketing factors.

Figure 2 shows that there was a total of 14 factors and inflation was the highly ranked factor followed by the non-availability of skilled pickers. Of the total fourteen factors, 6 had a very high level of contribution whereas 9 had a high level of contribution (Figure 3). This implies that marketing factors had a critical role in cotton downfall in the core cotton zone.

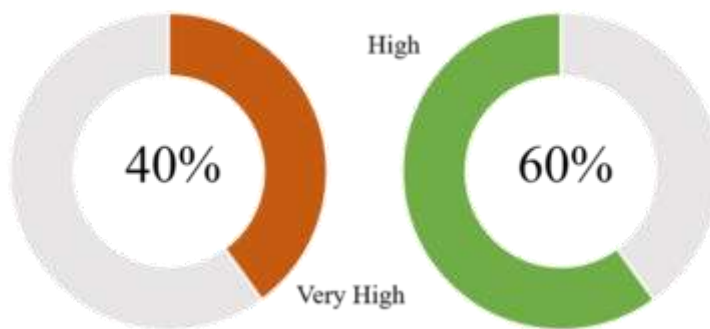


Figure 3. Distribution of factors playing high and very high contribution.

Principal Component Factor Analysis

Principle component factors analysis was used to extract those factors which are not only making the marketing system ineffective but also lowering the return of cotton growers. A total of 14 factors were included in the model. Reliability analysis of the factors was first calculated and new factors were extracted at the second step.

Reliability analysis

The Cronbach Alpha value, which measures how reliable the research instrument is, was found to be 0.81 in this research study. According to Kröz et al. (2003), this value should ideally be between 0.65 and 0.75, and according to Abu and Tasir (2001), it should be higher than 0.60. In our study, the reliability analysis produced a value greater than 0.65, confirming that the research instrument is highly reliable.

Extraction of factors using PCA

In this study, we used a total of fourteen (14) statements to figure out which factors were playing a key role in creating marketing issues for cotton growers. The Kaiser-Meyer-Olkin (KMO) was applied to ensure that running PCA was valid and the KMO value emerged at 0.618, which is considered valid and means the statements were suitable for running factor analysis. The KMO value was above the standard value of 0.50 as presented by Beavers et al. (2013). Bartlett's Test of Sphericity was also significant, showing that there was a meaningful connection between the statements, which is needed for factor analysis to work properly.

Table 2. Extraction of factors using PCA.

	Extracted factors				
	Ineffective marketing system	Poor quality of cotton	High cost of production	Inflation	Lack of incentives
Total marketing factors					
Lack of main cotton market in the area	.569	-.349	.153	-.567	
Fluctuation in the prices of inputs like fertilizers, seeds, pesticides etc	.699	-.502	-.184	-.228	
Fluctuations in market rates of cotton	.682			-.197	.588
Inflation	.576	-.265		.452	.486
Middleman monopoly	.785	.246	-.397		
No premium for quality cotton	.468		.594	.208	-.473
Distant markets	.616	.471	.291		-.309
High cost of production	.895			-.162	-.216
Illiteracy	.860	-.264			-.185
Non-availability of skilled pickers	.159	-.113	-.617	.160	
High cost of picking	-.110	.534	.495	-.199	.408
Non-availability of mechanical pickers	.196	-.444	.492	.527	.338
Contamination in cotton during picking	.381	.590	-.207	.510	
Contamination during transportation	.469	.753		-.186	.195
Eigenvalues	34.32	15.81	11.33	9.53	9.41
Kaiser-Meyer-Olkin (KMO) test	0.601				
Bartlett's Test of Sphericity	3782.9				
Significance level	0.000				

Table 2 shows that out of a total of 14 factors, 5 are extracted. Newly extracted 5 factors exhibited a total variation of 80.4%. The newly extracted factors included (i) an ineffective marketing system (ii) poor quality of cotton (iii) high cost of production (iv) inflation and (iv) lack of incentives.

Ineffective marketing system: The ineffective marketing system was the leading factor showing a variation of 34.32% of the variation in the marketing system and profitability of the cotton growers. There was no proper marketing system, distant marketing, middleman monopoly and fluctuating prices of cotton for the farmers. Pertinent to this farmer were not getting the right price of their cotton and their profitability was compromised.

Poor quality of cotton: Poor quality of cotton produced by the farmers showed a 15.81% variation. Pertinent to the non-availability of skilled pickers, non-availability of mechanical pickers, contamination while picking, storage and transportation lowered the quality of cotton produced. Eventually, the poor quality of produce earned lower returns to the farmers.

High cost of production: This important factor portrayed a variation of 11.33% in the marketing of cotton. Cotton is seen as prone to various pests' infestation and disease outbreaks and a large number of pesticides are applied to the cotton crop to protect the crop and ensure targeted production. Pertinent to intensive use of inputs like pesticides and fertilizers the cost of production of cotton was higher as comparative price in the market was low.

Inflation: inflation showed a variation of 9.53 in marketing factors. To achieve targeted production of cotton a balanced number of inputs like seeds, fertilizers, irrigation, mechanization and pesticides are deemed important. However, due to the rise of inflation in the country farmers are compelled to purchase inputs at high prices and sometimes double due to black marketing of inputs. Pertinent to inflation, the gap between the cost of production and profitability is widening over time.

Lack of incentives: Lack of incentives was the last extracted factor showing a 9.41% variation in the marketing factors. Farmers were compelled to grow cotton while facing inflation, poor quality of produce, high cost of production and non-availability of effective marketing. On the other hand, farmers had not been allowed to get any incentive from the government or institutions. There are no premiums given to the farmers who are growing clean cotton or organic cotton. The cotton produced either contaminated or cleaned is treated more or less the same in the local market which discourages cotton growers from growing more cotton.

DISCUSSION

In this study we explored those factors which are making cotton marketing ineffective, lowering the profitability of cotton producers and contributing to the failure of cotton crops in the core cotton zone. We identified that (i) an ineffective marketing system (ii) poor quality of cotton (iii) high cost of production (iv) inflation and (iv) lack of incentives were the leading reasons for the ineffective marketing of cotton in Pakistan and low profitability coming to cotton growers. Poor pest management, shift to other crops, climate variability, early sowing, poor quality Bt cotton seed, traditional methods of spraying, and the gap between farmers and extension staff are possible reasons behind cotton yield reduction in Pakistan (Ali and Ahmed, 2021).

Due to the ineffective marketing system in Pakistan, the farmer's profitability decreased. Various studies have reported that the marketing system of cotton was ineffective and less supportive for the farmers. A study such as Gohain (2018) reported that farmers in Punjab faced problems in marketing cotton due to a lack of public procurement and remunerative prices. There were a considerable number of farms in Pakistan's Punjab that were both technically and allocatively inefficient in the 'cotton-wheat' system (Shafiq and Rehman, 2000). In research conducted by Shahzad et al. (2021), it was revealed that market fluctuation and middleman monopoly were major marketing factors behind the paradigm shift of cotton crops in the Punjab province, Pakistan. Weak institutional infrastructure and lack of a marketing system were major constraints in the marketing of cotton in Pakistan (Ahmad et al., 2019). Khand et al. (2016) stated that middleman monopoly and the high price of diesel are significant problems in the cotton marketing system in Pakistan. This discussion is evident that ineffective marketing was not only lowering the profitability but even was playing a role in compelling farmers to switch to another crop than cotton.

The quality of cotton being produced in Pakistan is compromised, which gets low prices in the market. The use of locally produced cotton in Pakistan is also low due to poor quality. These results are endorsed by Shahid et al. (2016) that cotton in Pakistan has high amounts of traces of pesticides and chemicals, with 70-85% of total pesticide use concentrated on this crop. There are a considerable number of farms in Pakistan's 'cotton-wheat' system that are both technically and allocatively inefficient in cotton production (Shafiq and Rehman, 2000). In a study, Shahid et al. (2016) stated that Pakistani cotton crops use 70-85% of total pesticides, with high percentages applied in Punjab, Sindh, Khyber Pakhtunkhwa, and Balochistan (Shahid et al., 2016).

Pertinent to the increase in number of pesticides and intensive use of fertilizers, the cost of production was higher. Which was also the key factor in lowering the profitability of the cotton farmers. This is endorsed by the findings from Shahzad et al. (2021) who reported that factors responsible for the paradigm shift of cotton crop in Pakistan include the high cost of seed and fertilizers, adulteration of pesticides, unavailability of certified seed, poor quality of water, extreme heat waves, market fluctuation, and middleman monopoly (Shahzad et al., 2021b). Increased input costs in the cotton production process in Pakistan resulted in negative returns during 2002, 2002, 2006, and 2007 (Ali et al., 2012).

Climatic volatility had adverse impacts on cotton production and compelled farmers to increase their cost of production lowering the quality of cotton produced. The main sources of environmental impacts in cotton cropping systems in Pakistan are pesticides and fertilizer use, field emissions, field operations, and irrigation (Ullah et al., 2016). Climate change and biotic stresses are causing a reduction in cotton production in Pakistan, and transgenic approaches can help address these problems (Razzaq et al., 2021). The major constraints causing the sweeping decline in Pakistan's cotton production include environmental, climate change, water-related constraints, agronomic constraints, and socio-economic-related constraints (Ch et al., 2021).

Farmer were facing a lack of incentives for their production not in terms of high returns nor the premium prices for clean cotton and organic production. High prices of diesel, agricultural inputs, and pesticides are prominent problems raised by cotton growers in Pakistan, and interventions like incentives and lowering agricultural input rates may benefit them (Khan et al., 2016). Pakistan's cotton industry faces issues with export potential and needs to strengthen its competitiveness through trade policy, research, and proactive disaster management policy (Zaheer et al., 2015).

CONCLUSION

We conclude that cotton growers in the Punjab province are facing critical issues of poor marketing systems for the cotton crop. The support by the public sector institution in this regard is inadequate and intermediaries such as middlemen are manipulating the local market. Farmers are compelled to sell out their produce at low rates which is lowering their returns. The profitability of cotton has already declined due to poor production, high cost of production, inflation and high cost of inputs. The support price announced is less as compared to the cost, which is also not ensured in the market. Consequently, not only the cotton production declining but also the cotton growers are switching to other crops which are comparatively better in marketing than the cotton. To support the farmers, there is a need for an effective marketing system for cotton growers which should be regulated by the government and agriculture department. The government should limit the role of the middleman and initiate a direct marketing system for the cotton growers. Farmers should be provided with incentives and premiums for the production of clean cotton.

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REFERENCES

- Abdi, H., & Williams, L. (2010). Principal component analysis. *Wiley Interdisciplinary Reviews: Computational Statistics*, 2. <https://doi.org/10.1002/wics.101>.
- Ahmad, A., Iftikhar, M., Shahbaz, B., Igodan, C., Lechman, K., & Khan, G. (2019). Assessment of skills gap among intermediaries of cotton supply chain in Punjab, Pakistan. *International Journal of Agricultural Extension*. <https://doi.org/10.33687/IJAE.006.03.2644>.
- Ahmad, D. (2017). Analysis of Economic Implications for Cotton Production in Southern Punjab of Pakistan. *Transylvanian Review*, 1.
- Ahmad, D. (2017). Analysis of Economic Implications for Cotton Production in Southern Punjab of Pakistan. *Transylvanian Review*, 1.
- Ali, A., & Ahmed, Z. (2021). Revival of Cotton Pest Management Strategies in Pakistan. *Outlooks on Pest Management*. https://doi.org/10.1564/v32_aug_02.
- Ali, H., Aslam, M., & Ali, H. (2012). Economic Analysis of Input Trend in Cotton Production Process in Pakistan. *Asian Economic and Financial Review*, 2, 553-561.
- Alojonovich, A. (2017). The Main Directions of Cost Reduction and Increasing Effectiveness in Cotton Production. , 6, 1-4. <https://doi.org/10.4172/2168-9881.1000168>.
- Billard, L., & Diday, E. (2007). Principal Component Analysis. , 145-187. <https://doi.org/10.1002/9780470090183.CH5>.
- Ch, K., Ashraf, S., & Ashraf, I. (2021). Cotton production trends in Pakistan: An integrative review. *Journal of Plant and Environment*. <https://doi.org/10.33687/jpe.003.02.3747>.
- Darandale, A., Bhatt, P., & Darandale, A. (2014). Constraints Faced by Cotton Growers in Management of Cotton Cultivation. *Trends in Biosciences*, 7, 618-620.
- Das, M., Sarangi, K., Mishra, S., Mohapatra, B., & Dash, A. (2022). Analysis of Resource Use Efficiency and Constraints of Cotton Production in Odisha, India. *Asian Journal of Agricultural Extension, Economics & Sociology*. <https://doi.org/10.9734/ajaees/2022/v40i121806>.
- Gillham, F., Bell, T., Arin, T., Matthews, G., Rumeur, C., & Hearn, A. (1995). Cotton Production Prospects for the Next Decade. . <https://doi.org/10.1596/0-8213-3312-7>.
- Gohain, N. (2018). An Analysis of Problems and Constraints Faced by Farmers in Marketing of Agricultural Produce in Punjab. *Economic Affairs*. <https://doi.org/10.30954/0424-2513.3.2018.11>.

- Jolliffe, I., & Cadima, J. (2016). Principal component analysis: a review and recent developments. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 374. <https://doi.org/10.1098/rsta.2015.0202>.
- Khalid, M., Hassan, U., Hanzala, M., Amjad, I., & Hassan, A. (2023). CURRENT SITUATION AND PROSPECTS OF COTTON PRODUCTION IN PAKISTAN. *Bulletin of Biological and Allied Sciences Research*. <https://doi.org/10.54112/bbasr.v2022i1.27>.
- Khan, A., Ashraf, I., Hassan, G., & Ashraf, S. (2016). On farm analysis of cotton growers handicaps: evidence from cotton belt of Pakistan. *The Journal of Agricultural Extension*, 4, 79-85.
- Khan, M., Wahid, A., Ahmad, M., Tahir, M., Ahmed, M., Ahmad, S., & Hasanuzzaman, M. (2020). World Cotton Production and Consumption: An Overview. , 1-7. https://doi.org/10.1007/978-981-15-1472-2_1.
- Kouser, S., & Qaim, M. (2013). Valuing financial, health, and environmental benefits of Bt cotton in Pakistan. *Agricultural Economics*, 44, 323-335. <https://doi.org/10.1111/AGEC.12014>.
- Malik, T., & Ahsan, M. (2016). Review of the cotton market in Pakistan and its future prospects. , 23. <https://doi.org/10.1051/OCL/2016043>.
- Maqbool, M., Rehman, H., Bashir, F., & Ahmad, R. (2019). Investigating Pakistan's Revealed Comparative Advantage and competitiveness in Cotton Sector. *Review of Economics and Development Studies*. <https://doi.org/10.26710/READS.V5I1.570>.
- Razzaq, A., Zafar, M., Ali, A., Hafeez, A., Batool, W., Shi, Y., Gōng, W., & Yuan, Y. (2021). Cotton germplasm improvement and progress in Pakistan. *Journal of Cotton Research*, 4, 1-14. <https://doi.org/10.1186/s42397-020-00077-x>.
- Shabbir, M., & Yaqoob, N. (2019). The impact of technological advancement on total factor productivity of cotton: a comparative analysis between Pakistan and India. *Journal of Economic Structures*, 8. <https://doi.org/10.1186/s40008-019-0160-4>.
- Shafiq, M., & Rehman, T. (2000). The extent of resource use inefficiencies in cotton production in Pakistan's Punjab: an application of Data Envelopment Analysis. *Agricultural Economics*, 22, 321-330. <https://doi.org/10.1111/J.1574-0862.2000.TB00078.X>.
- Shahid, M., Ahmad, A., Khalid, S., Siddique, H., Saeed, M., Ashraf, M., Sabir, M., Niazi, N., Bilal, M., Naqvi, S., Bibi, I., & Pinelli, E. (2016). Pesticides Pollution in Agricultural Soils of Pakistan. , 199-229. https://doi.org/10.1007/978-3-319-34451-5_9.
- Shahzad, M., Iftikhar, M., Shahbaz, B., & Wajid, S. A. (2021). An investigative insight of factors responsible for cotton paradigm shifting in the Punjab, Pakistan. *Pakistan Journal of Agricultural Sciences*, 58(6).
- Shahzad, M., Iftikhar, M., Shahbaz, B., & Wajid, S. A. (2021). Impact of cropping pattern shift on livelihood assets of the farmers in Punjab, Pakistan. *International Journal of Agricultural Extension*, 8(3), 189-197.
- Ullah, A., Perret, S., Gheewala, S., & Soni, P. (2016). Eco-efficiency of cotton-cropping systems in Pakistan: an integrated approach of life cycle assessment and data envelopment analysis. *Journal of Cleaner Production*, 134, 623-632. <https://doi.org/10.1016/J.JCLEPRO.2015.10.112>.
- Ullah, A., Perret, S., Gheewala, S., & Soni, P. (2016). Eco-efficiency of cotton-cropping systems in Pakistan: an integrated approach of life cycle assessment and data envelopment analysis. *Journal of Cleaner Production*, 134, 623-632. <https://doi.org/10.1016/J.JCLEPRO.2015.10.112>.
- Yadav, S., Godara, A., , N., & Singh, R. (2018). Perceived Constraints in Production of Bt cotton by the Growers in Haryana. *Journal of Community Mobilization and Sustainable Development*, 13, 133-136.
- Zaheer, R., Niazi, M., & Nizami, U. (2015). Cotton Export Potential: A Case Study of Pakistan. *Journal of economics and sustainable development*, 6, 134-139.