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LIVELIHOOD CHALLENGES OF THE MUGA SILK SAREE WEAVING COMMUNITY: A CASE STUDY OF SUALKUCHI, ASSAM (INDIA)

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ABSTRACT

Muga silk, known as the golden thread, has been reared from a peculiar silkworm called *muga* since time immemorial. Muga silk is widely grown in Sualkuchi, renowned as the Manchester of Assam in India, where a large population (weavers) is engaged in the handloom sector. The antique and mesmerising muga products, such as mekhela chadar and saree have occupied the hearts of people from all walks of life, as muga silk products carry unique characteristics. Muga silk of Sualkuchi is a symbol of the fact that centuries change and eras change, but faith remains eternal. However, the cottage industry of Assam in India faces headwinds from global spillovers as well as the protracted and intensified COVID-19 pandemic due to the informal nature of the muga silk sector. Rises in temperature and humidity are major threats to the muga silkworm in the future due to climate change and anthropogenic disturbances across the globe. The development of the Sualkuchi muga silk saree weaving community is the future, not the past; its solution

is self-reliance. The cultural and heritage story of the muga silk saree of Assam should be restored by every possible means; otherwise, everything of Sualkuchi will be at stake.

KEYWORDS Sualkuchi, Climate Change, Geographical Indications, Sericulture, Livelihood.

RESUMEN *Retos para la Subsistencia de la Comunidad Tejedora de Seda Muga: un Estudio de Caso de Sualkuchi, Assam (India)*

La seda Muga, conocida como el hilo dorado, se ha extraído desde tiempos inmemoriales de un peculiar gusano de seda llamado *muga*. Se cultiva en gran medida en Sualkuchi, conocido como el Manchester de Assam en India, donde una gran parte de la población tejedora se dedica al sector de los telares. Los antiquísimos y maravillosos productos de muga, como los mekhela chadar o los saris, tienen un lugar en los corazones de la gente en distintos ámbitos de la vida, ya que los productos de seda muga cuentan con unas características únicas. La seda muga de Sualkuchi representa que, pese a los cambios a través de siglos y épocas, la fe permanece eterna. Sin embargo, la industria artesanal de Assam en India se enfrenta a retos globales, así como los efectos prolongados e intensificados de la COVID-19 debido al carácter informal de la industria de la seda muga. La subida de las temperaturas y la humedad son las mayores amenazas a las que se enfrentarán los gusanos de seda muga en el futuro debido al cambio climático y a alteraciones humanas en el medio ambiente. Le evolución de la comunidad tejedora de saris de seda muga de Sualkuchi es el futuro, no el pasado; su solución es la autosuficiencia. La historia cultural y patrimonial de los saris de seda muga de Assam debe ser restaurada a través de todos los medios posibles; de lo contrario, todo estará en riesgo en Sualkuchi.

PALABRAS CLAVE: Sualkuchi; cambio climático; indicaciones geográficas; sericultura; sustento

1. Introduction

A beautiful fabric is the charm of every individual across gender, class, caste, region, and religion (Jamal & Sen, 2018). Silk is renowned as the *queen* of all fabrics available on earth (Varadarajan, 1988). There are several places, such as China and India, popular for weaving silk varieties (Jamal et al., 2022). Sualkuchi is silk heaven, and its sleek product is mekhela chadar (Phukan, 2012). The practice of sericulture and weaving has been followed in Sualkuchi and other parts of Assam, India, since ancient times (Tikader et al., 2013). Sericulture is a good source of income for muga silk weavers, and fulfils their clothing requirements (Kalita, 2022). Half of the population of Sualkuchi village depends on silk weaving for their livelihood (Chakravartty, 2015). Approximately one thousand cocoons are needed and wrapped to prepare one muga silk saree (Saikia et al., 2016). The cost incurred in the preparation of a single muga saree or mekhela chadar is US$6,000 which is more than ₹5 lakh in Indian currency (Directorate of Assam, 2021).

Environmentally, Assam is the only suitable place in the world for all four major varieties of natural silk production, including muga, eri, mulberry, and tussar (Khadria, 1990). Approximately 7,140 hectares of land in Assam are under muga silk cultivation (Ahmed & Saikia, 2022). It is the most expensive among all silks, as the muga silk production is very low, but demand remains very high in domestic and foreign markets throughout the year (Jamal et al., 2022). Over 1.26 million handloom weavers are engaged in over 9.32 million handlooms, and around 2.32 million people's livelihoods are associated with the muga trade as muga farmers, labourers and salespersons (ARTFED, 2019). Caterpillars are required to make cocoons and are in danger of disappearing due to climate change, adverse weather conditions, natural hazards, and anthropogenic activities (Barah et al., 1988). The handloom sector requires a significant transformational and exponential growth in its marketing, development, and livelihoods (Jamal et al., 2020). Free, open, and inclusive development is needed in the Sualkuchi handloom sector of Assam (Singha & Singha, 2020).

Muga silk was given the Geographical Indications (GI) tag in 2007, highlighting its significance as a prominent and precious fabric (Das et al., 2023). GI is given to any product with unique qualities that are attributable to its geographical territory only (Jamal et al., 2021). In this case, authentic muga silk only come from Assam (Singha & Sonowal, 2016). The changing environmental conditions and other anthropogenic factors, such as climate change and pollution, adversely hamper muga silk production (Kiyokawa, 1993). Muga silk is on the verge of extinction by the mid-21st century, and thus, the livelihood of a large section of weavers who depend on it is under threat (Bonia, 2020; Khakhlari, 2020). This study aims to highlight livelihood challenges associated with muga silk cultivation and its subsequent impacts on the dependent population. Introspection in the development of a sustainable model for its survival has been attempted under the umbrella of Sustainable Development Goals (SDGs). In this article we identify and analyse the factors responsible for the decline in muga silk production, its products, and the people involved in it, from the life cycle of silkworms to the end products.

2. Study Area

Assam is located in the northeastern part of India and is famous for varieties of silk cultivation, such as muga, eri, mulberry, and tussar (Baishya, 2016). Sualkuchi is called the silk village of Assam and is also known as Soulkuchi (Bhagabati & Jena, 2023). Sualkuchi is a small village in the Kamrup district (rural), located north of the Brahmaputra River, approximately 35 km from Guwahati in Assam (District Census Handbook, 2011). Sulakuchi village is situated in the Hajo sub-division of Kamrup district, which is 40 km from Amingaon, the district headquarters (Das, 2022).

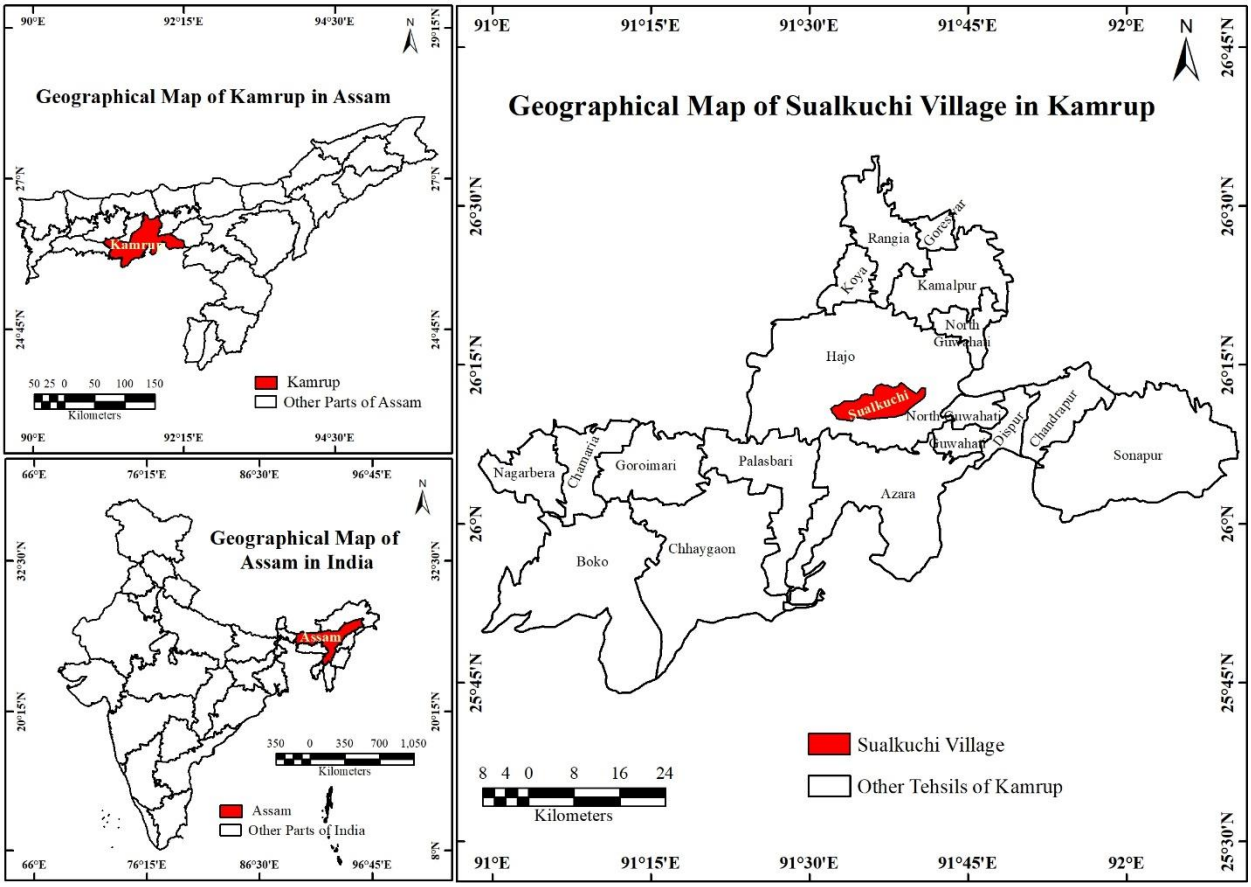

Fig. 1 Prepared by Authors, 2025 (Directorate of Sericulture, 2021)

Previously, the village known as Swarnaudya, then Swarnakuchi, and now, Sualkuchi is the land of unity in religion and work culture (Singh et al., 2022). The weaving tradition in the village can be traced back to the 11th century king Dharma Pal Dynasty (District Census Handbook, 2011). The king sponsored the weavers and brought around 26 families to Sualkuchi from Tantikuchi in the 11th century (Chowdhury, 2019). Presently, 15,000 silk looms are operational in Sualkuchi, most of which are involved in weaving *mekhela chadar* and *gamosa* (Das & Das, 2022). Mekhela chadar is the traditional dress of Assam, which is an inseparable custom of the region (Das et al., 2010). These enriched products are high in demand across the country and foreign markets (Chakravartty & Basumatary, 2018).

3. Database and Research Methodology

This study is based on household surveys and secondary data. A literature review was conducted before initiating the survey, which included government reports, research articles, government

websites, research journals, newspapers, magazines, and others to reach a constructive outcome (Fig. 2). Data from District Census Handbooks, Directorate of Sericulture, Geographical Indications Registry, Government of Assam, Assam Apex Weavers and Artisans Cooperative Federation Ltd., were incorporated to draw a critical evaluation of the study. Other crucial information from the internet was synergised to achieve an inclusive understanding of the study. This helped shape the research and draw a comprehensive conclusion. Data collected through primary and secondary sources were systematically analysed and interpreted accordingly. Statistical tools, such as trend lines, bar diagrams, pie diagrams, radar diagrams, and narratives were represented using a qualitative approach. Results and discussions were done based on the outcome, and suggestions were incorporated.

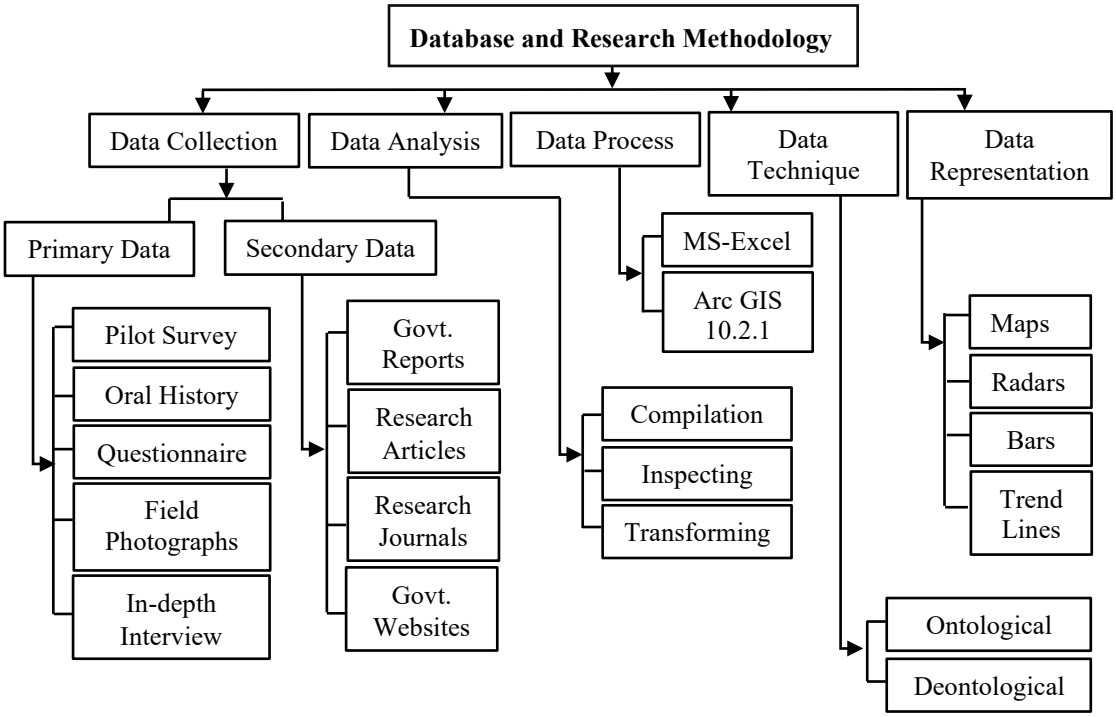

Fig. 2 Database and Research Methodology Chart (Prepared by Authors, 2023)

A household survey was conducted in Sualkuchi using questionnaires and personal interviews with members of the muga silk saree weaving community. In the discussion, it was concluded that their society is gender-neutral, unlike the gender-biased societies found across different parts of India. Snowball sampling was conducted in muga silk clusters of Sualkuchi in Assam in 2023. Primary data, including oral history, were documented through field visits,

participatory observations and snowball samplings[1], while ontological and deontological techniques were used for critical analyses.

Ontological technique states the study of the nature of being, and during the in-depth interview, the living conditions of the muga silk weavers were not good. Muga silk saree weavers were living in pathetic conditions, including being underpaid for their heritage work, and without any social security. However, the government and other agencies claimed many improvements for the weavers, but in reality, they were living precarious lives. The existence of muga silk saree weavers was in danger because they did not have the confidence to stand up and make their voice heard before political leaders. The concept of Geographical Indications (GI) is good, but no big positive changes were observed in the lives of muga silk saree weavers of Sualkuchi. The deontological technique focuses on duty and rules, which muga silk saree weavers of Sualkuchi have been following in preparing the unique mekhela chadar, sarees, and other products for generations. In the data collection process, the weavers mentioned that they were continuing their ancestral work of muga silk saree weaving by their own choice, despite it not being at all a profit-making occupation. Weavers have limited choices in this regard, and they did what they think is right without the fear of losing anything, because, they replied, that they had lost everything already. Muga silk saree weavers of Sualkuchi believed that they were doing their heritage work, which was morally good, and they were also ready to face the consequences in the future. They earned their livelihoods through good means and were kind to everyone, including the interviewers.

An ethnographic study was conducted to understand the ground reality of the continuously changing muga silk saree production, competition, and the bearers of such consequences (weaving community and young generations). Muga silk saree weavers of Sualkuchi faced the biggest competition from counterfeit and duplicate muga silk products, as these products were spoiling markets and compelling weavers to move to other work. The counterfeit muga silk products had penetrated into the domestic markets, and it became difficult to track, trace, and catch the group running the counterfeit system. These weavers did not have the logistical support and infrastructure to stop the sale and purchase of counterfeit muga silk products. However, the demand for original

[1] Snowball sampling is called a chain-referral or non-probability sampling technique, where existing study participants assist recruiting future participants from their social network. This allows us to reach inaccessible communities due to several reasons, including mistrust, privacy issue, and marginalised populations being studied.

and antique muga silk products is still high in the market, but the range of the demand has shrunk over the years.

4. Results and Discussions

The people of Assam are highly industrious and are known for their consistent and disciplined work. The Ahom kingdom of undivided Assam has adorned muga silk products for centuries. Muga silk is the pride of Assam, but the income and profit from its production, processing, distribution, and sale are very low. The Geographical Indications (GI) tag was given to muga silk of Assam in 2007, but weavers and farmers believe that the GI tag did not contribute much to the production and distribution of authentic muga silk. According to their calculations, the muga silkworm is on the verge of extinction due to frequent turbulence in weather conditions during their breeding season over the years. If this turbulence continues in the future, the muga silkworm will be extinct in Sualkuchi by 2050. Hence, there is an urgent need to take appropriate steps for the preservation, protection, and conservation of muga silkworms, and their habitat (Bhattacharyya & Goswami, 2015).

a. Process Involved in Muga Silk Production

Rearing silkworm or silk farming, called sericulture, requires a certain skill and patience. Muga silk is reared in the open air, where farmers protect the larvae by continuously shooting to keep away birds, owls, bats, and other predators from the Som trees. Farmers keep a watchful eye to ensure that silk moths form the cocoons needed to make muga silk. After one or two months, weavers bring down these silkworms from Sualu and Som trees with the leaves to further silk production. Muga is produced from the cocoons of *Antheraea Assamensis*, which is found only in Assam. Antheraea Assamensis moth eggs, called seeds, are laid on the leaves of Som trees for hatching. Muga is a hollow metabolic insect that passes through four stages: egg, larva, cocoon or pupa, and moth. These trees are ready for sericulture after four to five years of plantation. Muga silk production process is semi-wild and semi-domesticated. In the wild process, the life cycle of silkworms begins from seed cocoons, where moths develop inside cocoons. This takes 18-20 days for a moth to develop fully inside the cocoon, and it emerges from the cocoon as a full-fledged moth ready for mating (Kumaresan, 2002).

To spin cocoons, the female butterflies are hung on the dry leaves of aromatic Sualu and Som trees, called talli by the weavers, for the male butterflies to mate with them. Artisans select 2 female silk moths after they have matured and tie them vertically on a wooden stick. Later, male silk moths are tied to female silk moths for further breeding. Later, the females start laying eggs after 10 to 15 hours and continue for 3 days and die. A female can lay more than 100 eggs in a life cycle of three days. These eggs mature into larvae in a couple of days; these larvae continue feeding on Sualu leaves and Som trees and mature into silkworms. This process takes around 8-10 days for the larvae to emerge after breaking the eggshell. The tiny worms immediately crawl up the leaves to begin feeding. They grow rapidly, eat swiftly, and reach 30 mm in length after 4–5 weeks. Silkworms change their skin four times during that time, and they eat more vigorously in the last stage of their lifecycle (Das, 2020).

b. What Makes Muga Unique

Muga silk of Assam reached its peak under the Ahom dynasty rulers, who ruled Assam for more than 600 years. During that time, people paid taxes of muga cloth to the Ahom kings. At least one or more bundles of golden muga silk were given annually as a tribute to the king. The successive kings made it compulsory for every adult to regularly weave and spin a certain quantity of muga silk yarn for the sustainability of the region. Muga silk was luxurious, and only the royal and noble families of Assam could afford it. The silk is grown in the high altitudes of Assam. Muga silk is the pride of Assam, and is the rarest of the rare silks produced in India. Silk moths are pure and sensitive, and they cannot survive even the slightest change in their habitat. Garments prepared from muga outlast other fibers because it is the unique silk of Assam. Muga silk products are passed from one generation to another. Mekhela chadar made of muga silk is a must during the Rongali Bihu dance, which is the most popular dance in Assam. Mekhela chadar is worn on several occasions, such as festivals, pujas, parties, and marriages.

Mahatma Gandhi visited Sualkuchi in 1946 and was impressed as well as surprised by the rich art and culture of Assam. Here, Assamese women weave the golden thread and khadi to make India *Atmanirbhar* (self-dependent). Female weavers, locally called *hippini* weave several fairy tales on their looms (Saikia, 2011). The description of Sualkuchi village is evident in Kautilya's *Arthasastra*. The excellent handloom works of Sualkuchi village are now compared with those of several metropolitan cities and towns across the world. When tourists visit Assam, they try to buy

at least some muga silk products; this is the beauty of Sualkuchi. Buying muga products from their source ensures their quality and authenticity, rather than from other metropolitan cities. Muga silk is the future and can last for more than a hundred years if handled with care. In Assam, without muga, any festival or marriage is impossible, as it is a sacred and indispensable part of Assamese culture. Many colours of tribal life have appeared in fashion through muga silk products, which are an integral part of invaluable treasures of Assam. These are woven with gold borders, hence called golden threads. If the human body is covered with muga silk, the intensity of harmful effects of ultraviolet (UV) rays will be reduced by 85%. Muga silk provides extra protection from sunlight to the skin. Muga silk rearers collect seeds, await moth emergence, and work in gardens of Som trees from dusk to dawn. The most expensive muga silks are derived from the mid-hatched cocoons, as the silks are torn and can be turned into continuous threads. Muga silk production is very low compared to other silks, such as tussar, eri, and mulberry, which results in its higher price (Tiwari et al., 2023).

c. Socioeconomic Profile

Sualkuchi is renowned as the hub of golden thread and the silk village of Assam. The literacy rate in Sualkuchi is quite good, with 88% of males and 75% of females literate, which is better than the state-level literacy rate (Fig. 3).[2] The same positive indication is seen in the sex ratio, which is 1001 females per 1000 males in Sualkuchi (Fig. 4). Most farmers and weavers use handlooms to produce muga silk saree or mekhela chadar, accounting for 59%, and the remaining 41% use power looms for the same (Fig. 5; District Census Handbook, 2011). Handlooms have been used for ages, but the power loom is new with the aim of boosting production on a large scale. The main season of muga silk production is autumn, which accounts for 62% of the total silk production, followed by spring, summer, and winter (Fig. 6). Autumn is the best and the most desirable season for muga silk production (Field Survey, 2023).

[2] National literacy rate: 84.7% for males and 70.3% for females (2023).

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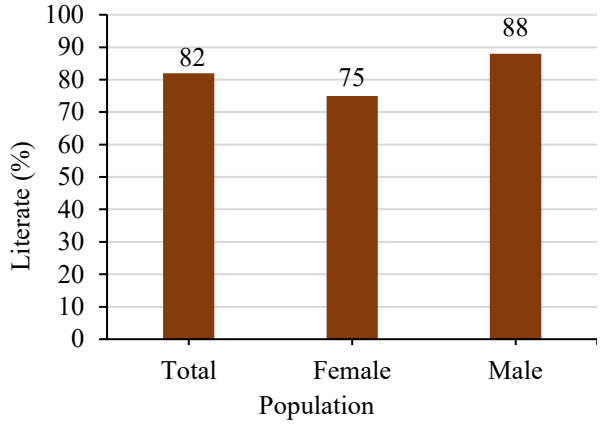


Fig. 3 Literacy Rate in Sualkuchi (Field Survey, 2023)

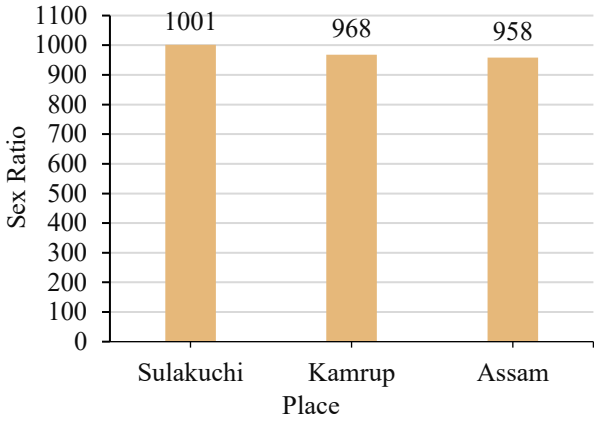


Fig. 4 Sex Ratio, 2011 (District Census Handbook, 2011)

Handloom weaving has been a vital part of the socioeconomic life of the Assamese for ages. Farmers and weavers locally called tanti, are shifting their ancestral work of muga silk saree weaving to Banarasi Brocades saree weaving (Fig. 7). All weavers, including those of muga silk saree and Banarasi Brocades saree, are in a financial crisis because they always face difficulties to obtain hard cash. Banks do not help by providing them with hassle-free loan because they belong to the informal sector of the economy and cannot give anything as collateral to the banks (Fig. 8).

The handloom industry of Assam is the oldest and the biggest cottage industry in Assam, which is locally called *tat haal*. In Sualkuchi, approximately 90% of the *tanti* are from the younger generation, which depicts the attraction of the muga products. Customers from all over India, including Delhi, Mumbai, Chennai, Kolkata, and Hyderabad, visit Sualkuchi village and purchase muga silk products. Approximately 50% of these products are exported to foreign countries, including the Middle East, Europe, and Oceania (Unni et al., 2008).

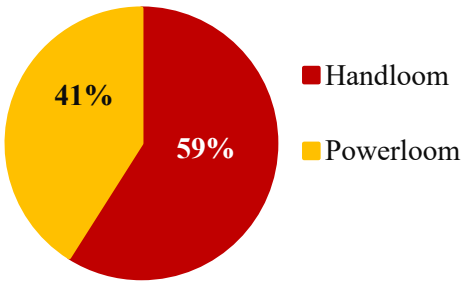


Fig. 5 Mode of Production (Field Survey, 2023)

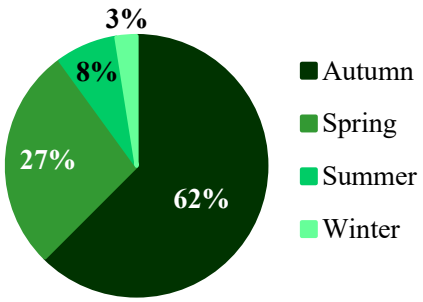


Fig. 6 Season of Production (Field Survey, 2023)

Female farmers and weavers rarely take loans from formal institutions, such as scheduled commercial and cooperative banks. The muga silk industry turnover has crossed $25 million (₹200 crores) annually, but the condition of muga silk weavers and farmers is deteriorating day by day. For the last 20 years, Sualkuchi weavers have been helpless in producing adequate natural muga silk cocoons. The supply of artificial cocoons from Bengaluru substitutes the rich muga silk cocoons due to their cheap and easy availability in the market. These factors have created a grave situation for the muga silk industry of Sualkuchi. If this trend continues, the intangible cultural heritage of Assam muga silk will lose its glory (Field Survey, 2023).

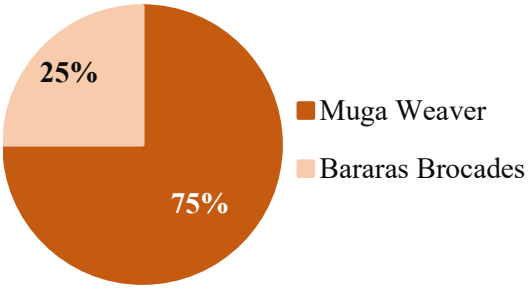


Fig. 7 Migration of Muga Community (Field Survey, 2023)

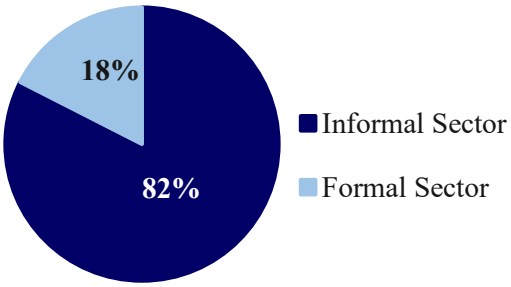


Fig. 8 Provision of Loan (Field Survey, 2023)

The heritage and pride of muga silk weavers are on the verge of extinction due to the penetration of cheap, counterfeit silks from other states or regions. Therefore, weavers are looking for other alternatives and diversification of their muga silk products to ensure their livelihoods are sustainable (Fig. 9). Incessant and unprecedented use of pesticides in Sualkuchi silk gardens is another factor responsible for the extinction of muga cocoons (Fig. 10). Pesticides affect the immune system and physiology of silkworms, which later affects the silk fiber generation. Sustaining livelihood is needed to preserve and protect the rich heritage, culture, and rural economy, and the lives of people who directly and indirectly dependent on muga silk cultivation (Field Survey, 2023).

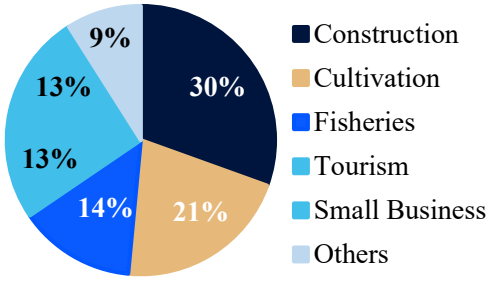


Fig. 9 Secondary Source of Livelihood (Field Survey, 2023)

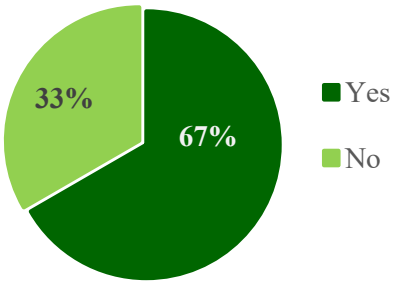


Fig. 10 Use of Pesticides (Field Survey, 2023)

d. Preparation of Muga Silk Mekhela Chadar, Sarees, and others

Muga is renowned as the golden silk of Assam. Different kinds of weaves, motifs, and designs can be observed on the muga silk products. The price of muga silk products ranges from hundreds to thousands ($) and even more. The woven motifs are first drawn on graph paper using a pen or pencil. Afterwards, several holes are punched along the lines on the rectangular cardboards to obtain the desired paper design. The punched cards are hung over the Jacquard handloom, which is fixed at the top of the loom. The punched cards are reeled through threads and then inserted into the Jacquard handloom. The cards automatically roll down the looms, and the required design is woven into the threads of the looms. A natural dyeing process is another vital step in the preparation and production of muga silk saree and chadar. (Saikia et al., 2022).

Initially, the skill of weaving a muga saree was considered the main criterion for the marriage of a young girl. This is why weaving in Assam is a way of life rather than a source of income. Traditionally, in Assam, muga silk is used to prepare *mekhela chadar*, equivalent to saree for girls, and kurtas for boys. These (sarees and kurtas) are considered the most sophisticated attire in Assam. Assamese women often wear mekhela chadar, a long flowing skirt up to the ankles called mekhela, and the upper garment is called reha. The red colour pattern at the end of reha is symbolic and graceful. Several designs are woven on the border of mekhela and reha as per market demand. After completing all works, these sarees are sold in markets across the country (Padaki et al., 2014). [3]

Mekhela chadars are available in multiple colours, such as grey, blue, red, white, purple, black, and peacock. The quality of muga silk products is unparalleled because the tanti of Sualkuchi feel the product in weaving the muga products. Tanti charged $15-80 (₹1000–₹6000) to prepare one mekhela chadar, which depends on the work and design being woven into it. The price of silk products prepared in Sualkuchi is higher than in any across India, as its quality is better than that of other places. Tantis know that no fashion can replace the rich tradition of muga silk products. Sualkuchi weavers are now learning new techniques of weaving to excel in weaving and enhance muga silk products in all possible ways. Additionally, Sualkuchi will explore new

[3] Reha is a long, scarf-like cloth made of muga silk that forms a part of a three-piece attire. Reha is worn over the Mekha and Chador.

avenues in muga silk products that will empower tantis more economically and financially. (Neog et al., 2010).

e. Effects of Climate Change

Muga silk cultivation is currently facing a survival threat in Sualkuchi village, Kamrup district, Assam. The silkworm requires an average temperature of 30–35 °C and humidity of 85%–90% to flourish. Silkworms have started dying due to increased humidity and temperature in the last couple of years, causing an increase in the frequency and intensity of heat waves (Fig. 11 and 12). Important districts, such as Morigaon, Kamrup, Nalbari, Dhemaji, Lakhimpur, Karimganj, and Hailakandi, have suffered huge losses in muga silk production due to climate change (Guha et al., 2019).

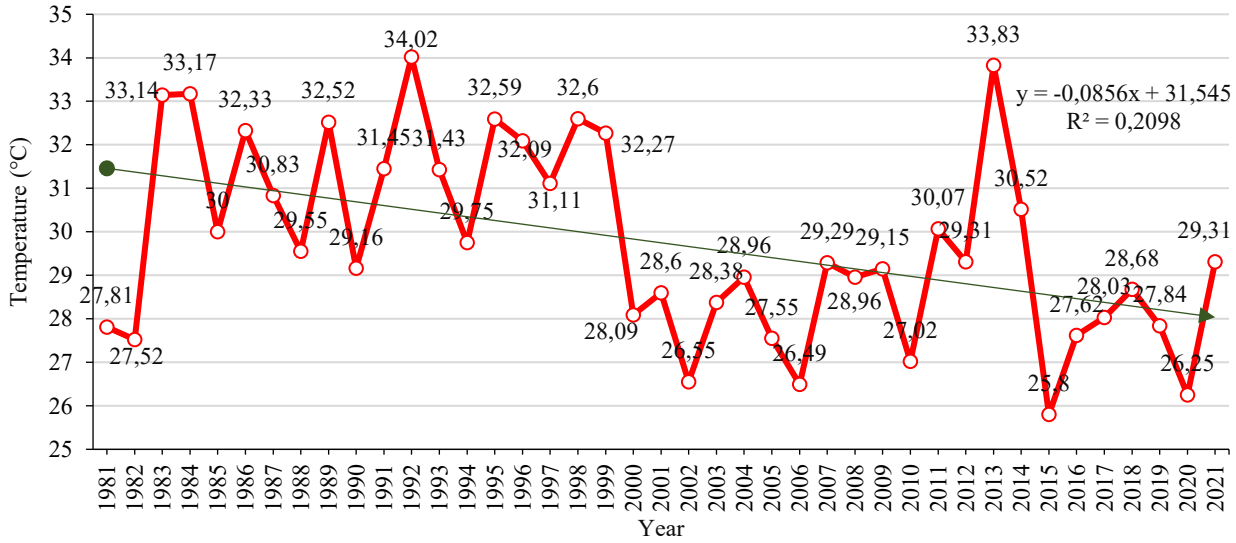


Fig. 11 Annual Temperature Range in Sualkuchi Village from 1981–2021 (National Aeronautics and Space Administration (NASA), 20223 and Prepared by Authors, 2023)

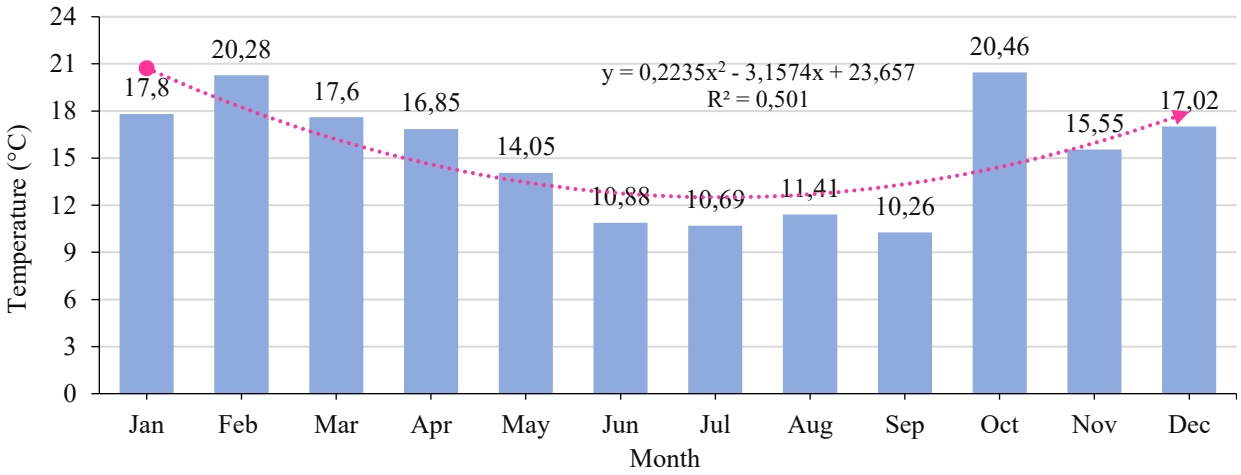
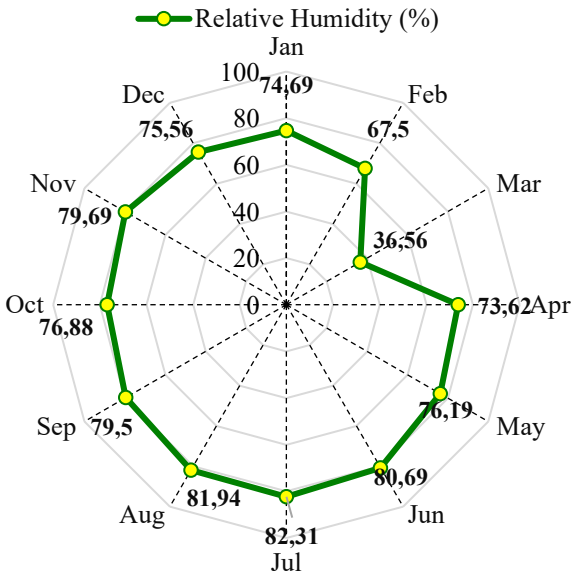


Fig. 12 Monthly Temperature Range in Sualkuchi Village, 2021 (National Aeronautics and Space Administration (NASA), 2023 and Prepared by Authors, 2023)

The relative humidity in Sualkuchi village ranges from 75% to 90%, and the specific humidity ranges from 18 g/kg to 32 g/kg (Fig. 13). The ideal physical condition for silk cultivation requires a temperature of 6 °C in winter and 40 °C in summer. These conditions rarely prevail in muga silk-growing areas for a long time due to the adverse effects of climate change. Farmers delayed the rearing of muga silk moths for 15–20 days to avoid their death in high temperatures over the years. Changes in humidity and temperature above normal, can cause multiple diseases, such as *phutuka, flacherie*, and *grasseriel*, which wipe out the entire lot of silkworms. All the muga silkworm-growing areas are struggling and facing existential crises due to climate change and will be completely lost by 2050.



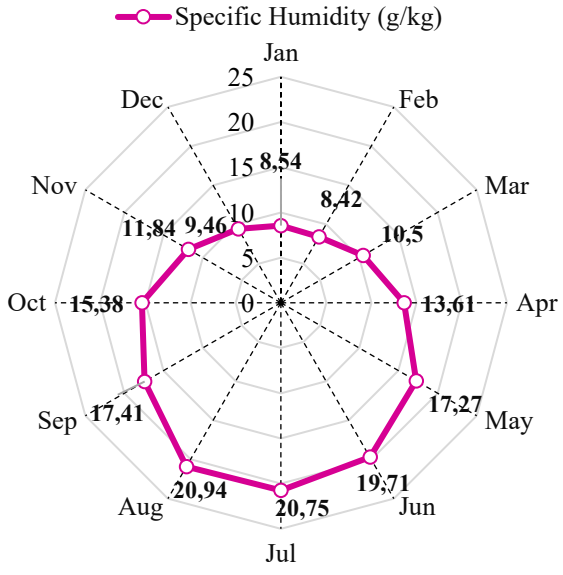


Fig. 13 Monthly Relative Humidity and Specific Humidity in Sualkuchi, 2021 (NASA, 2023 and Prepared by Authors, 2023)

Another effect of climate change is high intensity of rainfall for a very short period of time. This phenomenon indicates a sudden flood-like situation in the Sualkuchi muga silk-growing area (Fig. 14). Drought and flood-like situations are harmful to cocoon rearing. Heavy to very heavy rainfall in July is quite common in Sualkuchi, which leads to complete cocoon damage (Fig. 15). Inundation of the entire muga silk cluster disrupts the support system for the rapid recovery of the matured moth, which is ready for mating and the subsequent laying and hatching of the female moth. This causes disruption in completing the cycle and reproduction capacity of the female moth, resulting in a large-scale drop in muga silk production.

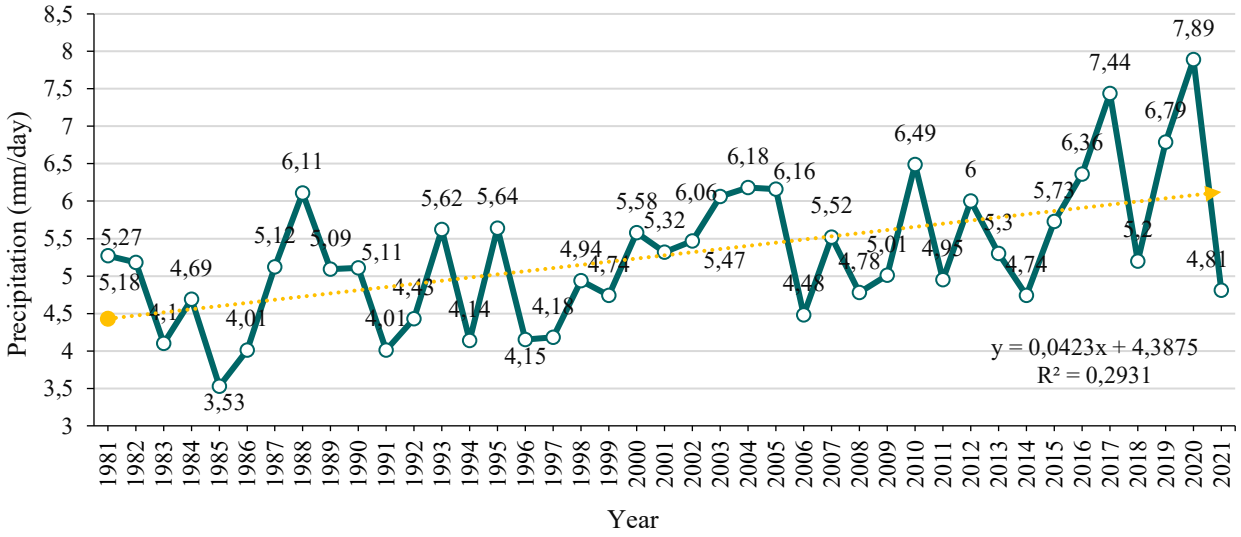


Fig. 14 Annual Precipitation in Sualkuchi from 1981–2021 (National Aeronautics and Space Administration (NASA), 2023 and Prepared by Authors, 2023)

Muga silk production is no longer a profitable venture in Sualkuchi village of Assam, as farmers cannot produce muga silk without caterpillars. *Phutuka* is locally known as phutka rog (disease). The required number of laboratories to test, track and treat the spread of phutka rog (disease) is lacking due to the shortage of medical infrastructure. People are less aware of the spread of phutka rog, which results in complete damage to a large chunk of muga silk production in Sualkuchi village (Paul, 2017).

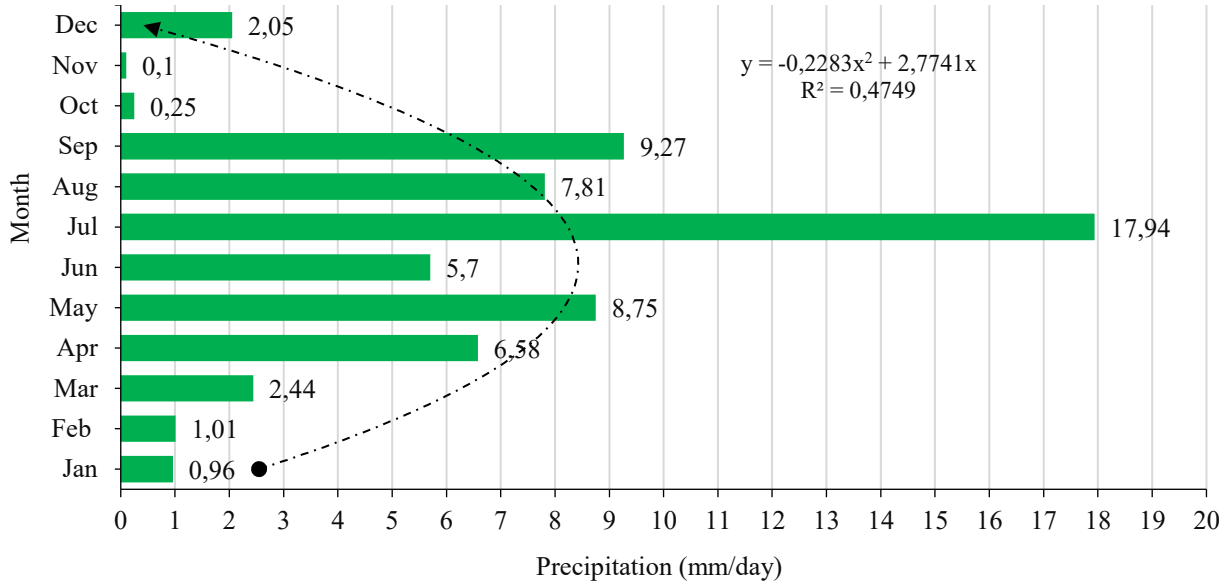


Fig. 15 Monthly Precipitation in Sualkuchi, 2021 (National Aeronautics and Space Administration (NASA), 2023 and Prepared by Authors, 2023)

f. Challenges for Muga Silk

Farmers purchase seed cocoons at a high price from different parts of Assam due to the unavailability of good-quality muga seeds. A large number of artisans are needed to rear muga silk. Not all cocoons are suitable for muga silk preparation, as only hatched cocoons are suitable for muga silk preparation. Most eggs are not fertilised properly, resulting in poor quality due to global warming. Shortage of raw materials leading to the shutdown of several karkhanas (weaving areas). The labour and expenses required in the preparation of the muga silk increase the price per saree. Both weavers and rearers are facing a loss because their wages have remained the same over the last decade. However, the price of cocoons and muga silk sarees has increased by more than 50% during that period. Modern power looms are replacing century-old traditional handlooms due to the frequent interruption in supply of raw materials for handlooms (Jamal & Hazarika, 2020). The tantis of Sualkuchi village have raised grave concerns over the introduction of mechanised looms for more production in less time. At present, almost 40% of the tantis are compelled to use modern looms because they are left with no other option to support their livelihood. Muga silk production has gradually decreased over the years due to climate change and the lack of opportunities in the cottage industry. In a true sense, the tantis of Sualkuchi have not benefitted much in employment and economic sustainability even after the Geographical Indications (GI)

granted to muga silk in 2007. Many customers have been attracted to Banarasi Brocades and sarees as a substitute for muga silk sarees because Banarasi sarees are cheaper and have a higher glaze than muga sarees. Banarasi sarees are approximately 30% cheaper than muga silk sarees, such that a Banarasi saree costs $115 (₹10,000), and a muga saree costs $150-$160 (₹13,000-₹14,000) (Jamal and Sen, 2022).

g. Role of Government

Muga silk suffered a major setback due to the penetration of domestic and foreign cheap silks in the local markets of Assam. In many cases, fabricated and counterfeit silks were sold in the name of the original muga silk. Recently, an immense protest was held in Sualkuchi village of Assam, forcing the local government to take necessary steps to stop the sale of fabricated and counterfeit muga silk. Although the government seal that differentiates pure muga silk from other silks is partially successful, the government scheme, such as *Vocal for local and local to global* is the correct step to show faith in muga silk artisans and empower them for their product diversification (Jamal, 2023b). The government has designated Geographical Indications (GI) tag/certificate to muga silk of Assam. The GI tag is given to combat the rise of duplicate muga silk production and its introduction in local markets of Assam at a cheaper rate (Fig. 16 and 17).

Fig. 16 Muga Silk of Assam Logo (Geographical Indications (GI) Registry, 2023)

Invaluable Treasures of Incredible India

Fig. 17 India's GI logo and Tagline (Department of Industrial Policy and Promotion, 2023)

Former President of India, Dr. A.P.J. Abdul Kalam, visited Sualkuchi on 17 October 2006 and appreciated the world-class embroidery work of Sualkuchi village. This includes craftsmen, weavers, farmers, and cooperative societies working day and night to make the muga silk products better. Dr. Kalam said that if a hundred villages like Sualkuchi were developed in different parts of India, the unemployment problem would be solved within a year. All muga silk farmers and weavers support environmental conservation efforts, including the promotion of organic farming

instead of chemical farming to protect muga silkworms. They have taken several steps to restore this millennium-old intangible culture of India (Jamal, 2023a).

The government has taken steps to ensure a regular supply of raw materials at a cheaper rate to encourage muga silk weavers and save traditional handlooms. However, a cloth bank is required to ensure the production and sale of golden thread products. The government should take the lead role and formalise all the tantis in Sualkuchi village, which would attract many hippinis to choose muga silk weaving as their primary source of livelihood. Consequently, weaver shortage problem would be solved, and the living standards of muga silk tantis and muga silk production would be improved (Das, 2021).

5. Suggestions and Recommendations

Cross-breeding of muga silk races using eco-friendly techniques will strengthen silkworm resistance. The first step is to identify different races of silkworms. Afterwards, cross-breeding should be done without harming, either the environment or the species. Identification of the government-approved, wild silk species will increase silk production several times, but this is quite risky. Several people, including scientists and researchers, are searching for wild silkworm species, which are believed to be found in dense forests between Assam, and Manipur borders of Northeast India. If cross-breeding between the two species becomes successful, the offspring will adapt to the adverse environment of the region over the years. This cross-breeding will ensure better silkworm quality and bumper production without any fear of disease spread. However, complete checks and balances are required in the monitoring of such silkworm species because there are many chances of its misuse.

6. Conclusion

Sualkuchi is a craft centre for golden silk weaving, which is antique and unique to Assam. Farmers and weavers of Sualkuchi village have been engaged in muga silk production and its unique products for generations. These farmers and weavers are the greatest assets in preserving and protecting the invaluable treasures of Assam. They are highly dedicated to exhibiting their invaluable art and unique culture to the outside world. Ironically these farmers and weavers are living miserable lives despite several efforts of the government. The resurgence of the Sualkuchi

cottage industry is possible through good governance and strong political will. It is high time to think and do whatever is possible to improve the living conditions of muga silk artisans and ensure their sustainability. The Assam government is taking every possible step, such as providing subsidies on raw materials and arranging training workshops for skill enhancement. Other stakeholders are identifying new areas of cooperation, guidance, and vision for future collaboration with business entities. Muga silk saree diversification, exhibitions at regular intervals, demand-driven markets, training, and awareness programs will hopefully resurrect the muga silk sector once again.

WORKS CITED

AHMED, M. & SAIKIA, J. P. (2022) A Novel Activated Charcoal Based Wash to Make Muga Silk Shiny. *Journal of Natural Fibers*: 1–9. https://doi.org/10.1080/15440478.2022.2145407

ASSAM APEX WEAVERS AND ARTISANS COOPERATIVE FEDERATION LTD. (ARTFED) (2019) ARTFED an Apex Level Society. *Government of Assam: Handloom Textiles & Sericulture*, https://artfed.assam.gov.in/how-to/artfed-an-apex-level-society

BAISHYA, M. (2016) A Study on Educational and Vocational Status of Women Weavers with Special Reference to Sualkuchi Block, Kamrup District, Assam, India. *International Journal of Research in Engineering, IT and Social Sciences*, Vol. 06 (06): 26–30. www.indusedu.org

BARAH, A. GOSWAMI, M. & SAMSON, M. V. (1988) Sex Association in the Double Cocoons of Muga Silkworm, Antheraea Assama Ww. Current Science, *Current Science Association*, Vol. 57 (11): 623–624. https://www.jstor.org/stable/24091695

BHAGABATI, S. & JENA, S. K. (2023) Sustainable Women Entrepreneurship: A Study on Muga Silk Entrepreneurs in Sualkuchi Village of Assam. *SROTASWINI*, Vol. VI: 22–41.

BHATTACHARYYA, M. & GOSWAMI, C. (2015) Muga Industry—A Pride of Assam: An Estimation of Employment Generation, Kamrup District. *Space and Culture*, Vol. 3 (2): 45–53. http://creativecommons.org/licenses/by/2.0

BONIA, B. (2020) Muga Silk Rearers: A Field Study of Lakhimpur District of Assam. *International Journal of Scientific & Technology Research*, Vol. 9 (04): 700–704. www.ijstr.org

CHAKRAVARTTY, P. (2015) Pat-Muga Industry as a Source of Women Empowerment in Rural Areas of Kamrup District of Assam. *Indian Journal of Applied Research*, Vol. 5 (10): 278–280.

CHAKRAVARTTY, P. & BASUMATARY, K. (2018) Sualkuchi Village of Assam: The Country of Golden Thread. *Journal of Business and Management (IOSR-JBM)*, Vol. 20 (3) Ver. VI: 12–16. www.iosrjournals.org

CHOWDHURY, N. (2019) Socio-Economic Problems of Muga Silk Weavers of Sualkuchi Silk Industry. *International Journal of Scientific & Technology Research*, Vol. 8 (09): 595–601. www.ijstr.org

DAS, B. PADAKI, N. & DAS, S. (2010) Preparation and Processing of Muga Silk. Tekstilna industrija, Broj 4: 12–20.

DAS, N. (2021) Traditional Muga Silk (Antheraea assamensis) Rearing as a Means of Rural Livelihood and Conservation Efforts among the Indigenous Communities of Assam. *International Journal of Advances in Agricultural Science and Technology*, Vol. 8 (7): 55–68. https://doi.org/10.47856/ijaast.2021.v08i7.007

DAS, N. (2022) Geographical Indication (GI) as a Means of Craft Tourism: A Case of Muga Silk in Assam, India. *Revista Brasileira de Ecoturismo, São Paulo*, ago-out, Vol. 15 (4): 802–808.

DAS, P. and DAS, R. (2022) Sualkuchi: The Manchester of Assam and its Uncertain Future. *International Journal of Scientific Development and Research (IJSDR)*, Vol. 7 (8): 1–3. www.ijsdr.org

DAS, P. SAIKIA, M. & NEOG, D. (2023) Effect of Climate Change on Eri and Muga Cultivation and the Resultant Impact on Rural Income and Employment in Assam. *Journal of Livestock Science*, Vol. 14: 135–147. https://doi.org/10.33259/JLivestSci.2023.135-147

DAS, S. (2020) Effect of Drying on Tensile Properties and Structure of Tasar and Muga Silk. *Indian Journal of Fibre & Textile Research*, Vol. 45: 211–214.

DIRECTORATE OF SERICULTURE. (2021) Government of Assam: Handloom Textiles & Sericulture, https://sericulture.assam.gov.in/

DISTRICT CENSUS HANDBOOK[1]. (2011) Sericulture. Census of India: Assam, Village and Town Directory: Kamrup, Series 19, Part XII-A, 9–19.

DISTRICT CENSUS HANDBOOK[2]. (2011) Weaving industry at Sualkuchi. Census of India: Assam, Village and Town Directory: Kamrup, Series 19, Part XII-B.

GOVERNMENT OF ASSAM. (2023) Patent Information Centre. *Assam Science Technology and Environment Council*, https://astec.assam.gov.in/portlet-innerpage/patent-information-centre

GEOGRAPHICAL INDICATIONS REGISTRY. (2023) Muga Silk of Assam (Logo- connected with GI-55). *Intellectual Property of India, Patents, Designs and Trademarks, Geographical Indications*, https://search.ipindia.gov.in/GIRPublic/Application/Details/384

GUHA, L. HRIDYA, H. DAS, B. SARKAR, B. N. BHUYAN, N. B. & CHOUDHURY, B. (2019) Analysing the Impact of Climatic Changes on Rearing Performance of Antheraea assamensis (Muga Silk Worm): Study of a Decade. *The 25th International Congress on Sericulture and Silk Industry*.

JAMAL, S. (2023a) Importance of Geographical Indications in Enhancing the Indigenous Economy: A Case Study of Darjeeling Tea, West Bengal, India hosted by *World Congress on Food Science and Technology, Paris, France*, https://doi.org/10.13140/RG.2.2.32649.83047

JAMAL, S. (2023b) Impact of COVID-19 and Nationwide Lockdown on Informal Handicraft Artisans: A Review from Varanasi hosted by Development Studies Association (DSA), *University College London (UCL),* Online International Conference on the Theme Just Sustainable Future in an Urbanising and Mobile World, https://doi.org/10.13140/RG.2.2.15872.61448

JAMAL, S. & SEN, A. (2018) Decline in the Handloom Cottage Industry: A Case Study of Handloom Bunkars of Varanasi. *The Geographer*, Vol. 65 (2): 128–136. https://doi.org/10.5281/zenodo.8218978

JAMAL, S. & SEN, A. (2022) Creative Cultural Economy in the Era of COVID-19: An Analysis of Handicrafts from India and South Korea. *Third Concept: An International Journal of Ideas-Third Concept*, Vol. 36 (421): 172–187. https://doi.org/10.5281/zenodo.8219075

JAMAL, S. & HAZARIKA, R. (2020) Unexplored Built Heritage: Traditional Weaving Community, Varanasi. *Journal of the Social Sciences*, Vol. 48 (4): 1257–1265. https://doi.org/10.5281/zenodo.8218892

JAMAL, S. HAZARIKA, R. & SEN, A. (2020) Household Morphology of Varanasi Weavers. *International Journal of Scientific & Technology Research*, Vol. 9 (02): 3783–3787. https://doi.org/10.5281/zenodo.8218951

JAMAL, S. UPADHYAY, A. & BAJAJ, A. (2022). Judima the Traditional Rice Wine and Dimasa Community: A Geographical Review of Dima Hasao. *Indialogs*, Vol. 9: 77–97. https://doi.org/10.5565/rev/indialogs.205

JAMAL, S. UPADHYAY, A. & DUA, R. (2021) Indigenous People and Changing Socio-Cultural Behavior: A Case Study of Toto Tribes, Totopara. *Sustainability, Agriculture, Food and Environmental Research (SAFER)*, Vol. 9 (3): 369–392. https://doi.org/10.7770/safer-V9N3-art2286

KALITA, P. (2022) Role of Muga Silk-Gi of Assam in the Sustainable Development of Assam. *International Journal of Law Management & Humanities*, Vol. 5 (6): 588–598. https://doi.org/10.10000/IJLMH.113846

KHADRIA, N. (1990) Traditional Crafts and Occupational Structure of the Assamese Rural Society in the 19th Century. *Social Scientist*, Vol. 18 (11/12): 36–63. http://www.jstor.com/stable/3517150

KHAKHLARI, P. (2020) Silk Products and Marketing Strategy of a Weaving Industry in Assam. *Humanities & Social Sciences Reviews*, Vol. 8: 91–101. https://doi.org/10.18510/hssr.2020.8212

KIYOKAWA, Y. (1993) Possibilities for Producing High Quality Raw Silk and Fostering a Skilled Work Force in the Indian Silk-Reeling Industry. Hitotsubashi Journal of Economics, *Hitotsubashi University*, Vol. 34 (2): 87–109. https://www.jstor.org/stable/43295960

KUMARESAN, P. (2002) Quality Silk Production: Some Economic Issues. *Economic and Political Weekly*, Vol. 37 (39): 4019–4022. https://www.jstor.org/stable/4412661

NEOG, K. SINGH, H. R. UNNI, B. & SAHU, A. K. (2010) Analysis of Genetic Diversity of Muga Silkworm (Antheraea Assamensis, Helfer; Lepidoptera: Saturniidae) Using RAPD-based Molecular Markers. *African Journal of Biotechnology*, Vol. 9 (12): 1746–1752. http://www.academicjournals.org/AJB

PHUKAN, R. (2012) Muga Silk Industry of Assam in Historical Perspectives. *Global Journal of Human Social Science History & Anthropology, Global Journals Inc. (USA)*, Vol. 12 (9): 5–8.

PADAKI, P. V. BHATTACHARYA, A. DAS, B. CHOUDHURY, B. MISHRA. S. N. & SINGH, B. K. (2014) Studies on the Influence of Seasonal and Regional Aspects on the Quality of Muga Silk. *Research Journal of Textile and Apparel*, Vol. 18 (1): 25–30.

PAUL, A. (2017) Sustainable Livelihood through Muga Silk Cultivation by Muga Farmers of Upper Assam-A Study of Problems or Constraints. *Journal of Advance Management Research*, Vol. 05 (03): 46–62. http://www.jamrpublication.com

SAIKIA, J. N. (2011) Supply Chain Linkages and Constraints in Natural Silk Sector of Assam: A Study of Muga and Eri Silk. *International Journal of Multidisciplinary Management Studies*, Vol. 1 (3): 176–194. http://zenithresearch.org.in/

SAIKIA, M. GHOSH, M. RICHARD S. & PEIGLER, R. S. (2016) Factors Affecting on Quality Muga Silkworm (Antheraea Assamensis Helfer) Seed Crop Production: A Review. *Journal of Entomology and Zoology Studies*, Vol. 4 (6): 806–810. www.entomolijournal.com

SAIKIA, S. BORA, N. & SAIKIA, M. (2022) Recent Advances and Innovations in Muga Silk Industry. *Just Agriculture*, Vol. 2 (5): 1–5. www.justagriculture.in

SINGHA, A. & SONOWAL, P. (2016) An Importance of Muga Silkworm (Antheraea Assama Ww.) Seed Crops. J. Exp. Zool. *India*, Vol. 19 (1): 1215–1217. www.connectjournals.com/jez

SINGHA, R. & SINGHA, S. (2020) Women's Empowerment through the Silk Industry of Assam, India, and its Underlying Economy. *Journal of International Women's Studies*, Vol. 21 (5): 9–31. https://vc.bridgew.edu/jiws/vol21/iss5/3

SINGH, S. JIGYASU, D. K. SUBRAHMANYAM, G. SANGANNAVAR, P, KUMAR, K. CHOUDHURY, B. N. LUIKHAM, REETA & VIJAYAKUMARI, K. M. (2022) Conservation of Muga Silkworm, Antheraea Assamensis Helfer in the Natural Habitats at Different Geographical Location. *Plant Archives*, Vol. 22 (Special Issue): 230–239. https://doi.org/10.51470

TIKADER, A. VIJAYAN, K. & SARATCHANDRA, B. (2013) Muga Silkworm, Antheraea Assamensis (Lepidoptera: Saturniidae) – An Overview of Distribution, Biology and Breeding. *Eur. J. Entomol.*, Vol. 110 (2): 293–300. http://www.eje.cz/pdfs/110/2/293

TIWARI, S. ROSAK-SZYROCKA, J. BHARALI, D. AKOIJAM, S. L.S. & BINOY T. A. (2023) Demystifying the Sustainable Competitive Advantage of Sualkuchi Silk Products: Perspectives of Buyers and Sellers. *Sustainability*, Vol. 15: 1–21. https://doi.org/10.3390/su15021110

UNNI, B. G. BORA, U. SINGH, H. R. DILEEP, B. S. DEVI, B. WANN, S. B. BORA, A. BHAU, B. S. NEOG, K. & CHAKRAVORTY, R. (2008) High Yield and Quality Silk Fibre Production by Muga Silkworm, Antheraea Assama through Application of Plant Growth Promoting Rhizobacteria. Current Science, *Current Science Association*, Vol. 94 (6): 768–774. https://www.jstor.org/stable/24100631

VARADARAJAN, L. (1988) Silk in Northeastern and Eastern India: The Indigenous Tradition. Modern Asian Studies, Special Issue: Asian Studies in Honour of Professor Charles Boxer, *Cambridge University Press*, Vol. 22 (3): 561–570. https://www.jstor.org/stable/312597

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