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A Study on Problems and Prospects Analysis of Cotton Farmers in Middle Gujarat

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Abstract: This study examines the challenges and opportunities faced by cotton farmers in Middle Gujarat, focusing on the factors that influence their production and income. Surveying 340 farmers, the research found that unpredictable weather, pest attacks, and unstable markets are major challenges. At the same time, factors such as farm size and access to trustworthy information about farming inputs play a significant role in determining the amount of cotton they produce. Many farmers have limited formal education and mostly use chemical pesticides, though some are beginning to adopt more sustainable methods like Integrated Pest Management. Income gaps and difficulties in accessing markets make it harder for farmers to earn well. Statistical analysis shows clear links between the challenges faced, land size, input knowledge, and yield. The study suggests that farmers would benefit from better training, easier access to credit, stronger market support, and advice on climate-smart farming. These steps could help improve their productivity and livelihoods.

Keywords: Cotton farmers, production challenges, climate variability, pest management, landholding size, input awareness, Integrated Pest Management (IPM), market access, income disparities, sustainable farming, crop yield, financial support, cotton cultivation.

I. INTRODUCTION

Cotton farming holds a crucial place in India's agricultural landscape, supporting the livelihood of a significant number of rural households. As one of the largest producers of cotton globally, India relies heavily on this crop for both domestic use and export, especially in the textile and garment industries. Despite its economic importance, the cotton farming sector faces numerous setbacks that make it difficult for farmers to sustain consistent income and growth.

Cotton growers often encounter a mix of challenges, including erratic weather patterns, pest infestations, rising input expenses, and unstable market rates. Many farmers also face difficulties in obtaining timely credit, insurance, and reliable market access. These issues not only reduce profit margins but also create long-term financial stress for farming families.

At the same time, the cotton sector presents certain opportunities. Technological advancements, government support programs, and training in modern farming practices offer potential pathways for improving productivity and profitability. With the right interventions, farmers can adopt better methods of cultivation, access new markets, and improve their economic well-being.

This study focuses on examining the real-world problems cotton farmers experience and the possible prospects that can help improve their situation. By understanding both the challenges and future opportunities, this research aims to provide insights that may assist in shaping better support systems for cotton cultivators.

II. OBJECTIVES OF THE STUDY

- 1) To identify the major problems faced by cotton farmers.
- 2) To analyze the socio-economic conditions of cotton farmers.
- 3) To examine the level of awareness and utilization of government schemes and support programs among cotton farmers.

III. LITERATURE REVIEW

Randhawa et al. (2022) investigated the effect of lime on the strength of Indian black cotton soil. Lime was added in different proportions, and 9% lime showed the highest unconfined compressive strength (UCS). The soil's maximum dry density also increased. Beyond 9%, UCS declined, making 9% the optimal level for stabilization.

Singh et al. (2022) evaluated the impact of the Cotton Development Programme (CDP) in Punjab. The program led to a rise in the use of recommended Bt-cotton hybrids and fertilizers. Productivity increased by 138% over six years. The CDP helped overcome the whitefly crisis of 2015.

Singandhupe et al. (2022) analyzed climate-smart strategies in Gujarat to improve cotton yields. Data from 2001 to 2011 showed variations in rainfall and evapotranspiration. Supplemental irrigation was found necessary. Efficient water use could boost lint production.

Ghori et al. (2022) looked into the Better Cotton Initiative (BCI) in India and Pakistan. Farmers in the program earned more and spent less on inputs compared to others. However, there was no improvement in labor working conditions. The research emphasized that programs like BCI must consider local systems and structures for better impact.

Murali and Khan (2022) used 30 years of data to examine what affects cotton production in different parts of India. They found that the area under cotton increased after Bt cotton was introduced. Support prices, irrigation, and past yields played a key role. The study recommended improving crop buying systems and developing stronger seed varieties.

Saraf et al. (2022) discussed recent changes in farm marketing in India. They pointed out problems like poor markets, climate risks, and the need for more private investment. The new farm laws aimed to reduce government control and improve efficiency. The authors called for more reforms to help farmers sell better.

Pavithra et al. (2022) reviewed cotton farming and trade over three decades in India. The area and production rose due to hybrid and Bt seeds, but later slowed due to pest resistance. Cotton exports grew fast during some years, but then dropped. Imports of better-quality cotton increased steadily.

Suman et al. (2022) studied how cotton and sugar exports changed between 2001 and 2020. Cotton exports grew well but showed a lot of price changes. India's position in cotton trade improved after 2007. Sugar imports mainly came from Brazil, which had stronger export advantages than India.

Nikam et al. (2022) explored how cotton farmers in Maharashtra got information about farming. Farmers used different sources to decide on crop practices in rainfed and irrigated areas. The study found that good information helps increase yields and profits. It also called for better advisory services suited to each region.

Kumar et al. (2021) researched cotton farming in Haryana's Palwal district. Larger farms had better yields and higher profits. When used properly, inputs like fertilizers, labor, and machinery improved results. The study noted that some resources were either underused or overused, suggesting the need for better planning.

Sharma et al. (2021) studied how farmers in Haryana adopted Bt cotton. Most were in the 35–50 age group and had average land sizes. Adoption was linked to income, land size, and media exposure. Popular crop combinations were cotton-mustard and cotton-wheat. The findings support wider use of Bt cotton for better output.

Delate et al. (2021) compared organic cotton with conventional methods. Organic farming reduced chemical use and improved environmental outcomes. However, it faced challenges like pest control and seed availability. The study encouraged more support for organic practices.

Singh (2021) studied the work patterns of laborers in the cotton fields of Punjab. The research showed that most workers were hired on a daily basis and paid by the amount of work done. There were differences in tasks and wages between men and women. Cotton farming remained important for these workers as job options in other crops reduced due to machines. The study suggested better policies to support poor farm laborers.

Matloob et al. (2020) reviewed cotton farming systems worldwide. Mechanized systems in the US and China contrast with low-input systems in India and Africa. Issues like poor seeds and climate risks lower yields in India. The authors recommended climate-smart and eco-friendly practices.

A. Hypothesis

Null Hypothesis (H_{01}): The challenges faced by cotton farmers during cultivation do not have a significant impact on their crop yield.

Null Hypothesis (H_{02}): There is no meaningful link between the socio-economic status of cotton farmers and the amount of cotton they produce.

Null Hypothesis (H_{03}): Farmers' knowledge and use of government programs do not significantly influence their cotton production levels.

Alternative Hypothesis (H_{a1}): The challenges faced by cotton farmers during cultivation have a significant impact on their crop yield.

Alternative Hypothesis (H_{a2}): There is a meaningful link between the socio-economic status of cotton farmers and the amount of cotton they produce.

Alternative Hypothesis (H_{a3}): Farmers' knowledge and use of government programs significantly influence their cotton production levels.

IV. RESEARCH METHODOLOGY

This study follows a descriptive research approach aimed at examining the challenges encountered by cotton farmers, their socio-economic background, and their level of awareness and use of government assistance programs. The research focuses on Middle Gujarat, a prominent region known for its cotton cultivation. A total of 340 cotton farmers were chosen as respondents using a combination of cluster and random sampling techniques. Initially, cotton-producing villages or clusters were identified, and farmers were randomly selected from these clusters to ensure a balanced and representative sample.

Data collection was primarily done through structured questionnaires and personal interviews, addressing key topics such as production issues, financial constraints, pest control, market accessibility, socio-economic status, and familiarity with government schemes. Secondary data from official reports and agricultural records supplemented the primary data to strengthen the study. All collected data were organized and analyzed using SPSS software. Descriptive statistics, particularly percentage analysis, helped summarize farmers' profiles and their responses related to the study objectives. To explore relationships between categorical variables, like the link between socio-economic factors, farming challenges, scheme awareness, and crop yield, the Chi-square test was employed.

To ensure the reliability and clarity of the research tools, the questionnaire was tested on a small group of local farmers and refined based on their feedback. Standardized methods were followed throughout data collection to maintain consistency. Although the study focuses on cotton farmers in Middle Gujarat, limiting its wider applicability, and relies on self-reported data that may involve some bias, the approach provides a solid basis for examining the challenges and prospects of cotton farming in the area.

A. Data Analysis and Interpretation

Percentage Analysis

Table-A

Education	No. of Farmers	%	Pest Control Method	No. of Farmers	%
No formal	77	22.6	Chemical	160	47.1
Primary	126	37.1	Biological	8	2.4
Secondary	97	28.5	Integrated Pest Management	49	43.8
Higher	40	11.8	No control measure	23	6.8
Total	340	100	Total	340	100
Land Holding	Farmers	%	Challenges faced in production	Farmers	%
< 2 Acres	50	14.7	Climate Variability	186	54.7
2-5 Acres	152	44.7	Pest Infection	57	16.8
5-10 Acres	32	9.4	Market Fluctuation	71	20.9
>10 Acres	106	31.2	Damage by Animals	26	7.6
Total	340	100	Total	340	100
Yield	Farmers	%	source of input awareness	Farmers	%
< 5 Quintal	101	29.7	Expert advice	81	23.8
5-10 Quintal	126	37.1	Past experience	138	40.6
10-15 Quintal	96	28.2	Trial and error	46	13.5
> 15 Quintal	17	5.0	Dealer advice	75	22.1
Total	340	100	Total	340	100
Average Income from Cotton	Farmers	%	Challenges faced in selling cotton produce	Farmers	%
< 50k	115	33.8	Low Prices	171	50.3
50k to 100k	87	25.6	Delayed Payments	47	13.8

100k to 150k	17	5.0	Poor Market Access	66	19.4
> 150k	121	35.6	Quality Rejection	56	16.5
Total	340	100	Total	340	100
Market Access	Farmers	%	Satisfaction with price	Farmers	%
Mobile apps	77	22.6	Very Satisfied	102	30
Local Markets	78	22.9	Satisfied	180	52.9
Trader	71	20.9	Neutral	43	12.6
Word of Mouth	114	33.5	Dissatisfied	15	4.4
Total	340	100	Total	340	100

(Source: Survey Data by Authors)

- **Educational Background of Farmers:**The survey revealed that a large proportion of cotton farmers in Middle Gujarat have limited formal education. About 37.1% have completed only primary schooling, while 22.6% have not received any formal education. This moderate literacy rate may affect their ability to access agricultural extension services, adopt new technologies, and make informed decisions.
- **Pest Control Practices:**Chemical pest control remains the most widely used method among the respondents (47.1%). However, a considerable 43.8% of farmers have adopted Integrated Pest Management (IPM), reflecting a shift toward environmentally friendly and sustainable pest control practices. Very few (2.4%) use biological methods, and 6.8% do not use any control measures.
- **Landholding Patterns:**The majority of farmers (44.7%) manage land between 2 to 5 acres, while 31.2% own larger holdings exceeding 10 acres. Only 14.7% of the respondents have less than 2 acres of land, indicating that small and medium-scale farmers dominate the region's cotton cultivation landscape.
- **Production-Related Challenges:**Climate variability was cited as the most significant challenge faced during production by 54.7% of farmers. This was followed by market fluctuations (20.9%) and pest infestations (16.8%). These findings highlight the susceptibility of cotton farming to both climatic and economic risks.
- **Cotton Yield Levels:**Most farmers reported yields ranging from 5 to 10 quintals per acre (37.1%), while 29.7% produced less than 5 quintals. Only 5.0% achieved yields above 15 quintals, indicating scope for improving productivity through better farming practices and support services.
- **Awareness of Agricultural Inputs:**When deciding on agricultural inputs, 40.6% of farmers rely on their past experience, while only 23.8% seek expert advice. This indicates a reliance on traditional knowledge and limited use of professional consultation, which may affect the efficiency of input use.
- **Income from Cotton Cultivation:**There is a wide disparity in income levels among cotton farmers. While 35.6% earn more than ₹1.5 lakh annually from cotton, 33.8% earn less than ₹50,000. This variation suggests income inequality and highlights the need for strategies to enhance farm profitability for lower-income farmers.
- **Challenges in Cotton Marketing:** Low price realization was identified as the most common marketing issue (50.3%), followed by poor market access (19.4%) and quality rejection (16.5%). These obstacles suggest inefficiencies in the cotton marketing system and the need for policy interventions to ensure fair returns for farmers.
- **Access to Market Information:**A significant number of farmers (33.5%) rely on word-of-mouth communication for market information. While mobile apps (22.6%) and local markets (22.9%) are used by some, access to real-time and reliable market data remains limited, affecting marketing decisions and price negotiation.
- **Satisfaction with Cotton Prices:**Despite marketing challenges, 52.9% of farmers expressed satisfaction with the prices they received, and 30% were very satisfied. However, 12.6% were neutral and 4.4% were dissatisfied, suggesting varied experiences and perceptions regarding pricing and profit margins.

Chi-Square Analysis

Table-B

Challenges faced in production	Cotton Yield per Acre				Total
	<5 q	5-10 q	10-15 q	>15 q	
Climate Variability	40	82	53	11	186

Pest Infection	27	12	18	0	57
Market Fluctuation	24	18	23	6	71
Damage by Animals	10	14	2	0	26
Total	101	126	96	17	340
Land Holding					
< 2 Acres	40	10	0	0	50
2-5 Acres	61	91	0	0	152
5-10 Acres	0	17	9	6	32
>10 Acres	0	8	87	11	106
Total	101	126	96	17	340
Source of input awareness					
Expert advice	20	45	5	11	81
Past experience	31	53	48	6	138
Trial and error	10	0	36	0	46
Dealer advice	40	28	7	0	75
Total	101	126	96	17	340

(Source: Computed in SPSS by the Authors)

Chi-Square Table

Table-C

Association Between	Chi-Square Value	Df	Sig.	results
Challenges faced in production and Cotton Yield	32.993	9	0.000	The null hypothesis Rejected
Land Holding and Cotton Yield	335.728	9	0.000	The null hypothesis Rejected
Source of input awareness and Cotton Yield	127.208	9	0.000	The null hypothesis Rejected

(Source: Computed in SPSS by the Authors)

B. Interpretation of Chi-Square Analysis

To investigate the relationship between selected independent variables and cotton yield, a Chi-Square test was conducted using the data collected from 340 cotton farmers in Middle Gujarat. The analysis considered three key factors: the challenges encountered during production, size of landholdings, and the source from which farmers gain awareness about agricultural inputs. The results are presented below:

1) Relationship Between Production Challenges and Cotton Yield

The Chi-Square value calculated for the link between production-related challenges and cotton yield per acre is 32.993, with 9 degrees of freedom and a significance level of 0.000. As the p-value is less than 0.05, the result is statistically significant, leading to the rejection of the null hypothesis. This suggests that the type of problem a farmer faces—such as climate fluctuations, pest attacks, or market issues—has a notable impact on the yield. Notably, climate-related difficulties were the most common among farmers reporting lower yields.

2) Relationship Between Landholding Size and Cotton Yield

For landholding and yield, the Chi-Square result was 335.728, again with 9 degrees of freedom and a p-value of 0.000. This clearly indicates a significant association, and the null hypothesis is rejected. The data shows that smaller landholders (less than 5 acres) mostly fall into the lower yield categories, while larger landowners (above 10 acres) are concentrated in the higher yield brackets. This outcome suggests that land size influences yield potential, possibly due to better availability of inputs, mechanization, or economies of scale.

3) Relationship Between Input Awareness Source and Cotton Yield

The Chi-Square test for the source of input awareness and its effect on cotton yield gave a value of 127.208, with 9 degrees of freedom and a significance value of 0.000. This means the null hypothesis is again rejected, confirming a meaningful relationship. Farmers who rely on expert consultations or their own prior knowledge tend to achieve higher yields, whereas those depending on trial-and-error or dealer advice often report lower productivity. This highlights the importance of reliable information sources in making effective farming decisions.

V. FINDINGS

Percentage Analysis

- A majority of cotton farmers in Middle Gujarat have only primary or no formal education, limiting their access to modern farming knowledge.
- Most farmers rely on chemical pest control, though many are now adopting Integrated Pest Management methods.
- Cotton farming is largely practiced on small to medium landholdings, with fewer large-scale farmers in the region.
- Unpredictable weather conditions are the main challenge during cotton production, followed by market and pest issues.
- The highest number of farmers report yields between 5–10 quintals per acre, with few achieving higher productivity.
- Farmers often depend on personal experience rather than expert advice when selecting agricultural inputs.
- There is a wide gap in income from cotton, with some farmers earning well and others making very little.
- Low prices and poor market access are major barriers to profitable cotton selling for many farmers.
- Most farmers still rely on informal sources like word-of-mouth for market information.
- While over half are satisfied with their cotton prices, a portion of farmers remains neutral or dissatisfied.

Chi-Square Analysis

- Production challenges such as climate variability significantly affect cotton yields.
- Larger landholdings are associated with higher cotton production.
- Reliable sources of input knowledge lead to better cotton yields among farmers.

A. Suggestions

To enhance cotton farming in Middle Gujarat, it is important to organize regular training programs focused on modern agricultural techniques and effective pest management, especially promoting Integrated Pest Management (IPM) to ensure sustainability. Small and medium farmers should receive targeted support, including access to quality inputs and credit facilities, to improve productivity. Developing and promoting climate-resilient farming practices can help farmers better cope with environmental challenges. Improving market infrastructure and access to real-time price information will enable farmers to secure fair prices for their produce. Additionally, strengthening agricultural advisory services and encouraging the use of digital technologies can help farmers make informed decisions, leading to better yields and increased income.

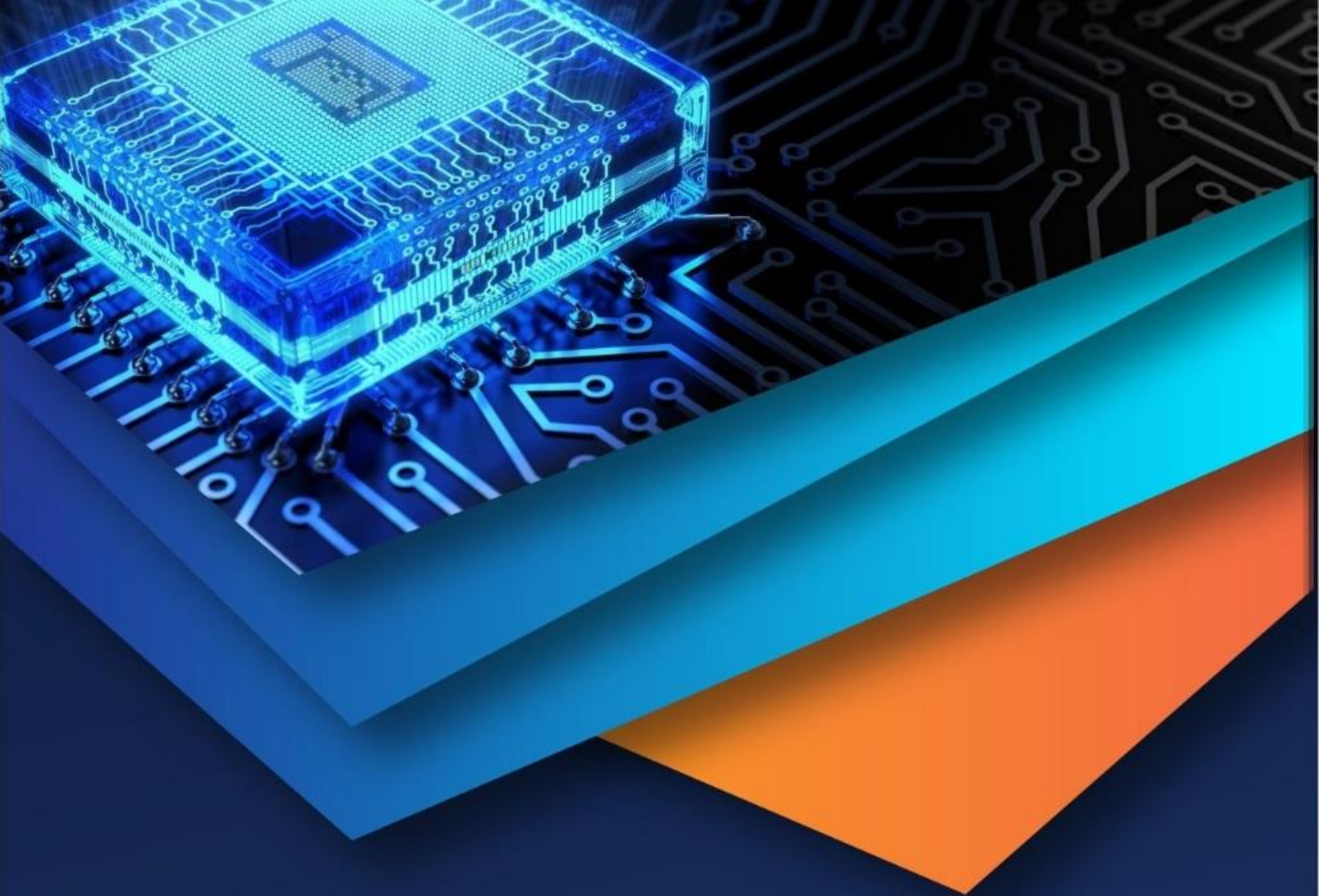
B. Conclusion

This research sheds light on the various difficulties cotton farmers in Middle Gujarat face, such as unpredictable weather, pest problems, and unstable markets. The study shows that the size of landholdings, challenges during production, and how farmers gain information about inputs all play a crucial role in determining their cotton yield. While many farmers still depend on their experience, there is a noticeable shift toward seeking expert advice and using sustainable pest control methods like Integrated Pest Management. Income inequality and limited access to markets continue to pose challenges for many farmers. To support these farmers better, efforts should focus on improving education, providing access to reliable resources, strengthening resilience against climate risks, and enhancing market connectivity. Such measures can help improve both the productivity and livelihoods of cotton farmers in this region.

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