

Causes of Cotton Decline in Pakistan: A Comprehensive Review

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ABSTRACT

This comprehensive review aims to find the causes of the decline in cotton production in Pakistan over the years. The study explains in detail the causes of the decline in production in Pakistan and the future of cotton production in Pakistan. Cotton, sometimes called 'white gold,' is traditionally the chief money spinner in Pakistani agriculture. This essential crop is the backbone of Pakistan's textile sector, contributing about sixty per cent of the country's overall exports. On the other hand, Cotton production sales in Pakistan have been worsening over the past decade, and the crop is facing several complications. This slumping cotton production is expected to drop to just 6.9 million bales by the 2024-25 season, down from 15 million bales just a decade ago. This is happening in the worst kind of season possible. There are several reasons for the decline in cotton production in Pakistan. The issues are climate change, obsolete agricultural techniques, a lack of investment in current technology, and government policies favoring alternative crops. In Pakistan, many pests carry a persistent risk to the cotton crop. These pests include the army-worm, white-fly, pink boll-worm, and jassid. These pests can inflict damage more significant than the economic harm threshold if allowed to continue uncontrolled. This may result in severe losses in both yield and quality. Mainly because the need for cotton revival is growing with time, the findings emphasized in this research constitute a vital addition to the current body of knowledge. These results will serve as a road map for decision-makers and institutions to revitalize the cotton crop in the core cotton zone. Before the completion of this research, there was a lack of sufficient scientific knowledge about cotton failure, particularly in the core cotton zone. A small number of the currently available research is descriptive, and their scope is restricted. For this investigation, a thorough list of constraints is retrieved and experimentally derived via principal component analysis. The reasons for cotton failure in the cotton zone are discussed. In this manner, the research fills in a methodological gap that was previously present and provides the foundation for the recommendations that will be used for the future course of action.

Keywords: Cotton, Pakistani Agriculture, textile sector

INTRODUCTION

Background

Cotton is an essential component of Pakistan's economy since it is a big cash crop, a leading supply of raw materials for the textile industry, and a considerable contribution to the country's gross domestic product and its profits in foreign currency (Siyal et al., 2021). Cotton is a significant part of Pakistan's currency

crop. This factor significantly impacts the nation's economy. This sector contributes over sixty-five per cent of the nation's foreign currency profits. Agriculture and the industrial sector comprise a significant portion of the

Country's revenue and employment sources. Cotton is Pakistan's second most important crop after wheat, and in comparison, to other crops, it takes up the most land in the country. Cotton is the crop that generates the most money for the country's exports, and in addition to the lint, the cotton seed is used for oil and meal production, which accounts for eighty per cent of the total national output of oilseed (Ashraf et al., 2024). Cotton and items connected to cotton provide ten per cent of the country's gross domestic product (GDP), contributing fifty-five per cent to the country's foreign currency profits (Tahseen Haider et al., 2022).

Regarding earning more foreign currency, Pakistan, an agriculturally growing nation, has to increase the amount of cotton it produces. Cotton output in the 2004-2005 season surpassed the objective of 10.72 million bales (Arshad et al., 2022). This was made possible by the mandatory adjustments made to the structure of the cotton industry, as well as the assurances provided by the government to the cotton producers on the support price. During the 2004-2005 crop year, the actual output of cotton was close to 15 million bales weighing 170 kilograms each (Nafees et al., 2023).

A favourable change in the production pattern, as well as an increase in the production of medium-long and long-staple cotton, has been brought about as a result of the consequences of the transfer of price risks from the producer to the government/TCP and the price insurance that has been offered to the farming community (A. Abbas, 2022).

Creating new kinds is an ongoing process influenced by technical advancements and mechanical advances in the global textile industry. This industry necessitates using cotton of higher grades and staple lengths to manufacture blended yarns for applications other than spinning (Iqbal, 2023). As a result, research efforts are focused on accomplishing the three goals listed above, with a particular emphasis on developing climate-adaptable, high-yielding, short-stature, medium- and long-stretched types resistant to diseases, insects, and pests. Several interesting strains that have increased commercial and spinning values have been developed thanks to evolution.

The government has established a goal of producing 12,000,000 bales for the 2005-2006 season (Ahmad et al., 2021). This goal will be accomplished by cultivating around 3.05 million hectares and achieving a 669 kilograms per hectare yield. It has been determined that this aim should be increased to fifteen million bales. This is not an unrealistic aim because the production goal was already surpassed in 2004-2005. It is abundantly clear that the current cotton strategy is pragmatic, as shown by the fact that prices have gained strength in response to the rise in output (Abubakar et al., 2023).

The government has appropriately improved seed cotton prices to Rs.975 per 40 kgs. For the 2005-2006 harvest, to assist the farmer in meeting the growing cost of cotton production. The credit for the effective execution belongs to the TCP and people who work for the government agencies. As part of its cotton strategy, the government has appointed the Trading Corporation of Pakistan to implement its price support port policy. This code maintains price stability and has been given the authority to import and export cotton to private organizations without charge (MUHAMMAD MITHAL RIND & HAKIM ALI SAHITO, 2023).

The growing cost of production in developing nations such as Pakistan is causing production efforts to be hampered. This is mainly because the import costs of agricultural inputs are increasing, directly influencing yields. The yield per hectare in Pakistan is 781 kilograms, whereas, in other major cotton-producing countries, such as Israel, it is 1,818 kilograms; in Australia, it is 1,802 kilograms; Syria, it is 1,571 kilograms; in Mexico, it is 1,312 kilograms; in Turkey, it is 1,289 kilograms; Spain, it is 1,218 kilograms; Brazil, it is 1,209 kilograms; China, it is 1,119 kilograms; Greece, it is 1,081 kilograms; Egypt 939 kilograms, and the United States of America, it is 951 kilograms (Arshad et al., 2021). As a result, Pakistan

has a significant opportunity to increase its cotton output by enhancing its cotton yield, which is still much lower than the national average of the world's central cotton-producing nations (Shahzad et al., 2021).

Historical Trends of Cotton in Pakistan

In the past, there was a significant desire for an increase in fibre characteristics elements, the evolution of cotton's resilience to disease and other damaging insect pests, and the emphasis on abiotic factors. According to (Qureshi et al., 2021), this has been a proponent of genetic modification and represents a revolution in the progress of genomes. This analysis considers all of the available and newly discovered genetic resources in cotton and the potential for their use in future years. Consumption of mellifluous materials and genetic resources threaten the yield of cotton produced today. According to (et al., 2023), the cultivation of cotton, weaving, and spinning in the Indus Valley occurred about 3000 BCE. At one point, cotton was consumed in a fashion comparable to Egypt's. It has been shown that the cultivation of *Gossypium arboreum*, which originates from the primordial *G. herbaceum*, dates back to Moen Jo daro at least 6000 BCE (Moulherat et al., 2002). This culture has been delineated.

Pakistan is the seventh biggest textile manufacturer in the world, the fourth largest producer of yarn globally, the second largest exporter, and the third largest exporter (according to the United States and the International Chamber of Commerce) (Nazeer et al., 2023). Cotton goods account for over sixty per cent of Pakistan's revenues from international trade (see Table 1). However, at least two per cent of Pakistan's gross domestic product economy is inexorably dependent on cotton and its products, and around ten per cent of the country's value added in agriculture is derived from cotton (Binyameen et al., 2021).

Table 1: Production of cotton in countries

Million 480 Ib.	2013	2014	2015	2016	2017	2017
Bales	/2014	/15	/16	/17	/18	/18
China	31.0	29.5	25.9	27.0	28.5	28.5
India	32.8	30.0	22.0	22.8	27.5	27.5
United States	12.9	16.3	12.9	17.2	21.3	21.0
Pakistan	9.5	10.6	7.0	7.7	8.2	8.2
Brazil	8.0	7.0	5.9	7.0	8.0	8.0
Australia	4.1	2.3	2.9	4.1	4.4	4.7
Turkey	2.3	3.2	2.7	3.2	4.0	4.0
Uzbekistan	4.1	3.9	3.8	3.7	3.7	3.6
Mexico	0.9	1.3	0.9	0.8	1.5	1.5
Turkmenistan	1.6	1.5	1.5	1.3	1.4	1.4
Mali	0.9	1.0	1.0	1.2	1.4	1.4
Burkina	1.3	1.4	1.1	1.3	1.3	1.3
Greece	1.4	1.3	1.0	1.0	1.2	1.2

Rest of World	9.8	9.8	7.7	8.5	9.0	9.6
African Franc Zone	4.1	4.8	4.0	4.8	4.8	4.8
EU-27	1.6	1.7	1.3	1.3	1.5	1.5
World	120.4	119.1	96.2	106.8	121.4	121.9

Located between the latitudes of 27 degrees North and 35 degrees North and the heights of 27 meters to 155 meters, the cotton belt of Pakistan spans about 1200 kilometres along the Indus River. The soil begins as clay loam and gradually transitions into sandy soil, with clay predominating in the southern region (ADB, 2009). Cotton agriculture encompasses around 2.79 million hectares of land worldwide (Jafri et al., 2022).

Two provinces in Pakistan are primarily responsible for the cultivation of upland cotton. The first province is Sindh, and the other province is Punjab. Punjab has the specific cotton cultivation sector, and Sindh is the other province. Sindh is also well-known for cotton cultivation. Cotton is mainly grown in the province of Punjab, namely in the districts of Jhang, Raheem Yaar, Bahawalnagar, Bahawalpur, Vahari, Multan, Khanewal, Rajanpur, Ranipur, Muzufabad, Lodran, and Faisalabad (Q. Abbas et al., 2023). The cultivation of cotton production is a well-known practice in all of the districts of Punjab, including those above.

On the other hand, it is most often grown in the districts of Sindh province, which include Nawabshah, Kazi Ahmed, Nausheroferoze, Ghotki, and Khairpur districts, such as the ones described above. These are all places located in the D zone. The climatic zones of Pakistan, where the highest temperatures are measured up to maximums ranging from 45 °C to 50 °C in Pakistan, are the parts of Sindh provinces where cotton is cultivated. These regions are very hot and dry, and the highest temperatures are measured. The cotton's vertical root allows it to resist drought and high temperatures. However, it is susceptible to water availability wildly during the blooming plant and ball formation stages (Zia et al., 1998). The temperature did not go over 35 degrees Celsius when there was a rise in the growth and evolution of the organism (Shahzad et al., 2021).

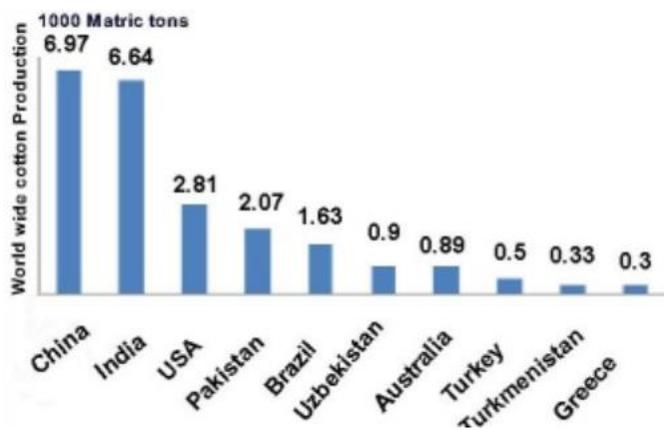


Figure 1: Cotton production (Ali et al., 2022)

Problem Statement

The cotton output does not reflect the difficulties experienced in one season but rather several years of bad management, neglect, and a combination of environmental factors whose causes are outside the industry. This article talks in great detail about the elements causing this crisis, the potential implications, and the

crucial actions that must be taken to limit any further losses. Pakistan has been witnessing a falling trend in the amount of cotton it produces for a very long time. In the last ten years, the nation's cotton production has dropped from 15 million bales to an estimated 6.9 million bales for the 2024/25 season. Many years have passed, and the cotton industry has been in a poor state with structural problems. Its spectacular fall can be considered its manifestation. Secondly, politicians have failed to provide the required help to the farmers, leading to the cotton industry being ignored by these individuals (Shahzad et al., 2022). These include subsidies for high-quality seeds and fertilizers, poor extension services, and R and D, the lion's share channelled into areas of little benefit in improving crop resilience or production. All of these elements contribute to this problem.

As a consequence, the cotton sector is having a difficult time keeping up with its rivals on a worldwide scale. Pakistan, which has a cotton industry that is substantially funded by the country, is falling behind India and Bangladesh in terms of output and quality. These countries are outpacing Pakistan at present. Its repercussions are substantial for Pakistan's textile sector, running much on indigenous cotton to meet its raw material requirements.

Study Objectives

The objectives are

1. To identify and analyze the significant causes of cotton decline in Pakistan.
2. To provide a comprehensive overview of existing research and suggest future directions.

Scope of Review

This in-depth investigation was carried out on the factors that led to the collapse of cotton production and developed recommendations for the resuscitation of cotton. According to the findings of this research, the reduction in cotton crop production is not beneficial to the cotton-related sector, agricultural groups, or the national economy. Therefore, reforms must be implemented to bring about the recovery of cotton crop production. The findings of this study call for more research to investigate the factors driving farmers to limit the area of cotton production, stop cotton agriculture altogether, or convert to other crops. The study uses review papers and articles with government reports.

Inclusion Criteria

In the inclusion criteria section, the study uses papers on cotton production and factors that affect cotton output in Pakistan. The complete list of twenty limitations was gathered from the literature, field observations, and the views of experts. Then, the agricultural officials from the research region were wetted through those restrictions.

Causes of cotton decline in Pakistan

This part investigates the many variables that modify cotton's area, production, and yield in Punjab, Sindh, and Pakistan. A comprehensive analysis of scholarly works was conducted to understand better the issues considered the most significant obstacles in reducing cotton production. Many research projects have been carried out to shed light on various difficulties. In light of this, the body of literature was further divided into several distinct areas, including (i) environmental restrictions, (ii) water management constraints, (iii) agronomic constraints, (iv) and socio-economic constraints. Depletion of soil fertility, salinity water, erlogging of the soil, and the effects of climate change are all topics considered under environmental restrictions (Shahzadi et al., 2024).

Environmental Factors

As a result of its vertical tap root structure, the cotton crop has an exceptional degree of resistance to high temperatures and drought circumstances. To achieve its full potential for growth and development, cotton, a perennial plant, needs both warm days and nights. Boyer (1982) found that throughout the blossoming and boll production stage, cotton was sensitive to changes in temperature as well as the readiness of water. (Ali et al., 2022) found that Pakistan is experiencing a water shortage, which may have been the cause of the delay in land preparation and planting of cotton. This further decreased the number of bolls, dry matter, fibre quality, and cottonseed production. Abbas (2020) believed that the rise in temperature in Pakistan did not lead to an increase in the amount of cotton produced. There was an inverse relationship between the temperature and the phases of sowing cotton, including emergence, blooming, and maturity. The conclusion that can be drawn from this is that cotton production was not anticipated to improve as the temperature rose. According to an increasing body of documented research, climate change negatively affects cotton harvests. (Ashraf et al., 2024) concluded that climate change (Nazeer et al., 2024) was the cause of the decrease in cotton output.

Additionally, they found that the management approaches used for cotton production looked to be ineffective in the aftermath of climate change. According to the findings, the crop finally produces a composite set of fruits due to the indeterminate development patterns of cotton. These fruits are susceptible to unpredictable weather, resulting in output discrepancy.

As per (Hussain et al., 2021), water is a must for the best possible development of cotton. Because the cotton has to mature, it needs to be irrigated throughout the process in a balanced mannequin; however, in case of too much or not sufficient irrigation, its yield would decline. According to (Pasha et al., 2023), several researchers discovered that the irrigation frequency was very significant in plant growth and yield components of cotton. Sahito et al. (2015) also concluded that the irrigation frequency can significantly relate to cotton's growth characteristics and yield components.

It was assured that sufficient irrigation boosted the boll formation and growth. This may lead to the conclusion that water should be excluded in excess quantity, as done with cotton crops (Akhtar et al., 2024). From the results of this research, some amount of water is reasonable for cotton; otherwise, excess water can even be contrary to the development characteristics of cotton. Several further studies (i.e., (Q. Abbas et al., 2023)) mentioned that the farmers of Pakistan employed excessive irrigation, resulting in decreased cotton output. Apart from reducing the cotton output, they were causing an impact on the capacity of the system to sustain itself as the cotton crop is highly water-consuming; use of water beyond the expected duration has also hurt the cotton crop as, in most cases, farmers utilize tube wells to extract water from the ground for the cotton crop (Arshad et al., 2021).

Unlike cotton, weather conditions have always had a significant role in influencing agricultural crop production. However, assessing the rain periods has overlapped in Punjab and Sindh, out of which the season in 2024-25 has been much more challenging than what otherwise would have been. Because of these rains, not only has development in the cotton plants lagged, but also, due to humidity increase, there has been an enhanced breeding ground for pests.

The major pests affecting the country's cotton fields are the armyworm, whitefly, pink bollworm, and jassid larva. These pests attack the cotton plants at different stages of their development, producing fewer and lower-quality fibres. For example, the cotton bolls fall from the plant with pink bollworm bores inside the cotton bolls, and the overall quality of the fibre decreases (Jafri et al., 2022). Whiteflies and jassids drain away the vitality of the plants as they feed on the sap of the plants, and the plants become weaker and more prone to illnesses (Ali & Ahmed, 2021).

The presence of these pests has made the more complex cases even more complicated, and the challenging weather conditions have made everything harder. Further, if untreated, these bugs can cause

catastrophicstroph, es much exceeding the economic injury level. If exceeded, the cost of pest damage is greater than that of managing the pests entirely.

Agricultural Practice

Agronomic considerations are crucial for the increasing production of cotton. If agronomic conditions are not well recognized, the yield of cotton crops may experience a significant decrease for a variety of causes. Regarding the several agronomic factors responsible for the poor yield of cotton, Ali et al. (2009) said that the planting method was the most important factor. It allows the plant to grow better and develop a solid crop stand that guarantees sufficient yield. Using traditional methods for planting cotton, Pakistani farmers often get low productivity. Alternatively, they could have made better use of current technology to achieve higher output. Binyameen et al. (2021) found that when the distance between plants within a cotton crop increases, the number of bolls increases, boll weight increases, and lin output increases.

For example, (et al., 2023) found an optimal plant height, more monopodial and sympodial branches, but more bolls under a low plant density. To get as high fibre quality and the maximum possible yield as Shahzad et al. (2019) suggested, cotton should be planted with rows 25 centimetres apart (Iqbal et al., 2022).

Cotton production was affected by various factors, including but not limited to the sowing method, the occurrence of pests, the advent of diseases, the infestation of weeds, the salinity of the soil, the deterioration of the soil, and the development of herbicides. Mollae et al. (2019) indicated that the poor yield of cotton was due to many agronomic factors, including resistance to unwanted plants, in another study. (2019) reported that the insects were detrimental to cotton output. In addition, they discovered that pesticides were the only way to keep those insects at bay, which were causing the pests. Soon, they analyzed the absence of quality seed, illnesses, heating and drought stress, and market pricing unpredictability all played a role in the low output of cotton. It was because of the poor seed quality; germination was inadequate, and the plant that grew from the ground was also weak and susceptible to different insects, pests, and diseases, leading to total crop failure (Antique you are et al., 2020). According to the research conducted by Chohan et al. (2020), the diseases with the highest crop loss are Fusarium wilt, boll rot, bacterial blight, leaf curl disease, and Alternaria leaf spot. According to Forrester (2009), Pakistan lacks a very professional seed business, which is a big thing that hinders cotton production in Pakistan. Based on their study, Saeed et al. (2020) observed that most of the seed farmers in Pakistan were not trained formally and that most were unaware of how to store and manage the seed. An influence on the germination process and the cost of production is related to the use of lower-quality seeds. In particular, Balaji and Kumar (2016) brought attention to the fact that the level of production costs for farmers had grown, which reduced their net earnings. The same conclusions were highlighted in the report published by the Government of Pakistan in 2019, which said farmers' advantages were diminished due to rising costs. (Qureshi et al., 2021) did research in which they discovered that cotton productivities were inhibited by an increase in input prices, which was then followed by inconsistent marketing and an insufficient source of livelihood in the cotton industry.

Economic practice

This technical upscaling process significantly improves the farmers' socio-economic characteristics (Ahmad et al., 2021). Hashmi et al. (2016) argued that the upscaling of cotton agriculture was correlated with the farmer's socio-economic conditions. They found a statistically significant link between the size of the farm and the amount of cotton produced, with over 1.6 million farmers in Pakistan growing cotton. However, the United States Department of Agriculture (USDA) notes that 81 per cent of farmers are small landholders, averaging less than 5.7 hectares.

However, Kousar et al. 's (2017) findings show that the big farmers in Pakistan influence and easily access resources and technologies equipping the farm. Small farmers, however, could not immediately utilize these

services, and resource availability was restricted. It is important to note that the farmers made the choices based on the factors: availability of resources (Nyairo et al., 2021), government assistance (USDA, 2019), inputs, and cost. It made it impossible for small farmers to make important choices regarding the increase in the cotton crop yield. On the part of the output, the lack of necessary information, the high cost of inputs of insecticides, soil reclamation materials, and organic manures, coupled with a lack of technical expertise, contributed to the escalation in the limits and affected the cotton output. Gohil (2016) is the year. Another research (Shahzad et al., 2021) indicates that cotton production was obstructed by many factors, such as increasing input costs, a slow-selling system, and a lack of sources to sustain livelihoods. Thus, farmers could not produce the exact cotton yield as desired because of various challenges. Failing to produce cotton there were plenty of problems that contributed to the loss in production, including the lack of finances to grow cotton, the lack of ability to get access to financing, the lack of ability to gain access to extension advisory services, and a lack of formal education (Wei et al., 2020). Hassan et al. (2021) observed that the farmers lacked knowledge about the agricultural inputs (Hassan et al., 2021) used to purchase the cotton inputs as they found it challenging to produce quality seed cotton. As (Jafri et al., 2022) already stated, most of Pakistan's rural population still practices traditional agriculture in producing cotton in the country, also utilizing conventional agricultural techniques, such as excessive use of water for irrigation, high doses of fertilizers, and excessive input. As a direct result, this has caused the cost of manufacturing to increase tremendously, and the efficiency of the usage of resources has remained very low (Cheema et al., 2021).

Policy and Institutional Factors

Pakistan's cotton output has been on a downward spiral for some time. This is, for instance, the case for the nation's cotton production, from a production of circa 15 million bales over the past ten years to an estimate of 6.9 million bales for the 2024-25 season. For many years, the cotton industry has experienced structural problems which culminated in the industry's fall. Part of this loss can be attributed to insufficient funding for the future of contemporary farming methods and agricultural technology. The cotton industry in Pakistan has been virtually untouched, and unlike the technological improvements that have been commonplace elsewhere in the world, in areas such as biotechnology, pest control, and irrigation. As a result of the use of antiquated farming methods coupled with a shortage of seeds and inputs of superior quality, agricultural output has decreased (Binyameen et al., 2021).

Politicians have not tried to help farmers, so they have neglected the cotton industry. They include a lack of subsidies for high-quality seeds and fertilizers, poor extension services, and insufficient attention to research and development directed toward crop resiliency and production. With all these factors in place, the problem attacks. Thus, the cotton sector fails to keep up with its global competitors. India and Bangladesh have spent significant sums of money on their cotton industries and are today outperforming Pakistan in output and quality. At the moment, Pakistan is trailing behind these countries. The textile sector in Pakistan, which depends primarily on indigenous cotton for its raw material requirements, is directly affected by this development, which has important ramifications.

Impact of cotton decline in Pakistan

Economic Impact

This information comes from the Labor Force Survey of Pakistan (2021), which found that 48.12% of women are illiterate, 22.8% of women are working in different sectors of the economy, and 15.5% are working in agriculture. 15.5% of the female labour force working in the agricultural industry has been impacted by the fall in the cotton crop since it began. We must not forget the industry that has sustained Pakistan's economic progress for a considerable time. There was a time when Pakistan, India, and China were all part of a wholly integrated textile value chain. This is a distant memory because cotton production

is declining. The nation is anticipated to import more than 7 million bales in the fiscal year 2025, even though output is now forecast to be just 5-6 million (Pasha et al., 2023).

The domestic shortage is driving up local cotton prices, and the projected import bill of approximately USD 2 billion for raw cotton and another USD 2 billion for textile intermediates, which are increasingly substituting local supplies, further threatens Pakistan's precarious balance of payment (BoP) position. These import bills are expected to be higher than the domestic shortage alone (Q. Abbas et al., 2023).

During July–August in the fiscal year 2025, cotton yarn imports had a stunning 257% increase compared to the same time in the previous year (Figure 1b). This increase may be attributed to the continued challenges that the spinning industry is experiencing with energy tariffs, which have rendered local yarn almost entirely uncompetitive. In June 2024, the domestic yarn output had a forty-percent decrease year-over-year. In addition to environmental obstacles and crop infestation, economic challenges also play a key influence in the impact of these problems. Cotton growing has become less viable due to the fluctuating prices of inputs such as fertilizers, insecticides, power, and high-quality seeds. Many farmers having trouble making ends meet have shifted their focus to other crops (Ashraf et al., 2024).

Fatima Khan, a specialist in rural development, says that cotton growing has become economically unviable for many small-scale farmers. Farmers are forced to explore other crops that offer greater returns because of the high cost of production combined with the low market pricing.

For several reasons, its effects on Pakistan's economy are severe. That is about half the population who end up working in the agriculture industry, which is seeing a decline in revenue and people in poverty within the cotton farming community increasing. This drop also impacts the industrial sector, especially the textile industry, contributing significantly to Pakistan's gross domestic product and export revenues (Shahzad et al., 2021). "One of the major textile industries in Pakistan is very dependent on cotton grown locally," says the chief executive officer of a famous textile factory. Cotton production also decreases, which requires more imported cotton, resulting in higher manufacturing costs and an impact on our capacity to compete in the global market. This scenario is not sustainable and risks losing jobs and dropping export profits.

A strategy to deal with the decrease in the cotton output should include several aspects. Integrated pest management (IPM) can result in more effective control of infestations. "A farmer education and training on integrated pest management techniques is necessary," Dr Shabbir told me. "Many of them require access to the most contemporary research and varieties of cotton resistant to pests (Nazeer et al., 2024).

They also make several investments in research and development in the agriculture sector. To combat the effects of climate change, we can breed drought-tolerant cotton. Furthermore, the government is obliged to provide financial assistance to farmers so they are not left without purchasing inputs within their budget range and have credit facilities. Policies and support programs favourable to cotton growers are essential; therefore, governance agencies should provide cotton farmers with compelling policies to encourage cotton growing. Without appropriation for cotton in its agriculture strategy, the government should put the crop on a priority list, according to Fatima Khan. Subsidies on inputs, improved pricing systems, and access to new agricultural practices can all help revitalize the industry.

Loss of revenue for Former and agriculture industry

According to the data from the Pakistan Cotton Ginners Association (PCGA), cotton production has decreased by 59.4 per cent since October 1, 2024. In total, 2.04 million bales had been produced up to October 1, 2024, a significant decrease from the magnitude of 5.03 million bales produced during the same period in 2023. Compared to the 2.9 million billion bales produced the previous year, Sindh's production decreased by 55.57 per cent to 1.3 million bales. By October 1, Punjab, previously Pakistan's most important

cotton grower, had produced 0.7 million bales, compared to 2.07 million bales at the same period in the previous year (Nazeer et al., 2024).

PCGA estimates indicate that Pakistan surpassed 8.4 million bales in 2023. On the other hand, the Economic Survey of Pakistan said that the country produced 10.2 million bales in 2023, which indicates that a certain amount of cotton output is not registered. According to the PCGA, the 34 per cent output deficiency in 2022's 4.91 million bales is remarkable compared to the 7.44 million bales produced in 2021. The decline in 2022 resulted from widespread floods in the provinces of Sindh and Punjab.

This year, the aim for cotton production throughout the nation was 11 million bales; however, this target may not be met, as the national cotton output may wind up being on the lower side or 8 million bales. In these situations, the textile sector constantly tries to import cotton to satisfy the industrial demand, which now ranges between 12 and 13 metric tons when it used to be between 16 and 17.

Social Impact

The decrease in Pakistan's cotton output substantially negatively influences the nation's economy and society. It has increased poverty, migration from rural to urban areas, and resource pressure. Additionally, it has affected the textile industry and traditional agricultural techniques.

Unemployment

Farmers and seasonal workers have seen their incomes diminish due to reduced cotton farming, leading to increased poverty in rural regions. Because cotton farming is becoming less profitable, many people living in rural regions are compelled to relocate to metropolitan areas for employment. This has resulted in congestion and stressed the infrastructure of urban areas. The Pakistan Central Cotton Committee (PCCC), which is the most prominent cotton research organization in the nation, is now confronted with significant financial constraints, which impede research and development initiatives that are particularly important for the revitalization of the cotton industry (Shahzad et al., 2021).

Environmental Impact

Climate change, including a rise in temperature, also affects cotton production in Pakistan. Moreover, it adds to the farmers' already tricky position in national strategies.

- Farmers are needed for scouting and control measures, and pesticide firms must set their field tetherin action. These field agents could contribute significantly to teaching farmers how to use pesticides so that pesticide treatments will be worthwhile and minimize their environmental effects. This objective is necessary for the business sector and government agencies to work together to be effectively met.
- The cotton industry needs a lot of action for its perfection and continuation. They should deal with the environment, market dynamics, and government assistance (Pasha et al., 2023).
- However, to allow scientific research to be performed through the PCCC, it is necessary to continue supporting research organizations to enable cutting-edge research in cotton science to take place in our rebirth.
- They could promote the use of contemporary agricultural techniques and technology to improve the quantity of cotton produced and reduce dependence on conventional methods.

- The government may pursue ways that will redound to the advantage of cotton growers to boost cotton production. Such policies may include a price constraint on agriculture inputs and/or agricultural subsidies.
- The need to collaborate between nonprofit organizations, research organizations, and government departments to overcome the cotton industry problems as it stands now is very keen. (Akhtar et al., 2024).

Research Gaps

This research is conducted to fill the research gap, and the study's primary goal is to present readers with a clear picture of the different factors hindering the development of cotton farms. It is divided into two main and sub-parts. In this first part of the course, you can calculate the change in area, output, and cotton yield in Punjab, Sindh, and Pakistan, respectively. In the second section, a critical literature review analysis identifies the causes underlying this shift in this area: productivity and the average yield. The findings of the first section form the basis of this analysis. Environmental, soil fertility, salinity, water-logging, climatic change, agronomic-related, water management-related, and sociolect-economic-associated restrictions are all subject to a rigorous examination to get the results.

RECOMMENDATIONS

- More money must be invested in research and development to fight the reduction in cotton output. This includes developing cotton types resistant to pests, improving seed quality, and developing irrigation methods. Investments in modern agricultural technology would enable the country of Pakistan to augment cotton production and improve the quality of the fibre produced.
- Extension services are vital in teaching farmers how to grow crops such as cotton. These systems can be improved to give farmers timely and relevant information. It would include teaching the correct use of fertilizers and pesticides and properly managing pests and irrigation systems.
- Financial assistance and policy support from the government must be offered to stimulate the use of modern agricultural techniques. This includes subsidies for high-quality seeds, fertilizers, and pesticides and financial incentives for farmers to adopt environmentally friendly farming methods.
- Market access must be improved so farmers are paid a fair price for their cotton. It, therefore, entails the creation of better transportation and storage infrastructure and creating transparent and efficient marketplaces for farmers (or vegetables) to sell their fruit (or vegetables).
- The private sector is hugely responsible for revitalizing the cotton business. This includes investment in cotton processing, value addition, and collaborating with farmers to increase production. Developing a more robust and competitive cotton industry in Pakistan is possible by encouraging cooperation between the public and private sectors.

CONCLUSION

The importance of the cotton crop in the economy of Pakistan is quite substantial, and the farmers and the sector in which it plays a significant part need to be assisted, which could only be possible if the process of producing the cotton could be fastened. As with cotton yield in Pakistan's Punjab region, the acreage, output, and yield shift has steadily moved in the opposite direction. A continual drop has begun in the area, and the same is happening with output in Punjab province. All over the province of Punjab, there has been a significant fall in the average yield. In Pakistan, however, agriculture is gradually declining in terms of productivity. This implies that Pakistan may face a cotton shortage and hence depend more on importing

materials for the textile industry. All shifts in area, output, and yield became even more substantial after 2015. The most damaging consequences on cotton production were caused by the changing environmental limits, not to mention the change of the climate.

On the other hand, the problem was exacerbated by the sudden decrease in the area scoped for cotton growth. Variations in outputs and yield of cotton might be related to different agronomic, water-related, environmental, and socio-economic restrictions. There can be many of these constraints. However, there remains some work to be done looking into the shift in area, mainly what causes us to be in the general direction of less land and less under cultivation. Farmers have ceased growing cotton or shifted to growing another crop because of the harsh restraints malaria would play against cotton farming. This implies that more store studies need to be done on the factors related to the change in cotton farming. Furthermore, it is also important to study why the farmers have stopped cultivating Cotton and the factors that induce farmers to adopt a new crop.

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