

Silk industry supply chain complexity: A comparative study on finding the gap between demand and supply

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Abstract:

This research is done to understand the current supply chain element responsible for demand and supply fluctuation in the industry. To get more authentic and feasible data we collected two types of data, primary and secondary. These data are collected by using deductive approach and different method such as surveyed questionnaire from farmers, manufacturers, and interview from government institution, observation and reading some journals, newspapers related with silk industry. The literature review is descriptive section of the research where all the important issues, definitions, theories and framework was described to understand the research more efficiently. In the literature review the thoughts about the supply chain management of silk industry, various difficulties inside the intricate network, critical analysis of demand and supply of silk industry are identified. Then using the demand curve and supply curve and also with collected data a content analysis was formed and finally through the research it is found that the lack of consistent supply of raw materials are the responsible cause behind lack of supply. The curve shows that the supply is linear and it has not changed in the last three years. Furthermore, gathering information from over 140 people. Our inquiries are constructed to provide statistical support for supply and demand. Our data study reveals that over 86% of individuals retain silk products on their lists of preferred items, however 40% of people believe the price of silk products is too expensive and

therefore unaffordable. 76% of distributors believe that the high price is to blame for the lack of production resources. In every year our country has imported \$1.62 million but production in domestic industry only \$16.1k. Finally the research shows that there is a lack of supply and increasing demand in the silk industry.

Keywords: *supply chain management, silk industry, cocoon production, silk import and exports, government, lack of consistent supply of raw materials*

Introduction

1.1 Research Background: After consulting with Professor Majurul Islam, Department of Botany at University of Rajshahi it is found that in silk supply chain management there are three stakeholders often involved directly; suppliers, manufacturers, and consumers. These stakeholders depend on each other directly in case of balancing the demand and supply. This paper focuses on the issues that part of the supply chain is responsible for creating the gap between demand and supply. According to Prothom Alo News though demand for Rajshahi silk increased up to 7.5 percent last year but it still struggling to fulfill the domestic demand. According to the Bangladesh sericulture development board (BSDB) and Mangabey news, Bangladesh has an ever-increasing demand of 300 metric tons of silk per year of which only 40 metric tons are produced in the country for the fiscal year 2017-18, while the amount remain at only 7 metric tons in the fiscal period 2022-2023. The rest of the demand has to be met through imports from different countries especially China. But before the government policy change in 1995; 90% of the country's demand was produced in the country. According to Prothom Alo News, Bangladesh's silk industry was hit hard in the 1990s and 2000s by what officials called faulty government policy which flooded the market with cheap Chinese silk imports. Manufacturers bit by bit enhanced their allegiance on imported silk yarn at a low price as a result our local yarn producers faced challenges to operate their businesses as they plucked to stand against with the imported yarn with NO tariffs from China and day by day the production decreased. Nowadays despite having silk demand due to poor investment, traditional manufacturing technology, unskilled manpower, constantly variable temperature, obsessive obedience on imported lower cost yarn, and lack of enough government patronization; the silk industry is suffering to supply adequate silk products. In the late 1990s, while more than 100 factories produced silk made products right now the number stands at only 8.

1.2 Research Question: Bangladesh has a glorious history in the silk industry but despite having adequate demand of the customer in the market silk supply is not adequate in every marketplace. Bangladesh's once-famous silk industry is struggling with some difficulties in recent years. Through our research paper, the paper is trying to detect the difficulties behind the inadequate supply of silk in the market. After an investigative survey where it was discussed with all the stakeholders involved in the silk industry including Suppliers, manufacturers, BSB, BSDB, silk retail shops, customers, and with some analytical method analysis, and tried to arrive at a final result through this research paper.

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1.3 Research Objective: Extensively the objective of the research paper is to render the gap analysis between demand and supply; despite having sufficient demand in the market, why the supply of silk is inadequate? So the objectives of this paper are-

- To find out the overall status of the silk industry in Bangladesh.
- To identify and analyze the Gap between the Demand and supply of the silk industry in Rajshahi, Bangladesh.
- To find out the major reasons behind the lack of silk production resources.
- To highlight customers' perception toward purchasing silk clothes in the present year 2023.

1.4 Research Overview: From our primary data collection of demand surveys on different silk factories, silk retail shops, and customers to 28th August 2023, the researchers find the silk demand is very high. But after reviewing 12 (journals, articles, and newspapers) from 2010 to 2022 and discussing with all the stakeholders involved in the silk industry in our research paper tries to present the reason behind; why silk is not available in the market in the time of 1990s and although there some silk retail shop why It's gone out of random people's purchase power. In brief, where's the actual gap balancing between the demand and supply of silk? Some of the reasons behind the inadequate supply of silk in the market are low-cost imported yarn, poor investment, traditional manufacturing technology, constantly variable temperature, insufficient government patronization, unavailable land, insufficient technical support, and production resources scarcity. This research is conducted in the Rajshahi Division due to the availability of maximum silk factories, silk retail shops, and the majority of farmers. The primary data was collected from customers, silk factory managers, silk retail shop owners, farmers, Bangladesh Sericulture Development Board (BSDB), and random clothes retailer shops. To conduct this research, the questionnaire, sample test through SPSS tools, and content analysis can be used.

Literature Review

2.1 Overview: The silk industry has an important historical place within Bangladesh's poor agricultural-based economy. However, its present expansion rate and market sway fall short of domestic and foreign aspirations. As a result, it is crucial to carefully consider both the current challenges and potential solutions. This research focuses primarily on the supply chain issues facing the silk industry, paying particular attention to the major causes of the worrying supply-demand imbalance. This study attempts to clarify the key causes causing the difference between the large demand for products made from silk and the limited supply of such products by probing the intricacies behind the lack of supply. The supply chain issues facing the silk industry are the subject of this study, which also addresses the major causes of the worrying supply-demand imbalance. The study aims to put light on the core factors underpinning this difference by probing the intricacies behind limited silk product supply despite significant demand.

2.2 SCM and Silk SCM: Supply chains serve as the global infrastructure for the movement of goods (Eftekhari, 2019). They play a crucial role in determining the availability and cost of products. This research delves into the intricacies of supply chains, with a particular focus on their function in meeting consumer demands. The objective is to understand why shortages occur despite high demand and to analyze how issues within one layer of the supply chain impact other layers, leading to a gap between supply and demand.

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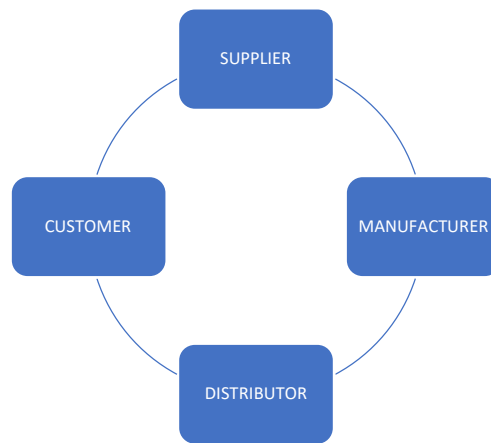


Figure 1: supply chain model (Lisan, 2019).

In Figure 1, there is a supply chain model where it can be noticed that each of the stakeholders or layers of this chain is connected that initially starts from the manufacturer and in the end serves the final customer. Any interruption among these can create a gap between the demand and supply.

The silk industry thrives within a complicated and interconnected supply chain structure thanks to Bangladesh's agro-based economy. The availability, cost, and accessibility of silk-based goods are influenced by a complex network of players, detailed procedures, and dynamic tactics. In order to fully comprehend the complexities that underlie the persistent imbalance between supply and demand in the world of silk goods, it is essential to have a detailed awareness of the various components within this supply chain.

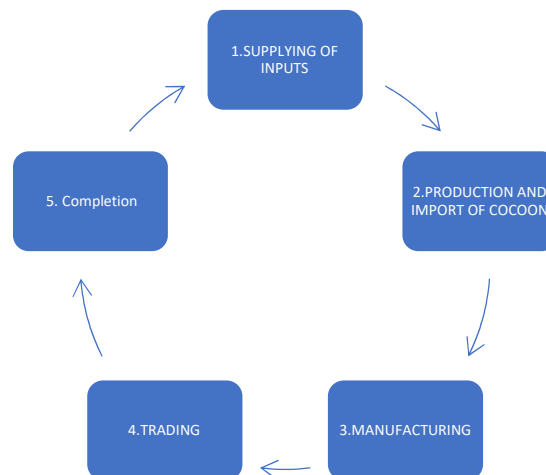


Figure 2: Supply chain of the silk industry (Lisan, 2018)

In Figure 2 the supply chain of the silk industry has been drawn. In this chain, there are five stakeholders or layers that begin from the supplying of inputs like creating shelter, collecting cocoons'

eggs and food, and other facilities for cocoons. Starting from this the finishing goods of each are supplied to the other stakeholders and after completing the cycle the finished goods are supplied to the final customers.

In this chain numerous difficulties and barriers manifest inside this intricate network, impeding the smooth operation of the sector

- **Farmers and Seri culturists:** Farmers confront a variety of challenges, such as a lack of access to good land for cultivation, insufficient money, and a skilled labor shortage. Productivity is hampered by outdated agricultural methods, and hazards from climate change-related unexpected weather patterns are great.
- **Suppliers of raw materials:** These parties face a variety of difficulties while locating high-tech equipment, substances, and materials. Governmental rules, inadequate infrastructure, and market monopolies reduce their effectiveness.
- **Manufacturers and Processors:** Manufacturers face challenges such as a lack of financial resources, monopolies in the production and distribution sectors, the use of outmoded technologies, and a workforce lacking in skills (Rony et al. 2020). Their problems are made worse by the lack of indigenous raw resources and ineffective import procedures. These challenges eventually have a large negative influence on supply and demand.
- **Logistical Barriers:** It is difficult to satisfy market demands when there is a disruption in the seamless movement of commodities from producers to consumers due to an insufficient supply chain. Price increases are a result of increased manufacturing costs brought on by a lack of raw resources and a reliance on imports.
- **Supply Demand Gap:** These are the main cause of the limited output of raw materials and final goods. These factors have led to a gap between supply and demand that other parties must deal with. Distributors, wholesalers, and retailers struggled to keep a stable supply chain in place and satisfy market demand due to the extremely restricted output. Although there is a sizable market need for silk items, there is a discrepancy between supply and demand.

Then again the main problem in the supply chain of the silk industry is in the manufacturing end or the supply of inputs and as the root of the chain is having problems that's why the total supply chain of the silk industry is facing issues as well (Lisan, 2019).

2.3 Critical analysis of silk industry demand and supply: A study on analysis of the development of China's modern silk industry Wang & Yang (2022) Another study by Mahadi, Ghazali & Sharifon supply chain management for garments industries using blockchain in BD (2018) presents brand-new, collaborative research on a blockchain-based system for managing the production of clothing. Additionally, make the case that any cost savings would be sizable in comparison to the current costs and continuing system maintenance of legacy IT systems. Compared to changes made to legacy IT systems, programming and implementing changes across the entire blockchain is significantly simpler.

A study on analysis of the development of China's modern silk industry by wang & Yang (2022) A study on analysis on the development of China's modern silk industry wang & Yang as the proverb "men's farming and women's weaving" paints a unique portrait of a traditional Chinese family structure, the Chinese silk weaving industry has a long history and has developed a

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complete, stable technical system. Since the modern era, the Chinese silk industry has gradually modernized thanks to the introduction and use of new looms, raw materials, and cutting-edge procedures. By examining the technological and social developments in the modern silk industry, this essay, which is based on historical data and comparative analysis, attempts to study the co-evolution of science, technology, and social structure. It has been discovered that stakeholders in the industries' upstream and downstream value chains will essentially all have an impact on how the business is shaped while also being impacted by the outcomes of product and process innovation. As a result, small, family-run farms may be less open to technology advancements to safeguard their regional commercial interests.

Mao & Pearce (2013) this study explores the experiences of foreign visitors to Beijing's silk market, one of the most popular tourist destinations. The literature on tourist shopping, Chinese inbound tourism, and doing tourism experience research in the Internet age will all be reviewed in this part. The first two are relevant to the investigation's topic, while the third has ramifications for the chosen research methodology. Tourism researchers and destination marketing organizations pay close attention to China since it sends a lot of tourists to other places who spend a lot of money there. In 2012, China attracted 57.7 million international arrivals and was ranked as the third-highest tourist-receiving destination. It is fourth in terms of tourism receipts (US\$ 50 billion) (UNWTO, 2013). This study investigates the shopping experiences of foreign visitors to Beijing's Silk Market, the busiest tourist destination in China.

The Study suggests that is extensively the objective of the research is to render the gap analysis between demand and supply despite having sufficient demand in the market whether the supply of silk is inadequate. The paper shows the overall situation of the silk industry from the farmers, the distributors, the retailers, and the customers. The questionnaires were prepared to evaluate the demand for silk cloth in the people and also analyze the problems of the supply chain which is most reasonable to the people.

Research Methodology and Methods

3.1 Overview: The research consists of different methods for data collection and data analysis. The main purpose of the research analysis is to highlight the issues of the gap between the demand of supply and also the responsibilities behind this gap. The mission of the research methods is to figure out the rationality of the problem and to bring out the perceptions of various categories people of in the country. The purpose of the research is to overview the supply chain management of producing silk products and identify the possible entity responsible for creating the gap between the demand and supply of products in the silk industry of Bangladesh. According to the journal of Kumar & Phrommathed, the research methodology is used to analyze the collected trustworthy data to reach a strategic or logical conclusion for the mentioned problem or issue and the data is also used to recommend or forecast possible solutions regarding the issue which can be used in the future to develop the sector (Kumar & Phrommathed, 2005).

3.2 Research approach: The research was started after studying the previous results and findings stated in different journals, articles, and books written by internationally recognized writers and authors like Extreme temperatures and erratic weather disrupt Bangladesh's famous Rajshahi silk industry by Abu Siddique 2023. In this research, this paper used secondary and primary data for the analysis of the gap between demand and supply of silk products and raw materials. Then the

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collected data will be analyzed using SPSS and demand supply curve and rationality will also be shown at the end of the research.

3.3 Data collection: Firstly, the data about various topics and vital reasoning about consumer goods and price hikes were collected from 15 different journals and their findings were used to collect knowledge about the questionnaire. In the case of collecting primary data, the questionnaire method was used and secondary data is collected by reading different journals. These two types of data were collected for demand analysis. For supply analysis, two types of data were collected and these are primary and secondary data. In the case of primary data, a questionnaire, interview, and observation were used, and in the case of secondary data, different research journals, newspapers and researcher interviews were used. This paper has developed two questionnaire models for demand and supply analysis that consist of total of 18 questions. The questionnaire data were collected from 5 different categories of people like consumers, manufacturers, farmers, wholesalers/ Retailers, and authorities to find out more about the topic. This paper also talked with the people who are directly involved with the process such as the Deputy Director of Rajshahi Silk Development Board who helped us with his valuable information about the topic. This paper also collected the data through physical interaction with the wholesalers, retailers, and consumers asking them questions about the silk industry issues.

3.4 Research Strategy: To find a logical and feasible result the researcher has to ensure a proper research strategy to do that. So, the research strategy of this research is to first collect the data and then the collected data will be analyzed using SPSS and find the descriptive values of the concerned variable like the mean, median, and mode. After the SPSS analysis, a summary will be added including all the primary and secondary data in a table with the demand and supply curve. Lastly, the rationality of the concerned variable will be added to conclude.

3.5 Research Methods: The methods which are used throughout the research are a deductive approached Questionnaire, interviews to collect primary data, SPSS tools to find out the descriptive value and frequency, demand schedule and demand curve following the supply curve to find out the statistical value of the market situation and to measure the reasons behind lack of production or supply. Shortly it can be said that the data analysis is done by using the content analysis approach.

Data analysis

As one of the GI products of Bangladesh, Rajshahi silk and muslin clothing are very good quality and also comfortable to use. Having a great history from the 19th century till the year of 2002, the industry faced a sudden downfall in 2018. But the silk industry has started its functions again to inherit the heritage and spread quality silk threads across the country and abroad. But as in the present year though there are around a huge demand for domestic silk cloths in the open market but there is not enough supply. Because of that, the industry is facing a lot of challenges. To make the scenario clearer and more understandable this study has conducted a demand and supply analysis using various methods and theories that are mentioned beneath.

4.1 Demand and supply analysis: According to the Observatory of Economic Complexity of Bangladesh, the country has exported only \$16.1k in silk fabrics (Domestic production-golden color silk) to foreign countries United States, India, Netherlands, etc. But on the other hand, the

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country has imported \$1.62 million (Synthetic silk thread) of silk fabrics mostly from India and China (OEC, 2021). As the Ekhn tv news shows that Bangladesh has a total of 450 metric tons of silk thread demand in the current market but 91% or 410 metric tons of the silk thread raw materials are imported from foreign countries with costs of around 300 corer tk in a year. It identifies that the country is currently able to produce only 9% of the total demand for silk threads in Bangladesh (Ekhn, 2023). The statistics highlight that the country has a huge market demand for silk clothing. Using the deductive approach primary data was collected to indicate the frequencies of demand in the current market in Rajshahi, Bangladesh. The data was gathered using a structured questionnaire through dichotomous, multiple choice, and contingency questions related to the situation. The data demonstrates few decisive results and frequencies as mentioned. Showing the collected data from the structured questionnaire are mentioned below-

Dichotomous Question

SL	Question	Yes	No
1	In terms of purchasing clothes, do you keep them on your preference list?	86%	14%
2	Does the price of silk clothes seem more expensive compared to other clothes?	67%	33%
3	Are you comfortable with the quality of silk clothes?	89%	11%

Table 1: Demand analysis questions from the questionnaire

From the collected primary data of a sample size of 100, it can be noticed that 86% of customers preferred silk clothing in terms of purchasing their required dress. On the other hand, almost 14% of customers confessed that they do not preferably choose silk as their clothing for multiple reasons. In question 2, which is focused on pricing it can be seen that almost 67% customer of our survey feel that silk clothing's comparatively more expensive than any other type of clothes. On the contrary 33% of customer thinks that silk clothing is not more expensive than other clothing because of the variation of purchase power as they are from higher and higher middle class. Question 3 was created to focus on the comforts of customers, where it can be noticed that almost 89% of customers think that silk clothing's more comfortable than the other types. On the other hand, 11% of customers thought silk clothes are not comfortable compare to other clothes.

Contingency Question

SL	Question	Option 1	Option 2	Option 3	Option 4
1	Which of the following do you think is responsible for not purchasing silk clothes?	39% (Inadequacy of silk clothes)	40% (High Price)	8% (Suspicion about Quality)	13% (Lack of new Design)
2	Which do you think is responsible for the high price and scarcity of silk clothes?	15% (Lack of govt. patronization)	76% (Scarcity of production resources)	5% (Problems in commercialization)	4% (Monopoly market)
3	What is your preferable marketplace to purchase silk clothes?	23% (Dhaka)	77% (Rajshahi)	-	-

Table 2: Demand analysis questions from the questionnaire

Question 1, was created to find which of the following reason is responsible for not purchasing silk clothing. Through this question, it was found that 39% of people do not purchase silk clothing because of “Inadequacy of clothes” Apart from this 40 % person of this survey do not purchase silk clothing because of high prices. 8% of people do not purchase silk clothing because they have a suspicion about its quality. Lastly, almost 13% of people do not purchase silk clothing because they don’t get variation in dresses. Question 2 was created to find the reason that is responsible for “The high price and scarcity of silk clothes” From our survey it is found that 15% of people believe “lack of government patronization” is responsible for this. 76% of people believe “scarcity of raw materials” is responsible for high prices and scarcity of raw silk clothes. This is the highest amount of percentage in this question. Around 5% of people believe that the “problem in commercialization” is responsible for high prices and product scarcity. Lastly, 4% of people are responsible monopoly for this problem. Question 3 was assigned to find the preferred city of customers in terms of silk clothing purchasing. Where it was found that around 23% of customers preferably choose Dhaka for their purchasing and 77% of customers choose Rajshahi for purchasing their silk clothing.

Now, according to the data gathered through interviews with the sales representative and shop manager of Sopura Silk and Usha Silk their daily sale is 100 clothes where the price for the clothes starts at 5000/- taka. So a **hypothetical** demand schedule and demand curve is mentioned below to verify the demand for the product.

Demand Schedule

Price (P_d)	Quantity (Q_d)
5000/-	100
3000/-	150
2000/-	200

Table 3: Demand Schedule of silk clothing sale in Sopura Silk (2023)

Demand Curve

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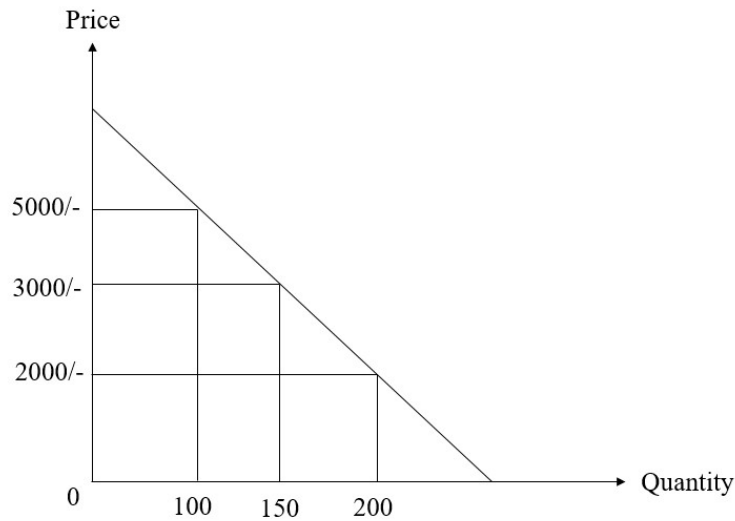


Figure 3: Demand Curve of silk clothing sale in Sopura silk (2021-2023)

The curve or Figure 1 clearly states that if the price (P) is lower than the demand increases and in the present situation as the price is high that's why the demand (D) is low. As per the deductive approach questionnaire, it can be identified that the silk industry has its clear and increasing demand in the market, but as the price range is high that's why the demand or sale is less in the market. In other words, it also can be said that as the supply is low that's why the price is high and as the price is high that's why the demand is low.

According to the factory manager of Sopura Silk Md. Saidur Rahman the low production of silk cloths is reasoned because there is not enough cocoon supply to the factory. That means the farmers don't farm it anymore. Continuing with the primary data collection according to the farmers of Vholarhat, Chapainawabganj they are not able to produce silk cocoon because of the hot weather in the northern part of Rajshahi. And also states that they are not willing to produce because of the low market value in the current market. Shortly there is no specific market for the farmers to sell their cocoons at a fine rate. The same two reasons which are lack of proper market value and unsuitable weather are the reason behind low production also stated by the Deputy Director of Bangladesh Sericulture Development Board Md. Atikur Rahman and Deputy Director of Regional Silk Extension Office Rajshahi. Further, the collected data from a survey about the supply states that-

SL	Question	Yes (%)	No (%)
1	Do the farmers face any challenges in selling the cocoon?	80 %	20 %
2	Are the farmers satisfied with the selling price of the cocoon?	40 %	60 %
3	Do the workers get any training on productivity?	10 %	90 %
4	Does the government play a vital role in the adoption of the modern factory?	10 %	90 %
5	Do you think domestic companies are able to fulfill the current market demand?	0 %	100 %

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6	Does the silk board take proper initiative for commercializing and price control?	52.5 %	47.5 %
7	Do the farmers get sufficient incentives for cultivation?	30 %	70 %

Table 4: Supply analysis questions from the questionnaire

During the primary data collection process, there were 7 descriptive questions to find out the required information about the supply of silk. In question 1 it was found that 80% of people believe farmers are facing challenges in selling silks. On the other hand, 20% of people make sure that farmers do not face challenges in selling silks. In question 2, almost 40% of people believe farmers are satisfied with the selling price of cocoons, though 60% of people believe farmers are not satisfied with their cocoon selling price. In question 3, 10% of people thought workers get training in terms of productivity. On the other hand, 90% of people affiliated with this industry say workers don't get any training facilities. In question 4, it was found that 10% of people related to this industry said "Government plays a vital role in the adoption of the modern factory" though 90% of people says government does not play a vital role to improve this industry. In question 5, which was about production capacity, here 100% of people say domestic companies are unable to fulfill the domestic demand. Question 6 was about the silk board, here 52.5% of people affiliated with this industry say the silk board takes proper initiatives for commercializing and price control, though 47.5% of people say the board does not take proper initiatives. The last question was about farmers' incentives, where 30% says farmers get sufficient incentives for cultivation, but 70% voted that farmers do not get a sufficient incentive for cocoon cultivation.

From the data of 1990-1995, a supply curve of the silk industry is mentioned to be at its glory stage. So if per kg silk cocoon price is assumed to be 150/- and gradually increases with time and the level of supply is also an assumed 100 kg supply when the price is 150/- taka per kg.

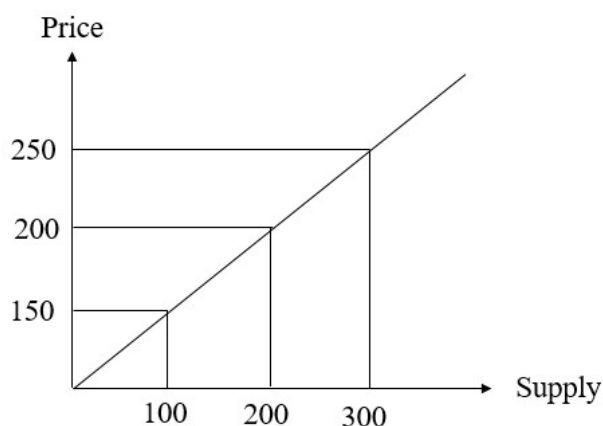


Figure 4: Supply curve of silk cocoon (1993-1995)

In the present time 2023, the scenario is a bit different according to the Regional Silk Extension Office Rajshahi there are 8 factories to generate threads from the cocoons but there is not enough supply of the cocoons from the farmers which results in the mentioned scenario.

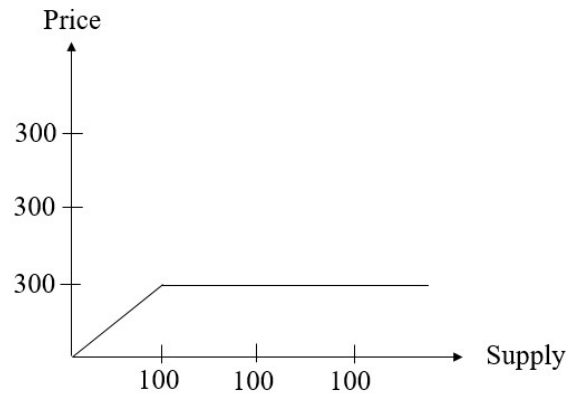


Figure 5: Supply curve of silk cocoon (2021-2023)

From the above figure, it can be identified that the present price per kg cocoon is 300/- and though the price is high in the present times still the supply rate is continuously the same. In that case, the only reason can be that there are not enough production facilities for the farmers. To justify the theory a survey was done the results are.

Question: what is the significant reason behind the lack of quality and production of silk clothing?

- Consistent supply of raw materials (0)
- Lack of technical support (1)
- Insufficient cultivable land (2)
- Insufficient skilled labor (3)

To the answer to this particular question, collected from (sample size 40) the farmers, manufacturers, retailers, and also the government authority agree about 65%, that the lack of a consistent supply of raw materials is responsible for the downfall of the significant production rate of silk clothes whereas 15% of the stakeholder thinks that the lack of technical support is the reason, 10% suggests lack of land is the reason. And it's quite true, farmers are not able to cultivate more cocoons because of the lack of land, marketplace, and price. Also, the weather and lack of skilled manpower are partially responsible as well.

Descriptive Statistics			
	N	Mean	Std. Deviation

What is the significant reason behind the lack of quality and production?	40	.65	1.027
Valid N (list-wise)	40		

The mean value of the question also indicates 65 which means the average people voted for the same reason which is the lack of a consistent supply of raw materials. So, after all the analysis and discussion it can be identified as the cocoon supply is low that's why not enough silk is manufactured, and the lack of marketplace and infrastructural support causes the shortage of cocoon supply. So the current market scenario is the demand for silk clothing is high but the supply is low.



Figure 6: Present situation of the silk industry in Bangladesh

4.4 Research ethics: The privacy of relevant stakeholders was carefully protected in this research study. The data gathered was systematically organized based on the societal roles and consumption positions of the participants. It is important to note that no personally identifiable information was collected during the voluntary data collection process, and there was no coercion involved (Stahl and Wright, 2018). Only those individuals who willingly participated contributed their data. To ensure ethical standards were upheld, no personal information regarding individuals' professions or environments was collected. Before analysis and presentation, all collected data underwent thorough anonymous collection. The research findings solely relied on the voluntarily provided information from interested participants, demonstrating a meticulous approach toward ethical considerations. This study was conducted with a strong commitment to ethical principles and a comprehensive understanding of various perspectives, including opposing viewpoints.

Research Findings

5.1 Results and Findings: According to the secondary data collected from various journals and news articles about the present requirement of silk raw materials in the market, the present demand in the market and the fundamental problems of the silk industry are mentioned below-

1. According to the Observatory of Economic Complexity of Bangladesh, the country has exported only \$16.1k in silk fabrics (Domestic production-golden color silk) to foreign countries United States, India, and the Netherlands, etc. But on the other hand, the country has imported \$1.62 million (Synthetic silk thread) of silk fabrics mostly from India and China (OEC, 2021).
2. As the Ekhn tv news shows that Bangladesh has a total of 450 metric tons of silk thread demand in the current market but 91% or 410 metric tons of the silk thread raw materials are imported from foreign countries with costs of around 300 corer tk in a year. It identifies that the country is currently able to produce only 9% of the total demand for silk threads in Bangladesh (Ekhn, 2023).
3. According to a journal by MN Islam and SA Mili, the reasons behind the downfall of the silk industry are infrastructural problems, technological problems, and a lack of skilled manpower (Islam et al. 2010).

Now the issues and information that were found from the primary data collection process are mentioned below:

1. From the data analysis of silk demand and supply it can be found that the industry lacks supply due to the proper manufacturing of silk cocoons and the silk cocoon is not manufactured because there is a lack of marketplace and price, lack of technology, and skilled training for the farmers, thus the demand raises but the supply does not.
2. From the interrogation, it was found that till the late 90s, there was a huge demand for silk clothing. Customers were preferably choosing those clothes because it was available in the market and also the dresses were very affordable.
3. As the production and supply of silk clothing are so limited, those clothes are only available in dedicated silk showrooms in very limited areas. Even those clothes are not even available in regular markets.
4. From the field visit, it is identified that there is no well-structured market and pricing system for cocoons. That's why 80% of farmers face challenges at the time of cocoon selling. Another questionnaire shows that only 40% of farmers are satisfied with the current cocoon prices.
5. During the factory visit, it is found that there is a monopoly in the manufacturing sector. Only a few manufacturers control the total manufacturing volume. The reason behind this problem is no big investment from the government and private sector.
6. The existing manufacturer is not able to fulfill the total silk demand as their scale of production is not up to the mark. Manufacturers face multiple challenges like lack of capital, absence of skilled labor, and insufficient supply of raw materials from domestic farmers and foreign imports.
7. Authority like the Bangladesh sericulture development board and others support is not sufficient to grow the industry. Like 52.5% of people related to this industry feels the board does not take proper initiatives for commercializing and price control. In another question, it is found 90% of people related to this industry feel government did not play a sufficient role to grow and modernizing this industry.

5.2 Impact and changes: Some important changes can be noticed due to the impact of the gap between demand and supply of raw materials that results in a shortage of silk products according to demand.

- Due to a shortage of raw materials, manufacturers cannot fulfill their demand which can result in the implication of the production process.
- Due to insufficient cocoons, the production capacity cannot increase which results in low productivity. As a result, the price of silk products increases.
- Due to a lack of raw materials, the government needs to fulfill the gap in raw materials. That's why the government provides an opportunity for all the manufacturing companies to import raw materials at low taxes from abroad. As a result, domestic producers are discouraged to produce cocoons and also new farmers do not want to take risks on this side.
- In 2005, middle-class people can bear the price of silk products. But today's market price of silk is very high because of a shortage of silk yarn that results in low productivity. so middle-class people cannot bear it.
- Due to the opportunity of importing silk yarn at a low tax rate, most of the manufacturers import yarn from China which is synthetic. These manufacturers have used these imported yarns as local yarn for the domestic people. This can hamper the goodwill of the local silk because of low quality and also it creates a misconception about the quality of local products to the domestic customer.

Recommendations

6.1 POV- Farmers: In the silk industry, farmers are the most important wing who provide raw materials such as cocoons from which the rest of the process begins. But farmers think that some problems such as lack of infrastructure, sufficient loans at the reasonable interest rates, quality cocoon eggs, etc. are responsible for the shortage of raw materials. Recommendation:

1. Sufficient microcredit should be provided to the farmers by specialized bank such as RUKUB and NGOs like BRAC, ASHA, TMSS, etc.
2. Modern facilities including proper shelter should be provided to farmers so that they can produce enough cocoon to meet the demand for raw materials.
3. Proper training should be provided under government institutions (Sericulture Development Board) and non-government institutions.
4. Creating a proper structural market where farmers and manufacturers can negotiate easily.

6.2 POV- Manufacturers: Manufacturers are those individuals who are creating silk yarn from raw materials (cocoon) and also by using that silk yarns they are made in a variety of silk products. But they also face some problems which obstruct the proper production process and result in low production. The problems are lack of capital, lack of proper govt. policies, and lack of skilled manpower. Recommendation:

1. The suitable policy should be made in terms of export, import, loan, and domestic trading which can help manufacturers to do all the activities properly related to manufacturing.

2. Skilled manpower should be hired and training facilities should be provided related to modern technology which can increase efficiency and productivity.

6.3 POV- Researchers: As a researcher, there are three important problems in terms of period such as short-term, mid-term and long-term. The recommendations are-

1. The industry has some short-term problems such as insufficient loan facilities, and skilled manpower. From the researcher's point of view, these can be overcome by creating skim at the reasonable interest rate and conducting some training sessions that can make skills all laborers.
2. In the case of mid-term problems such as lack of infrastructure, poor quality, etc. can be solved through adequate investment for making better infrastructure, improvement of processes through technological advancement, and investment in continuous training and development.
3. In the case of long-term problems such as improper government policies in which government encourages to import of silk yarn from abroad and this can discourage domestic production for a long time. So, the government should impose more import duties so that importers are discouraged. Furthermore, government should provide cultivable land and infrastructure facilities to those farmers who are encouraged to produce cocoons.

6.4 Research Limitation: The research was made to find out the problem in the supply chain of silk clothing which is responsible for creating low supply and high price. The research couldn't reach a final and precise result but all the primary data and a pilot questionnaire survey report which was provided to the consumers and related authorities found that 65% is the lack of a consistent supply of raw materials, lack of technical support 15% and lack of cultivable is 10% responsible for the gap between demand and supply, and high price. After the content analysis, we found the demand curve and supply curve by both demand and supply analysis it was found that the lack of a consistent supply of raw materials is responsible for creating the gap between demand and supply and also the high price. The limitation of the research is the geographical boundary barrier, visiting all the factories and silk clothing showrooms outside the Rajshahi was not possible. Another limitation is that observing the condition of farmers deeply was not done and collecting data from them by questionnaire and interrogation. For those limitations, the overall manufacturing scenario of silk and its raw materials could not be observed. In short, this research paper does not contain the overall data of all factories in the country, and data that was collected from farmers was not gathered by deep analysis.

Conclusion: In the research paper a lot has happened and done but the summary shows that the silk industry of Bangladesh is not in a stable or growing state because of the lack of supply. From the research using deductive approach and using content analysis it can be seen that the market of 2023 in Bangladesh still holds the demand for silk products and it was also shown in the demand curve as well. But in the supply analysis, it can also be identified that the industry is lacking in the case of the production of cocoon which is the root of preparing silk clothes. And for that, the factories are not getting enough cocoons or guts to manufacture more clothes. This leads to low supply. The research found the core problems behind low cocoon supply as well. As per the data collected from farmers and government authorities it can be said that the lack of technological support, infrastructural support, adequate investment, and also a proper market and market price

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are the key issues for producing enough cocoon. So finally the research states that the silk industry market consists of enough demand for the product but at a low price but the lacks to supply enough raw materials due to technological, infrastructural, and investment. According to the study if the government provides cultivable land and infrastructure facilities to those farmers who are encouraged to produce cocoons than the problem can be solved in the long-term scenario. Then again the main problem in the supply chain of the silk industry is in the manufacturing end and as the root of the chain is having problems that's why the total supply chain of the silk industry is facing issues as well.

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Appendix

Demand Questionnaire

What is your category?

- Housewife (0)
- Job Holder (1)
- Tourists (2)
- Senior Citizen (3)

What is your gender?

- Male (0)
- Female (1)

In terms of purchasing clothes, do you keep them on your preference list?

- Yes (0)
- No (1)

Does the price of silk clothes seem more expensive compared to other clothes?

- Yes (0)
- No (1)

Are you comfortable with the quality of silk clothes?

- Yes (0)
- No (1)

Which of the following do you think is responsible for not purchasing silk clothes?

- Inadequacy of silk clothes (0)
- High Price (1)
- Suspicion about quality (2)
- Lack of new design (3)

Which do you think is responsible for the high price and scarcity of silk clothes?

- Lack of patronization (0)
- Scarcity of production (1)
- Problems in commercialization (2)
- Monopoly Market (3)

What is your preferable marketplace to purchase silk clothes?

- Dhaka (0)
- Rajshahi (1)

Supply Questionnaire

1. Do the farmers get sufficient incentives from the government?

- Yes (0)
- NO (1)

2. What is the significant reason behind the lack of quality and production?

- Consistent supply of raw materials (0)
- Lack of technical support (1)

- Insufficient cultivable land (2)
- Insufficient skilled labor (3)

3. Do you face any challenges in selling the cocoon?

- Yes (0)
- No (1)

4. Are you satisfied with the selling price of cocoons?

- Yes (0)
- NO (1)

5. Do you get any training on productivity?

- Yes (0)
- NO (1)

6. Do the government play a vital role in the adaptation of modern factory?

- Yes (0)
- No (1)

7. Do you think domestic companies are able to fulfill the current market demand?

- Yes (0)
- No (1)

8. Does the silk board take proper initiative for commercialization and price control?

- Yes (0)
- No (1)