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# Sugarcane Value Chain Analysis in Kama District of Nangarhar Province

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## ABSTRACT

Sugarcane is one of the world's most valuable crops, used not only for sugar and molasses but also for energy, industrial products, and livestock feed. Every part of the plant serves a purpose: the juice provides energy and minerals, the bagasse is used for fuel and electricity generation, and residues are turned into organic fertilizers. Beyond its agricultural role, sugarcane supports transportation, packaging, processing industries, and agricultural machinery Sectors. It provides income for farmers, creates employment, and contributes to food, beverage, and industrial alcohol production. Given its wide applications, sugarcane is deeply linked with economic growth, sustainability, and social progress. Strengthening its value chain can increase national income, improve livelihoods, and enhance self-sufficiency. This study examines the sugarcane value chain in Kama District, Nangarhar Province during 2023-2024. The main objective was to analyze production, processing, marketing, and consumption, while identifying challenges and opportunities for improvement. Using both primary and secondary data, the research surveyed 80 farmers, 10 processors, 10 wholesalers, 10 retailers, and 10 consumers. Descriptive statistics, supported by Excel and SPSS, revealed key factors such as education, experience, access to capital, and market conditions influencing efficiency. The findings identified five main actors in the value chain: producers, collectors, wholesalers, retailers, and consumers. Producers earned the highest income (around AFN 33,775 per jerib), followed by wholesalers, while consumers experienced the lowest net returns (around AFN 4,993). Challenges included limited access to information, weak coordination, and production inefficiencies. The study recommends promoting youth engagement, improving access to seeds and machinery, strengthening market linkages, and offering training programs to boost productivity and efficiency.

**Keywords:** Kama district, process, sugarcane, value chain

## INTRODUCTION

Sugarcane (*Saccharum officinarum L.*), a perennial grass belong to the Graminaceae family, is one of the world's most important agricultural crops. It serves as a key source of sugar, jaggery, ethanol, and biofuel, and every part of the plant has economic value. Beyond its industrial uses, sugarcane is a vital source of income for farmers, generating employment and supporting rural livelihoods. Its cultivation contributes to multiple sectors, including food industries, energy, transportation, and agricultural machinery (Narottam & Mishra, 2023).

Globally, sugarcane has shaped both domestic and international markets. Efforts in crop improvement have focused on increasing sucrose content and developing "energy canes" capable of producing more fermentable sugar and bagasse for renewable energy (Shahid Afghan *et al.*, 2023). Today, Brazil, India, China, Pakistan, and Thailand are the leading producers. In 2021, global sugarcane production reached nearly 1.9 billion tons, with India ranking second after Brazil. Although Afghanistan remains a smaller contributor, Nangarhar Province—particularly Kama District—represents the country's main production hub (FAO, 2023). Afghanistan yearly Production of Sugarcane is extremely

from 58000 to 89000 metric tons, approximately 1750 hectares of land were under Sugarcane Cultivation Afghanistan, there is Currently no precise data available regarding Afghanistan's Sugarcane exports the Quantity of Sugarcane produced in Afghanistan is insufficient to meet the Country's domestic requirements. (Nangarhar Directorate of Agriculture, Irrigation and livestock,1402).

Kama District lies about 23 kilometers from Jalalabad and benefits from fertile land, abundant water from the Kunar River, and a favorable climate. These conditions make it one of the most suitable areas for sugarcane cultivation in Afghanistan. Farmers in Kama often harvest two or three crops per year, with sugarcane serving as a major cash crop alongside wheat, rice, and vegetables. (Aryanzai,2012). Much of the sugarcane is processed into jaggery (gurr), which is sold in markets across Nangarhar, Kunar, Laghman, and Kabul provinces (Independent Administrative Reform and Civil Service Commission, 2019).

Despite its importance, sugarcane farmers in Kama face multiple challenges, including inefficient supply systems, limited access to modern technology, and weak market System. These issues reduce productivity and profitability of Sugarcane, highlighting the need for a systematic analysis of the sugarcane value chain. Such an analysis helps identify obstacles from production to consumption, evaluate opportunities for value addition, and propose solutions to strengthen efficiency and competitiveness (Ministry of Agriculture, Irrigation, and Livestock, 2023).

The concept of a value chain refers to the sequence of activities through which a product passes, from initial production to final consumption, with each stage adding value (Schmitz, 2005). In agriculture, value chains encompass actors such as producers, processors, wholesalers, retailers, and consumers, as well as supporting institutions and policymakers (Kaplinsky & Morris, 2011).

By analyzing these components, the sugarcane value chain can reveal Strengths, Weaknesses, Opportunities, and Threats (SWOT). This allows policymakers, researchers, and farmers to strengthen linkages, enhance production efficiency, and improve market performance. Ultimately, an efficient value chain not only benefits local communities in Kama District but also contributes to Afghanistan's broader economic growth and food security.

## MATERIALS AND METHODS

### *Study Area*

The selected study area is Kama District of Nangarhar Province, located in the eastern region of Afghanistan. This research focuses on the development of the sugarcane value chain in the district. The choice of Kama is based on its status as one of the major sugarcane-producing districts in Afghanistan, with its produce being supplied not only locally but also to several other provinces of the country. For this purpose, in the study Primary data were collected through structured questionnaires in various villages of Kama District, including Sangar Sarai, Qala Akhund, Nawabad, Arbapan, Qandi,Qandaharo, Ebrahimi Sandi, Deh Ghazi Shekhan, Kama Khas, Zakhil, Koz Arbapan, Shergar Jalal, Shergar Gul Mohammad, and Shergar Khas.

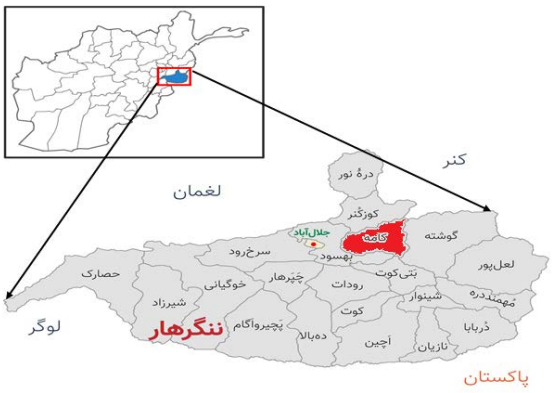


Figure.1: Show the map of Study area. Administrative map of Nangarhar Province.

### *Samples Collection*

For the purpose of this research, primary data were collected through a survey using pre-tested and structured questionnaires. In total, information was gathered from 120 respondents, consisting of 80 producers (farmers), 10 processors, 10 wholesalers, 10 retailers, and 10 consumers. To ensure the accuracy and

reliability of data, both questionnaires and interviews were designed. The questionnaires mainly included closed-ended questions, while semi-structured interviews were used to collect more detailed insights. Using purposive sampling, data and relevant information were collected from 120 individuals through both individual and group interviews across different locations.

### *Statistical Analysis*

In this study, the data were analyzed using the statistical software SPSS, specifically through *Frequency* and *Descriptive Statistics* functions. In addition, Microsoft Excel was also utilized to further process the data. The results were analyzed and interpreted through various techniques and presented in well-structured tables and graphs for clarity and better understanding.

## RESULTS

The results are organized around the five key actors identified in the chain: producers, processors, wholesalers, retailers, and consumers. For each group, their roles, characteristics, economic contributions, and challenges are highlighted. Together, these findings provide a comprehensive picture of how sugarcane moves from farm to market, the value it creates, and the barriers that limit its full potential.

The sugarcane value chain in Kama District involves five major groups of actors:

First we want to short definition of all actors.

1. Producers (farmers) – the primary suppliers of raw sugarcane.

2. Processors – who transform cane into jaggery, sugar syrup, and other products.

3. Wholesalers – who buy in bulk and distribute to wider markets.

4. Retailers – who sell directly to local consumers.

5. Consumers – who ultimately purchase and use sugarcane and its products.

These actors are interdependent, but their share of value, access to resources, and influence vary widely.

### *1 Producers (Farmers)*

Farmers form the backbone of the value chain. In Kama District, both smallholders and larger farmers are engaged in cane cultivation.

Table.1: Social Characteristics Influence Sugarcane Productivity in Kama District

| Land Size Category | Unite | Frequency | Percentage(%) |
|---|---|---|---|
| Less than 1 | jerib | 3 | **3.80** |
| 1-3 | jerib | 61 | **76.20** |
| 3-5 | jerib | 14 | **17.50** |
| More than 5 | jerib | 2 | **2.50** |
| **Total** | | 80 | **100** |

Table 1 show In Kama district of Nangarhar province, sugarcane cultivation varied by land size. About (3.80%) of farmers planted sugarcane on less than one jerib of land, the majority (76.20%) cultivated on 1 to 3 jeribs, while (17.50%) used 3 to 5 jeribs, and only (2.50%) of farmers Selected more than 5 jeribs for sugarcane farming.

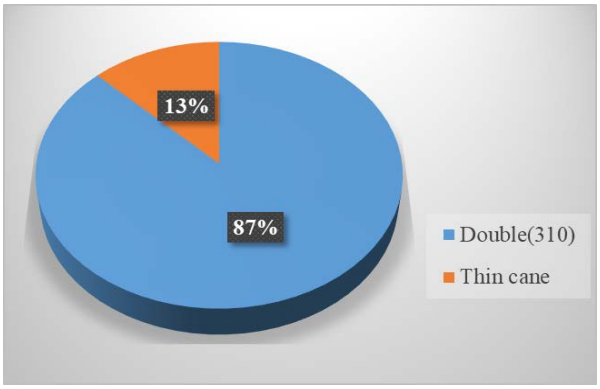


Figure 2: show Cultivation varieties in Kama districts

In Kama District of Nangarhar Province, farmers generally cultivate two types of sugarcane: one is called **Double 310** and the other is known as **Thin Cane**. The Double 310 variety is mostly grown for producing jaggery (gur) and is

specifically cultivated for this purpose, while the Thin Cane is commonly consumed as fresh chewing cane, sold in bundles for eating.

At present, about (87.50) % of farmers in Kama District grow only the Double 310 variety, mainly because it is more resistant to pests and diseases and also has higher market demand. In contrast, only (12.50%) of farmers cultivate Thin Cane, since this type is highly vulnerable to pests and diseases, making farmers reluctant to grow it.

Survey results revealed that producers achieved the highest average net income compared to other actors, earning around AFN 33,775 per jerib of cultivated land. This indicates that production remains the most profitable segment of the chain.

Social characteristics such as age, education, and family size influenced productivity. Younger farmers were more open to adopting new methods but often lacked capital and access to improved inputs. In contrast, older and more experienced farmers relied on traditional practices, which sometimes limited efficiency but ensured stable yields.

Farmer's faced multiple challenges. Access to high-quality seed cane and modern machinery was limited, while irrigation remained heavily dependent on river water.

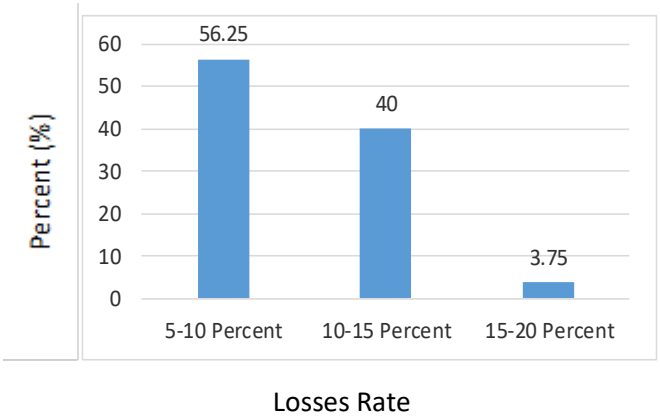


Figure 3: Show Farmers Losses rate

In Figure.3 the survey conducted in various villages of Kama district, Nangarhar province. The results indicate that (56.25%) of farmers incur (5–10%) losses during sugarcane harvesting, (40%) face (10–15%) losses, while (3.75%) of farmer's experience (15–20%) losses, resulting in a considerable reduction of their yield. mainly due to delays in transportation and inadequate storage. Despite these barriers, farmers expressed strong interest in continuing sugarcane cultivation, viewing it as a secure source of income compared to alternative crops.

***2 Processors***

The second important actor's in the chain are processors, who convert raw cane into products such as jaggery (locally known as gur), syrup, and molasses. Processors add significant value by transforming perishable raw cane into storable and marketable goods.

In Kama District, sugarcane is processed into jaggery (Gurr) and chewing canes (Gandairi)**,** while the by-product bagasse is used as fuel for burning.

In Kama District of Nangarhar Province, processors package sugarcane-based products in different forms and materials to make transportation easier and to avoid problems during the process of moving goods from one place to another. Of the processed sugarcane products, about (60%) are packed in sacks**,** 20% in cartons**,** and the remaining (20%) in various types of plastic packaging**.**

The study found that processors' profitability was moderate compared to producers. While processing created employment for local laborers, challenges such as outdated equipment, lack of packaging facilities, and fluctuating energy costs reduced efficiency. Many processors operated on a small scale, relying on family labor and simple technologies.

Another constraint was access to markets. Processed products were mainly sold locally or in nearby provinces, with limited opportunities for reaching larger urban centers. Price determination often depended on seasonal supply and demand, leaving processors vulnerable to market fluctuations.

Despite these challenges, processing plays a crucial role in extending the shelf life of sugarcane and diversifying its economic benefits beyond raw sugar production.

### *3 Wholesalers*

Wholesalers serve as the bridge between processors, retailers, and wider markets. They purchase sugarcane and its products in bulk, then distribute them to other districts and provinces.

The study shows that wholesalers generated an average net income of about AFN 4,993, making them the second most profitable group after producers. Their advantage lay in the ability to buy large volumes and transport them to markets with higher demand.

However, wholesalers also encountered several issues. Transportation costs were high, storage facilities were limited, and price fluctuations reduced their bargaining power. In some cases, wholesalers extended credit to retailers or farmers, which created financial risks when repayments were delayed.

Nevertheless, wholesalers remained essential for connecting producers and processors with consumers beyond Kama District, ensuring that sugarcane products reached a wider audience.

The analysis of this research revealed that wholesale traders of sugarcane and jaggery in Nangarhar Province, particularly in Kama District, face several challenges. The most important ones are outlined below:

1. Lack of suitable markets: There are no well-structured and reliable marketplaces for selling their products.
2. Inadequate storage facilities: Proper warehouses are not available to preserve their products. The few storage spaces built with personal resources are insufficient, as they lack necessary facilities. As a result, products cannot be stored for long periods, leading to moisture absorption and molding, which reduces both the quality and quantity of the products.
3. Absence of government support: Traders receive no institutional or financial support from the government in the sugarcane and jaggery sector.
4. High taxation: In the past, heavy taxes were a significant problem. However, according to traders, the government has recently shown some leniency, and current tax rates are relatively reasonable.
5. Unofficial charges in central markets: A particularly serious issue for wholesale traders is the existence of a group known as *contractors* (Tikdaran) in the central market, who impose informal fees. They charge 2 Afghanis on every 7 kilograms of jaggery sold, creating an additional financial burden on traders.

### *4 Retailers*

Retailers operate at the final stage of the chain before products reach consumers. They typically sell jaggery, syrup, and fresh cane in small quantities within local markets.

Compared to producers and wholesalers, retailers reported lower profit margins. Their role, however, is vital, as they provide consistent access for households to sugarcane products. Retailers often dealt with high competition and limited storage facilities, which forced them to sell quickly and sometimes at reduced prices.

The study also noted that most retailers had limited formal education and relied on family-based small businesses. Their business operations were constrained by seasonal demand, transportation issues, and lack of access to credit. Despite these difficulties, retailers maintained strong relationships with both wholesalers and consumers, acting as a key link in the distribution chain.

In Nangarhar Province, some sugarcane, sugarcane juice, and jaggery retailers have storage facilities (warehouses), while others do not. Among them, about (50%) of retailers have small storage facilities for keeping their products, (10%) have medium-sized warehouses, and the remaining (40%) have no storage facilities at all to preserve their products.

### *5 Consumers*

At the end of the chain are consumers, who benefit from a variety of sugarcane products, particularly jaggery and syrup. Most consumers expressed satisfaction with the quality and affordability of these products, especially when purchased locally.

However, consumers did not have any Particular challenges. Seasonal shortages occasionally limited availability, and

concerns were raised about product hygiene and storage conditions. Consumers also suggested that producers and processors should improve packaging and quality standards to ensure better shelf life and consumer confidence. Overall, consumer feedback highlighted the importance of maintaining affordable prices while ensuring improvements in product safety and quality.

Among sugarcane and sugarcane product consumers, about (40%) reported facing problems due to high prices**,** another **(**40%) complained about poor product quality**,** while the remaining **(**20%) stated that they did not encounter any issues when purchasing sugarcane or its products**.**

## DISCUSSION

Farmers in Kama district of Nangarhar Province face a range of concurrent challenges in sugarcane production, which directly and negatively affect both the quantity and quality of their output. The findings of this study indicate that the major constraints include weak financial capacity, rising input costs during planting, pests and diseases, limited access to appropriate technologies, low market prices, and the absence of reliable markets.

Quantitative data reveal that (40%) of farmers suffer from weak financial capacity, (60%) struggle with high input costs during cultivation, (62.50%) are affected by pests and diseases, (18.80%) lack access to suitable technologies, (12.50%) complain of low prices, and (6.20%) face challenges related to the absence of markets. In addition, marketing and sales of sugarcane products present another significant concern. The study shows that (17.50%) of farmers sell their produce in provincial markets, (78.75%) in district-level markets, and only (3.75%) manage to access national markets.

These findings align with the study of Buthelezi and Ngema (2023), who reported that the key barriers and problems to sugarcane production include lack of financial resources, limited access to improved seed varieties, poor market access, shortage of professional expertise, absence of business planning, transport difficulties, high production costs, and marketing challenges. Similarly, Abdel and Sharabassy (2007) highlighted that farmers encounter numerous technical constraints such as low yields, high transportation costs, lack or shortage of loading machinery, low product prices, and delays in realizing the value of their produce.

## CONCLUSION

This study was conducted under the title *"Sugarcane Value Chain Analysis in Kama District of Nangarhar Province"*, which revealed that every stage of the sugarcane value chain in this district faces numerous challenges, limiting the full realization of the crop's economic benefits. The main factors contributing to the weaknesses of this value chain include the lack of modern technology, limited access to improved seed varieties and chemical fertilizers, insufficient advanced processing factories, weak marketing mechanisms, restricted financial and technical support, absence of government support, minimal or no assistance from supporting institutions, and challenges in transportation and storage of products.

Conversely, the study identified several strengths within the sugarcane value chain in Kama district. These include favorable climatic conditions for sugarcane cultivation, farmers' long-term experience, availability of affordable labor, suitable soil for cultivation, ample raw materials for processing, the presence of multiple sugar processing factories, availability of technical personnel, diversified product production, access of major sugar and sugarcane product sellers to open markets, distribution networks across various areas, and the ability to influence product pricing. Retailers maintain direct contact with customers, access small and medium-sized markets, have a clear understanding of market conditions, respond promptly to consumer demand, and benefit from consumers' preference for natural sweetness and health benefits of sugarcane, as well as the traditional consumption habits and freedom of choice within the community.

However, the sugarcane value chain also faces significant threats, including climate change, increasing pest and disease incidence, imported sugar and sugar products, rising taxes, reduced sales volumes, seasonal shortages of raw

materials, import pressures from neighboring countries, insufficient storage capacity, the presence of competitive traders in the market, the availability of artificial sweeteners and low-cost imported sugar products, and decreased consumption due to economic difficulties.

The study also highlighted several opportunities for strengthening the sugarcane value chain. These include increasing demand for sugarcane and sugarcane products, implementation and support of agricultural development projects, potential connections to international markets, the introduction of new technologies, quality improvements for export, opportunities to enhance packaging and service delivery, establishment of modern sales systems, growing demand for health-oriented products, increased consumption of new products such as fresh sugarcane and juice, public awareness programs regarding consumption, exploration of new markets, and development of innovative packaging strategies.

The findings indicate that each stage of the sugarcane value chain possesses high economic potential. If farmers receive support, modern technologies are introduced, improved seeds are made available, credit systems are established, processing equipment is expanded, new marketing techniques and strategies are implemented, investment in packaging is made, and effective measures for transportation and storage are adopted, sugarcane production in Nangarhar Province can significantly increase. This would not only enhance the income of local farmers but also strengthen the provincial and national economy of Afghanistan.

The study concludes that policymakers, agricultural institutions, and the private sector should collaboratively design and implement practical programs to strengthen the sugarcane value chain, ensuring increased farmer income, industry development, and regional economic stability.

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