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### Stakeholder perspectives on the constraints in the cotton value chain: A systemic analysis

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#### Abstract

The rigorous and widespread implementation of value chain management (VCM) has become a prevalent trend in modern business practices and processes. However, due to the complex and multidimensional nature of value chains, achieving efficiency and effectiveness in real-world applications remains a significant challenge for practitioners. Numerous unidentified barriers continue to hinder the successful execution of value chain management within in cotton value chains in Nalgonda district. This study aimed to identify the common barriers to effective value chain management in a developing country's industrial value chains, using evidence from Nalgonda cotton industry. The analysis was based on survey data collected from 120 purposively sampled experts within the cotton value chain in Nalgonda. An ex-post facto research approach was employed to identify the barriers to effective value chain management. The findings revealed both architectural and governance-related obstacles, highlighting significant policy implications for cotton value chains. Additionally, the study underscored the need for further comprehensive research based on broader data sets from other industrial value chains to validate these findings.

**Keywords:** Constraints, opportunities, CISS-F framework, value chain management, strategy

#### 1. Introduction

The concept of value chain management (VCM) is widely recognized in contemporary literature for providing businesses with both operational and strategic benefits. VCM involves managing a series of activities related to the development, production, and delivery of a good or service in alignment with the requirements of the target market (Gereffi & Fernandez-Stark, 2016) [3]. Its significance lies in eliminating inefficiencies within organizational operations. Additionally, value chain management fosters both consistency and the necessary flexibility in delivering products and services to customers (Ross, 2013) [12]. This implies the attainment of streamlined, economically driven operations that optimize customer service.

The cotton value chain is a cornerstone of the global economy, sustaining the textile and apparel industries while providing livelihoods for millions, particularly in developing regions. Spanning cultivation, ginning, spinning, weaving and manufacturing, this complex chain engages a

wide range of stakeholders, including farmers, traders, processors, manufacturers and policymakers. Despite its pivotal role, the cotton value chain is fraught with challenges that impede its efficiency, sustainability and the equitable distribution of benefits across stakeholders. Koontz and Weihrich (2007) [6], in their book *Essentials of Management*, define value chain management as the analysis of each stage in the process, from raw material handling to the delivery of the final product to consumers. The goal is to maximize value for end users while minimizing costs. According to Kaplinsky and Morris (2001) [5], analyzing a value chain provides insight into the complete sequence of activities necessary to bring a product or service from its initial conception through various stages of production, delivery to the final consumer, and eventual disposal after use. This framework redirects the focus from a single firm to the entire value chain stream (Porter, 1985) [10]. It is based on the assumption that profitability is achieved only when activities are carried out in a way that

creates a sufficient margin between the total cost of these activities and the price consumers are willing to pay. The value added at each stage of the process ultimately determines the business's competitiveness and long-term sustainability (Porter & Kramer, 2011)<sup>[11]</sup>.

Organizations achieve profitability when their functions are effectively managed to add value to the products and services offered to customers. In the context of this study, value chains encompass both tangible and intangible value-adding activities. They are understood as a complex network of actors, policies, reference frameworks, power dynamics, interests, mindsets, aspirations, conflicts, positions, economic and social blind spots, priorities, technologies, practices, and support systems. Together, these elements contribute to enhancing a product or service as it moves from primary producers to end customers and eventual disposal. Effectively managing these interconnected components is essential for reducing uncertainty and improving customer service throughout the value chain.

Key constraints such as limited access to quality inputs, insufficient infrastructure, market price fluctuations, policy gaps and restricted market access create significant bottlenecks at various stages. These issues are further intensified by environmental concerns like water-intensive farming practices and excessive pesticide use, alongside social challenges such as labor exploitation. Addressing these multifaceted challenges demands a systemic approach that considers the interconnected roles of stakeholders and devises targeted solutions to address these barriers. As highlighted above, the necessity of value chain management is undeniable. However, real-world value chains are inherently complex and multidimensional, involving countless unknown variables that require optimization (Gereffi, 2014; Ponte & Sturgeon, 2014)<sup>[4, 9]</sup>. This complexity makes achieving efficient and effective value chain management a persistent challenge for practitioners. The cotton industry value chain in Zimbabwe serves as a prime example, as it continues to underperform despite dedicated efforts to apply value chain management principles. The presence of numerous unidentified barriers hindering effective and efficient value chain management underscores the need for both management practitioners and researchers to address these challenges.

This study takes a stakeholder-centric approach to examine the constraints within the cotton value chain, aiming to offer an in-depth understanding of the obstacles faced by each group involved. By identifying the root causes of inefficiencies, the research highlights potential areas for improvement and provides actionable recommendations to promote a more inclusive and sustainable value chain. In doing so, this analysis contributes to the broader conversation on value chain optimization and stakeholder equity, offering strategic insights for policymakers, industry leaders and development practitioners. The specific objective of the paper is to analyse the constraints in cotton value chain- stakeholders perspective.

The article follows the CISS conceptual framework developed by ICRIER-NABARD of agricultural value chains. The CISS-F framework which focuses on Competitiveness, Inclusiveness, Sustainability, Scalability and Access to Finance has been widely utilized as a comprehensive approach to evaluate the performance of

agricultural value chains. This framework provides a structured lens to assess how effectively value chains operate while addressing critical aspects such as economic viability, stakeholder equity, environmental responsibility, growth potential and financial accessibility (Ashok *et al*, 2022)<sup>[1]</sup>. By integrating these dimensions, the CISS-F framework offers a holistic perspective for analyzing and improving the overall functionality and resilience of agricultural value chains.

The competitiveness of value chains is assessed in both domestic and international markets. Domestically, competitiveness is evaluated by analyzing the farmer's share of the final consumer price. On the international front, it is measured by determining the export competitiveness of agricultural commodities through the use of Nominal Protection Coefficients (NPCs), which indicate the level of price protection and comparative advantage in global markets. NPCs under both exportable (NPCX) and importable hypothesis (NPCM) have been calculated. For NPCX and NPCM, the international export reference price ( $X_r$ ) and international import reference price ( $M_r$ ) were used respectively.

$$NPC_X = PD / X_r$$

$$NPC_M = PD / M_r$$

Whereas,  $NPC_X$  = Nominal Protection Coefficient  
 $PD$  = Domestic wholesale price

The inclusiveness of value chains is evaluated based on the participation of marginal and small farmers in production, as well as their access to markets and essential logistics, such as transportation, warehouses, and cold storage facilities. Examples of contract farming are highlighted to demonstrate how alternative marketing models can influence and enhance the involvement of marginal and small farmers within value chains.

The sustainability of value chains is evaluated from both financial and environmental perspectives. Financial sustainability is measured by examining the profitability of producing and marketing a commodity. Sensitivity analysis is employed to assess how farmers' profits respond to various scenarios, such as price volatility and climate change, for selected commodities. Environmental sustainability is analyzed based on factors such as water usage, fertilizer and pesticide consumption and other key environmental considerations specific to the cultivation of these commodities.

The scalability of value chains is measured by examining historical trends in area expansion and productivity gains. Both factors influence current production levels and indicate the potential for future increases in production capacity.

Access to finance is examined by analyzing the financial resources available to various stakeholders within the value chains, along with the role of innovative financing methods. The study identifies existing gaps in financing, the current extent of access to organized finance, and the potential for introducing innovative financial solutions. Based on these findings, financial interventions are recommended to enhance the competitiveness, inclusiveness, scalability, and sustainability of value chain participants.

## 2. Methodology

To examine the barriers to effective cotton value chain management (VCM) in Telangana, a positivist paradigm was adopted. This approach was appropriate because the units of analysis—value chain actors and allied stakeholders—exist independently, can be quantified, and are observable in reality. Consequently, this methodology aligns with the ontological and epistemological assumption that reality is external and objective (Creswell, 2011; Chia, 2002). To address the study’s main research question, a cross-sectional survey research design was utilized. Specifically, a descriptive survey design was chosen to guide the study, as it allowed for capturing events as they currently occur and examining their relationships with other factors (Creswell, 2015). According to Neuman (2015) [8], a descriptive survey study collects data—both facts and opinions—regarding present conditions and the state of a given phenomenon.

The ex-post-facto research design is commonly used in social and behavioral sciences due to the challenges of assigning respondents to dynamic behavioral conditions. This design was deemed appropriate for the study since the event had already taken place. As a systematic empirical

approach, it does not allow the researcher to have direct control over independent variables, as their occurrences have already been established. Therefore, the present study was conducted using an ex-post-facto research design. Ex-post facto research design used for the study.

This study adopted a value chain approach, which, as noted by Badir (2015), aligns with value chain analysis (VCA) to collect and examine data, identifying variables that influence value chain management in industrial settings. Analyzing value chains is crucial in a business environment where activities are highly interconnected. Applying this approach to Telangana cotton industry was particularly relevant, as the industry faced challenges beyond the control of individual managers. Consistent with the study’s philosophical foundation—specifically, a positivist ontology and an objective epistemology—the methodological approach prioritized the collection of primary data through quantitative methods, primarily utilizing standardized questionnaires.

**Status of District:** Nalgonda district was selected purposively due to high production of cotton in Telangana.

**Table 1:** District area under cotton in Telangana.

District	2020-2021			2021-2022		
	Area (Lakh ha)	Area (lakh acres)	Percentage to total area	Area (Lakh ha)	Area (lakh acres)	Percentage to total area
Nalgonda	294074.18	726672	12.07	264934.74	654667	14.10

Source: [www.agri.telangana.gov.in](http://www.agri.telangana.gov.in)

### 2.1 Selection of respondents

Selection criteria were applied to ensure that respondents adequately represented all segments and levels of Telangana cotton value chain. To create a meaningful assessment framework for barriers to effective and efficient value chain management (VCM), the investigator considered both experience and participation in the governance of the cotton industry value chain. Respondents with less than five years of experience were deemed less likely to have a deep understanding of the industry’s complexities. Conversely, individuals involved in the governance of the value chain were more likely to recognize and articulate the challenges within the industry.

As a result, respondents were drawn from various groups, including cotton farmer organizations, cotton ginning companies, textile manufacturers, clothing manufacturers, academia, input suppliers, civil society, financial institutions, and government ministries and agencies. Engaging a diverse range of experts helped balance potential biases among different stakeholder groups, ensuring data accuracy. Additionally, incorporating both private and public sector participants allowed for an analysis of differing perspectives between these entities.

A purposive sampling method, specifically the snowballing technique, was employed based on respondents' work experience, governance involvement, and knowledge of the cotton value chain. This non-probability sampling approach ultimately resulted in the recruitment of 350 respondents. Eighty (80) cotton farmers, each with at least five years of experience, were randomly selected from various villages for the study, with ten farmers chosen per village. Additionally, forty (40) officials, including traders,

managers, and processors involved in cotton procurement and handling, were also randomly selected. This brought the total number of respondents for the study to 120.

**Table 2:** Selection of respondents in Nalgonda district

S. No	Name of the district	Number of respondents	
		Cotton growers	Other stakeholders
1.	Nalgonda	80	40

**Table 3:** Selection of other stakeholders of the study

S. No	Stakeholders in the value chain	Number
1.	Officials of CCI	08
2.	Officials of PACS/DCMS	05
3.	Industry firms	08
4.	Traders	06
5.	Seed companies	06
6.	Retailers	07

**Table 4:** Districts, mandals and villages selected for the study.

S. No.	District	Mandal	Village	No. of cotton growers
1.	Nalgonda	Nakrekal	Inupamula	20
			Chandupatla	20
		Devarakonda	Acchampet	20
			Chennaram	20

This study was based on primary data gathered through standardized questionnaires completed by respondents in a cross-sectional survey. The questionnaire was designed following the development process outlined with primary data, secondary data, semi structured interviews and focus group discussions.

**Table 5:** Distribution of textile industries in Nalgonda district.

S. No.	Name of the textile industry	Location
1.	Venkateswara cotton Industries	Kokkerala Gowraram
2.	Bharathamma Cotton mills	Gudi malapuram
3.	Lalitha Parameswari Cotton mill	Koppolu
4.	Sambasiva Cotton Ginning mills	Pedda Adhisherlapally

**Statistical tools used in the study**

The constraints identified by respondents were operationally defined as challenges encountered during cotton cultivation. These challenges were assessed using a three-point continuum: "most agree," "partially agree," and "disagree," with corresponding scores of 3, 2, and 1. Garrett ranking scores were calculated to determine the order of significance, with the most commonly perceived problem ranked first, followed by the others in descending order of magnitude.

**Henry Garrett ranking technique**

Henry Garrett ranking technique was used to assess the constraints faced by the cotton stakeholders. In this technique, the respondents were asked to rank the given attribute according to the magnitude of the problem. The orders of merit given by the participants were converted into ranks by using the following formula.

$$Percent\ Position = \frac{100(R_{ij} - 0.5)}{N_{ij}}$$

Whereas,

$R_{ij}$  = Rank given for the  $i^{th}$  item  $J^{th}$  individual

$N_{ij}$  = Number of items ranked by  $j^{th}$  individual

The percent position of each rank obtained was converted

into scores by referring to the table given by Henry Garrett. Then for each factor, the scores of individual respondents were added together and divided by the total number of respondents for whom the scores were added. The mean scores for all the factors were arranged in the order of their ranks and inferences were drawn.

**3. Results and Discussion**

Constraints faced by respondent's stage wise in cotton value chain management. In cotton value chain management, stakeholders face various constraints at different stages. The cotton value chain is a complex system involving multiple stakeholders, from farmers to retailers, each playing a crucial role in transforming raw cotton into finished products. However, at every stage of the value chain—cultivation, harvesting, procurement, processing, manufacturing, and distribution—stakeholders face various constraints that affect efficiency, profitability, and sustainability. These challenges range from high input costs and pest infestations at the farm level to price fluctuations, quality issues, and supply chain inefficiencies in later stages. Identifying and addressing these constraints is essential for improving productivity, ensuring fair market practices, and enhancing the overall competitiveness of the cotton industry.

Close-ended questionnaire was constituted to know the constraints value chain stakeholders are facing in the present investigation. The results are represented in the form of frequencies and percentages. The cotton value chain involves various stages from cultivation to processing and ultimately delivering cotton products to end users. Throughout this chain, there are several stakeholders, each with their own interests, roles and concerns. Some problems that stakeholders might encounter in cotton value chain management that includes in table 6.

**Table 6:** Constraints as stated by stakeholders in the existing cotton value chain.

S. No	Constraints as stated by stakeholders in the cotton value chain	Average value	Garrett score	Garrett table position value	Rank
<b>Cotton farmers (n=80)</b>					
1.	High input cost	58.55	83.33	31	I
2.	Limited access to markets and fair pricing	53.80	50	50	II
3.	Climate risks	49.53	16.67	69	III
<b>Ginning and processors (n=8)</b>					
1.	Quality and consistency	64.57	50	50	II
2.	Lack of modern ginning facilities and processing units	61.56	83.33	69	III
3.	Maintaining environment and quality regulations can be costly and time consuming	67.12	16.67	31	I
<b>Textile/ Industry manufacturers (n=08)</b>					
1.	Inconsistent of raw cotton quality supply	66.57	50	50	II
2.	Fluctuations in cotton prices can affect profit margins and long-term planning	66.79	16.67	69	I
3.	Increasing consumer demand and adopt eco-friendly practices	64.41	83.33	31	III
<b>Retailers and Brands (n=7)</b>					
1.	Ensuring transparency and traceability in the supply chain to meet consumer demands for products	64.57	50	50	II
2.	Addressing market trends to products that align with current demands	61.56	83.33	31	III
3.	Addressing issues related to labor rights, fair wages and working conditions in chain	67.10	16.67	69	I
<b>Consumer (n=4)</b>					
1.	Consumers expect consistent and high-quality cotton products	64.69	50	50	II
2.	Increasing awareness of environmental and ethical concerns that influence purchasing decisions	61.52	83.33	31	III
3.	Balancing quality and affordability of products for consumers	67.15	16.67	69	I
<b>Logistics partners (n=7)</b>					
1.	Ensuring that all stages in value chain adhere to environmental, labor and safety regulations	64.57	50	50	II
2.	Managing policies to stabilize cotton prices and ensure fair trade practices	61.56	83.33	31	III
3.	Encouraging sustainable practices to reduce the environmental impact of cotton production and processing	67.1	16.67	69	I
<b>Distribution partners (n=6)</b>					
1.	Highlighting and advocating for fair labor practices, sustainable production in the value chain	64.79	50	50	II
2.	Focusing on improving the livelihoods of farmers and workers in cotton producing regions	61.89	83.33	31	III
3.	Lack of advanced technology for efficient processing	70.23	16.69	69	I



Addressing these problems requires collaboration among stakeholders, transparent communication, investments in technology and infrastructure and a commitment to sustainable and ethical practices throughout the cotton value chain.

### Analysis of Constraints in the Cotton Value Chain

The table highlights the major challenges faced by various stakeholders in the cotton value chain, ranked using the Garrett method. These constraints vary at different stages, affecting farmers, processors, manufacturers, retailers, consumers, logistics, and distribution partners.

#### 1. Challenges Faced by Cotton Farmers

- High input costs (Rank I) remain the most pressing issue, with expensive seeds, fertilizers, and pesticides placing a financial strain on farmers.
- Limited market access and fair pricing (Rank II) hinder farmers from securing profitable returns, largely due to intermediaries and price fluctuations.
- Climate risks (Rank III), such as unpredictable weather patterns, significantly impact cotton yields and quality.

#### 2. Challenges Faced by Ginners and Processors

- Compliance with environmental and quality regulations (Rank I) is a major hurdle due to high costs and complex procedures.
- Ensuring raw cotton quality and consistency (Rank II) is critical for maintaining processing efficiency.
- Lack of modern ginning infrastructure (Rank III) limits productivity and affects cotton quality.

#### 3. Challenges Faced by Textile Manufacturers

- Cotton price fluctuations (Rank I) create uncertainties, impacting profit margins and long-term planning.
- Inconsistent raw cotton supply (Rank II) disrupts production efficiency.
- Rising demand for sustainable and eco-friendly products (Rank III) pressures manufacturers to adopt greener practices.

#### 4. Challenges Faced by Retailers and Brands

- Labor rights, fair wages, and ethical working conditions (Rank I) are key concerns amid increasing regulatory and consumer scrutiny.
- Supply chain transparency and traceability (Rank II) are essential for maintaining consumer trust.
- Adapting to market trends (Rank III) is crucial to aligning product offerings with changing consumer preferences.

#### 5. Challenges Faced by Consumers

- Balancing product quality and affordability (Rank I) is the primary concern, as cost remains a major factor in purchasing decisions.
- Consistent and high-quality cotton products (Rank II) are a key expectation among consumers.
- Growing awareness of ethical and environmental issues (Rank III) influences purchasing behavior, driving demand for sustainable products.

#### 6. Challenges Faced by Logistics Partners

- Promoting sustainable practices (Rank I) is a top priority to reduce the environmental impact of transportation and processing.
- Ensuring compliance with labor, environmental, and safety regulations (Rank II) is essential.
- Stabilizing cotton prices and ensuring fair trade policies (Rank III) is necessary for ethical sourcing.

#### 7. Challenges Faced by Distribution Partners

- Lack of advanced processing technology (Rank I) limits efficiency and productivity.
- Advocating for fair labor practices and sustainable production (Rank II) remains a key responsibility.
- Enhancing the livelihoods of farmers and workers (Rank III) is critical for ensuring equitable value distribution.

### Key Takeaways

- Farmers struggle with high costs, market accessibility, and climate-related risks.
- Ginners and textile manufacturers face challenges in quality consistency, pricing, and sustainability.
- Retailers and consumers emphasize ethical sourcing, sustainability, and affordability.
- Logistics and distribution partners focus on environmental compliance and technological advancements.

To enhance efficiency and sustainability in the cotton value chain, targeted interventions such as improved policies, technological advancements, and sustainable practices are essential. Strengthening these areas will create a more resilient and profitable industry for all stakeholders.

### Conclusion

The analysis of constraints in the cotton value chain highlights the diverse challenges faced by different stakeholders, from cotton farmers to distribution partners. Each stage of the value chain has its own unique limitations, affecting productivity, operational efficiency, profitability, and long-term sustainability. A comprehensive approach to addressing these challenges is crucial to enhancing the overall performance of the cotton industry and ensuring equitable benefits for all stakeholders involved.

### Key Insights and Implications

#### 1. Challenges Faced by Farmers

- As the primary producers in the cotton value chain, farmers encounter high input costs, limited market access, and climate-related risks that significantly impact their livelihoods.
- The rising cost of essential inputs such as seeds, fertilizers, pesticides, and labor places a financial burden on small-scale farmers, often reducing their profit margins.
- Climate change-related risks, including unpredictable rainfall patterns, droughts, and pest infestations, further threaten cotton yields and quality.
- Limited access to direct markets forces farmers to rely on middlemen, often resulting in unfair pricing and

reduced income.

- Effective solutions include subsidized inputs, improved credit access, climate-smart agricultural practices, and better farmer-market linkages to ensure fair pricing.

## 2. Bottlenecks in Ginning and Processing

- Ginners and processors struggle with inconsistent raw cotton quality, leading to inefficiencies in production.
- Strict environmental and quality regulations add to operational costs, requiring businesses to invest in compliance measures.
- The lack of modern ginning and processing facilities reduces productivity and leads to quality inconsistencies in cotton fiber.
- Investments in advanced ginning technologies, improved cotton grading systems, and sustainable processing methods can significantly enhance efficiency and product quality.

## 3. Constraints in Textile Manufacturing

- The textile industry depends on a steady supply of high-quality cotton, but fluctuations in price and inconsistent raw material availability pose significant challenges.
- With growing consumer awareness, manufacturers are under increasing pressure to adopt sustainable and eco-friendly production practices.
- Implementing price stabilization policies, promoting ethical cotton sourcing, and encouraging green manufacturing can help the industry remain competitive and sustainable.

## 4. Retailer and Consumer Expectations

- Retailers and brands must ensure transparency and traceability in their supply chains to meet consumer demand for ethically sourced and sustainable products.
- Consumers are becoming more conscious of fair trade, labor rights, and environmental concerns, influencing their purchasing decisions.
- Balancing product affordability with quality and sustainability remains a significant challenge for brands and retailers.
- Strengthening supply chain accountability, ethical sourcing policies, and consumer education initiatives can bridge the gap between demand and responsible production.

## 5. Logistics and Distribution Challenges

- Efficient transportation, storage, and regulatory compliance are crucial to maintaining a smooth and efficient cotton supply chain.
- The lack of advanced technology in logistics and distribution increases operational costs and delays.
- Encouraging sustainable logistics practices, digital supply chain management, and improved trade policies can optimize distribution efficiency.

### The Way Forward: A Multi-Stakeholder Strategy

To develop a resilient, competitive, and sustainable cotton value chain, a multi-stakeholder approach must be adopted, focusing on the following key areas:

### Government Initiatives

- Providing financial support and subsidies to cotton farmers.
- Establishing price stabilization mechanisms to reduce market volatility.
- Promoting climate-resilient and sustainable farming techniques to enhance productivity.

### Technological Innovations

- Investing in modern ginning and processing infrastructure to improve efficiency.
- Utilizing digital solutions for supply chain transparency and tracking.
- Encouraging research into sustainable cotton farming and textile manufacturing techniques.

### Market and Trade Reforms

- Strengthening direct farmer-market linkages to eliminate middlemen and ensure fair pricing.
- Promoting international fair-trade practices to benefit all stakeholders.
- Encouraging fair labor policies and improved working conditions for all workers in the value chain.

### Sustainability and Consumer Awareness

- Encouraging retailers and brands to adopt eco-friendly production and packaging practices.
- Raising consumer awareness about sustainable cotton choices and ethical production.
- Ensuring compliance with labor, environmental, and ethical sourcing standards across the value chain.

The cotton industry stands at a crucial turning point where traditional challenges must be tackled with modern, forward-thinking solutions. A collaborative approach among farmers, manufacturers, retailers, logistics partners, consumers, and policymakers are essential to building a cotton value chain that is efficient, equitable, and sustainable. By embracing technological advancements, policy reforms, fair trade practices, and environmentally responsible production methods, the industry can enhance its economic performance while also meeting the growing global demand for sustainably produced and ethically sourced cotton products.

### 4. Future scope

The promising that knowledge of stakeholders in this study can be exploited technically to increase the strategies of respondents regarding quality and quantity of cotton produce in value chain management.

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