

Review Article

The Evolution of the Sericulture Industry in India: From Tradition to Modernity

Comment [D1]: So much content in the manuscript, reduce the content

ABSTRACT

Sericulture, the cultivation of silkworms for silk production, is an ancient practice that originated in China around 2600 BC and has had a profound impact on global commerce and culture. India, the world's second-largest silk producer, has seen significant growth in this industry, which contributes substantially to the economic well-being of rural and semi-urban communities. This agro-based enterprise supports millions of jobs and offers numerous opportunities for entrepreneurship and employment, particularly for women. The production of silk fabric involves several interdependent operations, including mulberry cultivation, silkworm seed production, rearing, ~~silk production~~, twisting, warp and weft making, dyeing and printing, spun silk production, fabric finishing, and garment design. Recent technological advancements, such as new **high yielding** hybrids and sericulture biotechnology, have enhanced silk productivity and quality, supporting sustainable development. Despite challenges like pests and environmental issues, India's diverse silk varieties and strong production base offer significant export opportunities. The industry must address technological and market access challenges to further improve its global standing.

Formatted: Indent: First line: 0.5"

Keywords: Sericulture; mulberry; production and silk.

1. INTRODUCTION

The English term "culture" means "rearing", and the Chinese word "Su (Si)" means "Silk". These two words have been combined to form the phrase "sericulture". The caterpillar of the adult silk moth is called a silkworm. Sericulture refers to the art and science of raising silkworms for silk production. This process includes the manufacture of raw silk and its refinement into the final product. Sericulture is the broad term for the business procedures used to produce silk from silkworms. Also known as silkworm farming, sericulture is a globally significant agricultural sector whose impact on commerce and culture has made it an essential component of human history. Mulberry cultivation, the primary food source for silkworms, has its roots in ancient China, where it first appeared around 2600 BC [1]. This industry has contributed to numerous nations' economies thrive and encouraged cross-cultural interaction over time. With decades of history, India has emerged as a leader in the production of silkworms, building on a millennium-old tradition that is ingrained in its cultural heritage.

Formatted: Indent: First line: 0.25"

India is the world's second-largest producer of silk. Approximately 9.76 million people are employed in rural and semi-urban areas of the nation by the sericulture industry. This industry is a major source of foreign exchange earnings for the nation. Over 52,360 villages in India are engaged in silkworm farming operations [2]. Renowned worldwide for its smooth and glossy texture, silk is often referred to as the "Queen of Textiles." Due to its elegance, vibrant hues, affinity for dyeing, thermal tolerance, and water absorbance, leading fashion designers worldwide adore them for being incredibly light, soft, strong, and smooth. The silk industry

begins with the farming activities of mulberry cultivation, raising silkworms, and producing speed. It then expands into the industries of silk reeling, twisting, weaving, dying, printing, and manufacturing. These operations provide employment for both skilled and unskilled labor forces, as well as a means of subsistence for small and marginal farmers. Additionally, the industry supports ancillary enterprises such as machine manufacture and by-product utilization, including the fabrication of spun silk yarn and pupae oil extraction. India's principal states for sericulture include Tamil Nadu, Maharashtra, West Bengal, Andhra Pradesh, Karnataka, and Jammu and Kashmir. Given that it produces the majority of India's silk, Mysore and North Bengaluru are referred to as "Silk City." The agro-based cottage industry of sericulture is essential to stabilizing the nation's national revenue, often referred to as a welfare-based, employment-oriented cottage industry [3]. In India, the sericulture industry stands as a leading producer of silk, adapting to diverse climatic conditions to develop various silk varieties, including Mulberry, Tasar, Eri, and Muga [4]. However, climate change, natural disasters, and ecological issues are affecting silk production and cocoon quality. Therefore, there is a pressing need for sustainable and innovative methods. Developments in genetics and biotechnology offer hope for the creation of disease-resistant silkworms and increased total silk yield [5]. This article discusses the current status of the sericulture sector in India, exploring its challenges, innovations, and future prospects.

2. TRANSFORMATION AND ADVANCEMENT OF THE INDIAN SILK INDUSTRY

2.1 Innovations in Silk Production

In recent decades, the Indian silk industry has undergone a remarkable transformation marked by substantial advancements in both productivity and quality. Innovations in breeding techniques, particularly the introduction of new multivoltine × bivoltine and bivoltine hybrids, have played a pivotal role in boosting raw silk production. Previously, the average yield of 25 kgs of cocoons per 100 dflshas surged to an impressive range of 60-65 kgs per 100 dfls today. The adoption of new technologies hasn't just doubled yields; it has also brought about qualitative improvements in cocoon production, significantly reducing renditta. Central to these advancements is the field of Seri-biotechnology, which leverages biological processes to enhance the quality of silkworms and the mulberry plants they feed on [6]. This interdisciplinary approach has become instrumental in overcoming challenges inherent in mulberry cultivation, such as environmental barriers, pollen incompatibility, and variations in ploidy between parent plants. One of the pioneering institutions driving these innovations is the **CSB-Central Sericultural Research and Training Institute (CSR&TI) in Mysore**. Through the application of tissue culture technology and diverse explants, CSR&TI has successfully developed numerous mulberry cultivars tailored to thrive in varied environmental conditions. This proactive approach not only addresses the complexities of hybrid development but also strengthens the resilience of India's sericulture against climatic uncertainties and evolving market demands. As the Indian silk industry continues to evolve, Seri-biotechnology remains at the forefront, promising further enhancements in yield, quality, and sustainability. By harnessing the power of biotechnology and continuous research, India is poised to maintain its leadership in global silk production while preserving its rich sericultural heritage for future generations.

2.2 Cultural and Economic Importance of Silk

Silk in India transcends beyond mere fabric; it embodies a cultural heritage steeped in tradition and reverence. With a lineage traced back through centuries in epic scriptures and historical narratives, silk holds a revered place in Indian society. Particularly significant is its role in

Formatted: Font color: Red

Formatted: Font color: Red

weddings, where Indian brides adorn themselves in silk sarees as a sacred tradition, symbolizing purity, grace, and prosperity. India's economic landscape, predominantly rural and agrarian, finds sericulture as a crucial agro-based enterprise contributing to over 70% of livelihoods. This sector not only sustains rural economies but also propels them forward economically. Blessed with diverse climatic conditions conducive to mulberry cultivation across its states, India stands as a beacon in global silk production. Key to India's silk industry are states like Karnataka, Andhra Pradesh, Tamil Nadu, Jammu and Kashmir, and West Bengal, renowned for their expertise and production capabilities. These regions serve as hubs where traditional craftsmanship meets modern innovation, driving the country's leadership in silk manufacturing. What sets India apart on the global stage is its unique ability to produce all five commercially exploited silks: mulberry, tropical tasar, temperate tasar, eri, and muga. This diversity not only underscores India's rich biodiversity but also its mastery in sericulture, offering a spectrum of luxurious silks with distinct textures, colors, and properties. In essence, the Indian silk industry is not just an economic endeavor but a cultural legacy intertwined with the nation's identity. As it continues to evolve with technological advancements and sustainable practices, India remains poised to uphold its stature as a global leader in silk production, preserving its rich heritage for generations to come.

In India, silk is distinguished into various types based on the silkworm species, their feeding plants, and the regions where they are reared. Mulberry silk, produced by the *Bombyx mori* silkworm, feeds on mulberry plants and is reared across all states of India. Tropical Tasar silk comes from the *Antheraea pernyi* and *Antheraea mylitta* silkworms, which feed on Sal, Arjun, and Asan plants, and is primarily cultivated in [Jharkhand](#), Bihar, Madhya Pradesh, Odisha, Maharashtra, West Bengal, and Andhra Pradesh. Oak Tasar silk is obtained from the *Antheraea proylei* silkworm, which feeds on oak trees and is predominantly reared in Manipur, Himachal Pradesh, Uttar Pradesh, and Assam. Eri silk, produced by the *Philosamia ricini* silkworm, which feeds on castor and tapioca plants, is cultivated in Assam, Bihar, West Bengal, Odisha, and Manipur. Lastly, Muga silk is derived from the *Antheraea assamensis* silkworm that feeds on Som and Soalu plants and is exclusively reared in the Brahmaputra river valley in Assam [7].

2.3 Trends and Export Performance of Indian Silk

From 2017-18 to 2022-23, Karnataka consistently led in raw silk production, peaking at 11,823 metric tons in 2022-23. Andhra Pradesh followed as a significant producer, with its output rising to 9,312 metric tons by 2022-23. Assam also maintained a strong production level, reaching 5,721 metric tons in the latest year. Tamil Nadu and Jharkhand contributed notably as well, with Tamil Nadu's production increasing to 2,589 metric tons and Jharkhand's output reaching 874 metric tons. Other states like West Bengal and Maharashtra also played key roles, with West Bengal producing 1,966 metric tons and Maharashtra 620 metric tons in 2022-23. The success of silkworm rearing in these states is attributed to factors such as extensive mulberry gardens, a large number of sericulture farmers, favorable climate and soil conditions, reliable irrigation, access to silkworm eggs, financial support from banks, well-developed market facilities, nurseries for mulberry plants, skilled farmers, training centers, and consistent power supply. These elements collectively support a thriving sericulture industry in these traditional hubs, crucial to India's prominent position in global silk production. India's silk exports primarily comprise fabrics, made-ups, and readymade garments, reflecting its substantial contribution to

Formatted: Indent: First line: 0.25"

Formatted: Indent: First line: 0.25"

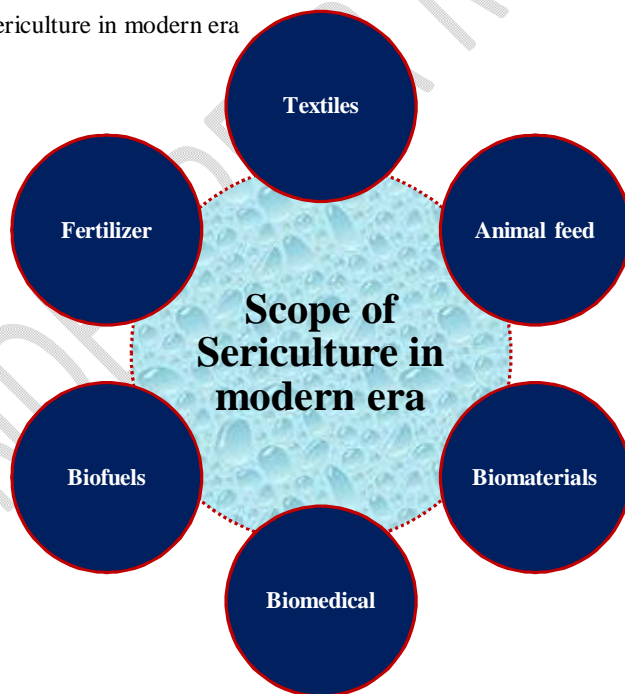
Comment [D2]: Need to add more reference

the global textile market. Overall, the total raw silk production across India showed a gradual increase, culminating at 36,583 metric tons in 2022-23 [8].

In the fiscal years 2021-22 and 2022-23, India earned export revenues of Rs. 1848.96 crores and Rs. 1773.38 crores respectively. While India's domestic market consumes over 85% of its silk production, the country exports approximately 15% of its total output, including value-added items. Over the past decade, there has been a progressive increase in both the volume and value of silk exports, highlighting India's growing presence in the international silk trade. This growth underscores the country's capability to meet global demand for high-quality silk products, driven by its rich sericultural tradition and advancements in manufacturing and design. Between 2017-18 and 2022-23, India's export earnings from silk demonstrated notable variations across different categories. The highest revenue came from silk fabrics and made-ups, peaking at ₹ 1,022.43 crore in 2018-19 and maintaining a significant level at ₹ 973.49 crore in 2022-23. Readymade garments also contributed substantially, although their earnings fluctuated, with a high of ₹ 742.27 crore in 2018-19 and dropping to ₹ 489.61 crore by 2022-23. Silk waste saw a substantial increase over the period, with earnings rising from ₹ 101.19 crore in 2017-18 to ₹ 179.19 crore in 2022-23. Natural silk yarn and silk carpets showed more variability, with natural silk yarn peaking at ₹ 52.62 crore in 2021-22 and silk carpets reaching ₹ 143.43 crore in 2019-20. Overall, total export earnings from silk grew from ₹ 1,649.48 crore in 2017-18 to ₹ 1,773.38 crore in 2022-23, reflecting a generally positive trend despite some fluctuations [9].

Comment [D3]: Add reference

Fig .1 Scope of sericulture in modern era



2.4 Research and Socioeconomic Impact of Sericulture

Sericulture plays a crucial role in India's rural economy, offering reliable income streams with sporadic returns. Academics in India have extensively researched various aspects of sericulture, focusing on *Bombyx mori* L, the mulberry silkworm. Hiware (2006) [10] investigated the effects of fortifying mulberry leaves with the homeopathic drug Nux Vomica on *B. mori*, analyzing parameters such as larval, cocoon, shell and pupal weight, silk ratio, average filament length and denier, and number of breakages during reeling. Sericulture plays a pivotal role in enhancing national income, rural development, women's empowerment, and employment generation through its economic benefits [11]. Avhadet *et al.* (2013) [12] highlighted challenges such as the impact of the Giant African snail, *Achatina fulica*, which can cause substantial cocoon losses and affect silk quality by contaminating mulberry leaves with a foul-smelling mucus. *Ocimum sanctum* extracts have shown promising results in promoting silkworm growth and enhancing silk quality, offering potential applications in boosting sericulture productivity [13]. The low-investment nature of sericulture attracts farmers seeking quick returns, thereby bolstering rural economies and livelihoods [14]. Chanotra *et al.* (2019) [15] emphasized sericulture's role in rural employment generation and the empowerment of marginalized groups, providing well-paying jobs and socioeconomic opportunities. As a rural enterprise, we aim to reduce poverty by creating jobs for both unskilled farm workers and skilled craftspeople from all backgrounds [16]. Similarly, Dar *et al.* (2020) [17] highlighted the viability of sericulture in Kargil, Jammu and Kashmir, as a sustainable option for farmers, particularly benefiting women and improving overall living standards in rural communities. Overall, sericulture not only contributes substantially to India's agricultural sector but also serves as a catalyst for socioeconomic development, empowering rural communities through sustainable income opportunities and enhanced livelihoods.

3. DIVERSE LANDSCAPE OF INDIAN SILK INDUSTRY

India's silk industry is celebrated globally for its exquisite brocade fabrics from Banaras, the luxurious silks of Karnataka, tie-and-dye and Patola from Gujarat and Rajasthan, ikats from Orissa, and the fine Bandhej and temple silks of Kancheepuram and Tanjore. These represent just a fraction of India's diverse range of silk weaves, textures, and patterns. Mulberry cultivation dominates the sericulture industry, comprising over 76% of total silk production and employing approximately 7.6 million people across 51,000 communities. This sector operates 328,627 handlooms, 45,867 powerlooms, and supports 814,616 weavers. Introduced to South India by Tipu Sultan in the 18th century, sericulture has since become a significant agricultural and commercial activity in the region [18]. India has a rich history in sericulture [19]. Silk holds cultural importance in religious ceremonies, weddings, and festivals in India, underscoring its deep-rooted societal significance. India's labor-intensive silk industry is renowned for its craftsmanship and aesthetic appeal, making it a leader in global fashion trends [20,21]. Sericulture is a multifaceted endeavor that fosters inclusive growth [22], with mulberry cultivation concentrated primarily in Karnataka, Andhra Pradesh, Tamil Nadu, West Bengal, and Jammu and Kashmir due to favorable climatic conditions. These states account for 95% of the country's raw silk production and cultivate 97% of the total mulberry land [23]. Technological advancements have transformed sericulture from a traditional occupation to a lucrative industry capable of generating substantial income [24]. As the world's second-largest producer of raw silk, India commands roughly 20% of global production, solidifying its position as a key player in the silk market. In addition to the aforementioned, India's silk industry encompasses a wide array of lesser-known but equally stunning varieties such as Muga silk from Assam, Eri silk from

Meghalaya, and Tasar silk from Bihar and Jharkhand. These unique silks contribute significantly to the country's textile heritage and economic landscape. The industry's geographical spread across different states highlights India's diverse climatic conditions that are conducive to various silk production processes. Moreover, initiatives promoting sustainable practices and organic silk production are gaining traction, ensuring the industry's resilience and environmental stewardship in the face of global challenges.

Comment [D4]: Reduced the content

4. REGIONAL INSIGHTS INTO INDIAN SERICULTURE

Comment [D5]: Why you focused on only three states, compare to this three states so many states are producing high amount of production

4.1 Sericulture in Jammu and Kashmir State

The state's sericulture sector has a rich history of success. Silk production in Jammu & Kashmir is mentioned in ancient Sanskrit writings such as Rajtarangini, making it a valuable heritage. Sericulture is the primary economic industry in Kashmir. Ancient Sanskrit literature suggests that Kashmir was the cradle of silk production. Jammu and Kashmir's diverse climatic characteristics, including subtropical in the plains, warm temperate in the hills, and temperate in the valley, making it excellent for rearing bivoltine races and producing fine silk [25]. Sultan Zain-ul-Abideen, the inventor of industrial Kashmir, emphasized the importance of this industry and introduced advanced techniques. According to official reports, Europe was the first continent with which Kashmir began trading silk. According to sources, in 1855, Kashmir could send 25000 oz of silkworm seeds to Europe. Exporting silkworm seeds to Europe helped Kashmir's silk industry establish a crucial position on the European silk route. In Kashmiri, silk fiber is referred to as "pote" and silkworms as "patikeom" (insects). Pote manufacture in the Valley is a traditional industry [26]. In Jammu and Kashmir, there are around 7 lakh mulberry trees out of which 53% are available in Jammu region and 47% in Kashmir region [27]. Jammu and Kashmir is a traditional bivoltine silk producing state, producing over 900 MT of cocoons by 27,000 farmers throughout 2575 villages. The Sericulture Development Department (SDD) oversees the commercialization of cocoons in the state. The administration has set up nine auction markets to dispose of cocoons. Cocoon markets provide warehouses, hot air dryers, and other facilities for buyers and sellers to market and store cocoons.

4.2 Sericulture in Maharashtra State

Several researchers from Maharashtra have delved into various aspects of the sericulture sector. According to his investigations, the sericulture sector in Aurangabad district is growing, with 90 villages and 277 people engaged in the practice [28]. According to Dewangan (2013) [29], sericulture offers promising livelihood opportunities for tribal communities, highlighting its low-investment nature and high production potential. The history of sericulture in Maharashtra traces back to the Satavahana Empire, which ruled regions including Dharanikota and Amaravati in Andhra Pradesh, as well as Junnar (Pune) and Pratisthan (Paithan) in Maharashtra. BAIF has supported natural resource management in sericulture through various programs such as research, extension, training, technological development, and demonstrations [30]. Although Maharashtra is not traditionally known for silk production, it holds significant potential for developing high-quality silk. To harness this potential, it is crucial to provide incentives and support similar to those available in traditional silk-producing states. This approach can stimulate growth and innovation in Maharashtra's sericulture industry, paving the way for enhanced economic opportunities and sustainable development.

4.3 Sericulture in Assam State

Sericulture has deep roots in Assam, dating back to ancient times, where local expertise spans rearing, spinning, and weaving silkworms. Muga silk, renowned for its shimmering golden hue, holds the distinction of being Assam's first GI-registered product and enjoys popularity in the global silk market. Assam ranks as the third-largest silk producer in India, contributing significantly with 94% of Muga silk and 62% of Eri silk production. Silk plays a vital role in Assamese cultural traditions, prominently featured in weddings and festivities [31]. Anitha (2011) [32] highlights in her study "Status of Silk Industry in India" that sericulture has the potential to uplift the rural economy, generating employment opportunities and boosting foreign trade through the adoption of advanced technologies and collaborations, such as those with Japan. The Central Silk Board's successful development and promotion of bivoltine silkworms capable of producing high-quality raw silk underscore India's efforts to enhance domestic silk production and improve cocoon marketing and processing strategies.

5. CURRENT MULBERRY PLANT-BASED PRODUCTS IN INDIA

The market in India currently offers a wide range of mulberry plant-based products from various companies across the country. Healthline Pvt. Ltd., located in Bengaluru, Karnataka, produces a mulberry leaf drink called Sericha. Tropicana Herbals from Dindigul offers Tropixx mulberry green tea and Mulberry Leaves Tea Cut. Phytotech Extracts Pvt. Ltd., based in Bangalore, markets a product named Multea. In Vadodara, Gujarat, Riddhi Traders provides a Herbal Care Soothing Skin Face Wash infused with tea tree oil and mulberry. Rhythm Winery in Pune, Maharashtra, specializes in Mulberry Premium Wines, while Fresh India Organics in Mumbai focuses on organic mulberry fruits. Tamek, operating out of New Delhi, sells Black Mulberry Juice. Botanic Healthcare in Hyderabad offers mulberry leaf extract, and Mehwer Groups in Srinagar, Jammu & Kashmir, supplies organic mulberry leaves in various forms—dried, whole, cut, or sliced. Arishtam Probiotics from Bangalore, Karnataka, is known for its Mulberry Shahtoot Wine. Frutteto-Paradise Juice Pvt. Ltd. in Maharashtra deals in frozen mulberries. Moringa India Health Care, located in Tirupur, Tamil Nadu, produces organic mulberry tea. Vrishti Bioscience in Bengaluru, Karnataka, also offers mulberry green tea. AmmaNutritions, another Bengaluru-based company, sells Amma Mulberry Tea, while Vinayak Ingredients Pvt. Ltd. in Mumbai provides mulberry leaf powder [33].

Comment [D6]: Need to justify why you are using here products

6. CURRENT INDIAN COMPANIES PRODUCING SILKWORM PUPAL PRODUCTS

Several companies in India are actively producing and marketing silkworm pupal products. SLV International, based in Bengaluru, Karnataka, offers silkworm pupae meal and oil. Inlife Pharma Pvt. Ltd., located in Hyderabad, markets a product called Inlife Silk Oil Omega 500mg Liquid Filled Veg Capsule. Asif Silk Industry, operating in Karnataka, provides a range of products including dried de-oiled silkworm pupae, edible silkworm pupae, frozen edible silkworm pupae, and sterilized pupae. Bhat Silk Industries in Jammu & Kashmir specializes in canned silkworm pupae [33].

7. INITIATIVES AND MILESTONES TO BOOST SERICULTURE ECONOMY

India's sericulture industry has undergone significant advancements aimed at boosting economic growth through various strategic initiatives and support systems. The Central Silk Board (CSB) plays a pivotal role in this endeavor by organizing a range of training programs. These include national-level short-term courses accessible to all, specialized programs for service personnel, and targeted training for rural farmers. Additionally, CSB conducts intensive training sessions

Comment [D7]: Reduce and consize the size

periodically, equipping participants with essential skills and fostering innovation in sericulture practices. International collaboration is facilitated through the International Centre for Training and Research in Tropical Sericulture (ICTRETS) in Mysore, which offers UGC-approved vocational courses in tropical sericulture. These international courses attract participants globally, contributing to knowledge exchange and enhancing sericulture practices worldwide. State and Central Sericulture Boards operate Regional Extension Centers and Technical Service Centers that provide critical support to silk rearers. These centers distribute advanced-stage silkworm larvae and high-quality mulberry saplings at subsidized rates, thereby enhancing productivity and ensuring quality output. Special incentive schemes are also in place for bivoltine silk producers, incentivizing the adoption of advanced sericulture techniques. To further support sericulture farmers, especially those engaged in bivoltine silk production, specialized crop insurance systems have been implemented. These insurance policies safeguard farmers against crop failures and adverse weather conditions, providing financial security and stability to rural sericulture communities. Furthermore, educational initiatives disseminate essential information on optimal farming practices, including the use of disinfectants and insecticides, promoting sustainable and efficient sericulture methods. In addition to these efforts, the government has introduced several schemes to promote the sericulture industry. The North East Region Textile Promotion Scheme (NERTPS) specifically targets the development of sericulture in the northeastern states, focusing on infrastructure development, capacity building, and market linkages. Moreover, the establishment of Silk Parks aims to create integrated facilities for silk production, processing, and marketing, fostering a comprehensive ecosystem for the industry. The introduction of modern technologies, such as improved reeling and spinning machines, has significantly increased productivity and reduced labor intensity. Research and development initiatives, led by institutions like the Central Sericultural Research and Training Institute (CSRTI), focus on developing disease-resistant silkworm breeds and high-yielding mulberry varieties, further enhancing the industry's output and resilience. These concerted efforts underscore India's commitment to enhancing the sericulture sector's economic impact. By integrating training, international collaboration, technological advancements, and support systems, India aims not only to bolster silk production but also to empower rural communities and ensure sustainable growth in the sericulture economy. The continuous investment in research, infrastructure, and farmer welfare schemes reflects a comprehensive strategy to secure India's position as a global leader in silk production [34].

8. STRENGTHS AND CHALLENGES OF SERICULTURE INDUSTRY IN INDIA

The development of indigenous mulberry varieties with high leaf yields, new bivoltine silkworm hybrids suitable for tropical regions, farmer-friendly technologies, and cost-effective food plant cultivation, rearing, and reeling practices, combined with abundant natural and man-made resources and trained labor, bodes well for the future of the sericulture industry, enhancing its global competitiveness. These advancements are expected to increase productivity and quality, making Indian silk a preferred choice in international markets. However, challenges such as fluctuating raw silk prices, vulnerability to pests and diseases, and competition from synthetic fibers continue to pose significant hurdles. The silk industry possesses several strengths, including a large production base, availability of skilled labor, land, and an established infrastructure with various silkworm breeds and hybrids. Additionally, the industry benefits from low investment requirements, a short gestation period, and higher returns. However, the industry also faces significant weaknesses. There are gaps in technology transfer and extension support,

inadequate market accessibility, and poor linkage among different stakeholders. The decentralized nature of the industry makes it difficult for financial institutions to provide necessary support. In terms of opportunities, the industry has the potential to generate rural employment and reduce migration to urban areas. The liberalization policies of the Government of India, aligned with WTO agreements, present further opportunities. Additionally, the reduction of silk production by traditional silk-producing countries like Japan and the USSR, along with the steady increase in garment exports, offers significant growth potential for the industry. Despite these opportunities, the industry is threatened by falling international prices and heavy dumping of silk products from China at low prices. The unpredictability of China's silk policies also poses a risk. Furthermore, the industry's inability to adapt to the changing quality demands of both domestic and export markets, coupled with a lack of awareness in the domestic market to respond to a demand-driven environment, remains a significant threat [35].

9. CONCLUSION

Comment [D8]: Reduce, repeating same content

This article offers a comprehensive overview of the current state of the sericulture sector in India. Sericulture is distinguished by its profound impact on the economy, heavily reliant on agricultural practices such as cocoon production and cottage industry labour. Key determinants of success include identifying market opportunities, continuous research and development, community empowerment, and learning from past challenges. In India, sericulture predominantly operates as a rural-based industry, providing significant employment opportunities. Despite historically being viewed as a supplementary source of income, recent industrial advancements have facilitated large-scale production and ensured sustainable livelihoods for rural communities. Entire families find stable employment in this sector, benefiting from competitive wages and improved quality of life. Sericulture's role extends beyond economic benefits; it plays a pivotal role in rural employment generation, preventing migration to urban areas, conserving the environment through sustainable practices, and addressing socio-economic disparities. By nurturing this sector, India not only preserves its cultural heritage but also secures a promising future for sustainable development in agriculture.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that generative AI technologies such as Large Language Models, etc have been used during writing or editing of manuscripts. This explanation will include the name, version, model, and source of the generative AI technology and as well as all input prompts provided to the generative AI technology.

Details of the AI usage are given below:

1. ChatGPT

REFERENCES

1. San TK. Dynastic China: an elementary history. The Other Press. 2014.
2. Indian Silk Export Promotion Council (ISEPC), India Brand Equity Foundation, 2023.
3. Baishya P. The silk industry of Assam- A case Study of the Sualkuchi cluster. Spectrum publication, Guwahati, Assam. 2005.

4. ChandS, ChandS,RaulaB. Usage of silkworm materials in various ground of science and research. *Journal of Natural Fibers*. 2023;20(1):2139328.
5. NagarajuJ. Application of genetic principles for improving silk production. *Current Science*. 2002;83(4):409-414.
6. MaheshaHB. *Seribiotechnology*. University of Mysore, Mysuru. 2017.
7. Sericulture in India: Cultivation and Economics, *Kurukshetra Journal*, Vol.65, No.3, January 2017.
8. Central silk board (Retrieved from: <http://csb.gov.in/wp-content/uploads/2024/05/1-AR-2022-23-Final-Low.pdf>).
9. <https://csb.gov.in/statistics/silk-exports-imports/total-export-earnings>.
10. HiwareCJ. Effect of fortification of Mulberry leaves with homeopathic drug Nux Vomica on *Bombyx mori* L. *Homeopathy*. 2006;95(03):148-150.
11. GangopadhyayD. Sericulture Industry in India – A Review. *India Science and Technology*. 2008.
12. Avhad SB, Hiware CJ. Mulberry defoliators: distribution and occurrence from Aurangabad (MS), India. *Journal of Entomology and Zoology Studies*. 2013;1(4):1-6.
13. PadmaS, VidyaP, RamaniM. Effect of *Ocimum sanctum* L. plant extract on the economic parameters of silkworm, *Bombyx mori* L. *Journal of Entomology and Zoology Studies*. 2015;3(2):62-64.
14. Naik AH. An Overview of Sericulture Industry in Kashmir. *International Journal of Research in Humanities, Arts and Literature*. 2017;5(11):185-196.
15. ChanotraS, Bali K, Bali RK. Sericulture: An opportunity for the upliftment of rural livelihood. *Journal of Entomology and Zoology Studies*. 2019;7:1100-1103.
16. Savithri G, Sujathamma P, Neeraja P. Indian sericulture industry for sustainable rural economy. *International Journal of Economics, Commerce and Research*. 2013;3(2):73-78.
17. DarKA, GanieNA, Wani MY, Rafiq A, KhanIL, Sahaf KA, Baqual MF. Sericulture: A viable option for farmers of Kargil. *The Pharma Innovations*. 2020;9(2):288-289.
18. Srinivas Rahmathulla VK, Vindhya GS, Rajan RK. Training programmes in sericulture: Their evaluation and impact on extension personnel and sericulturists. *Indian Journal of Sericulture*. 2007;46(1):26-31.
19. PatilBR, Singh KK, Pawar SE, Maarse L, OtteJ. Sericulture: An alternative source of income to enhance the livelihoods of small-scale farmers and tribal communities. *Pro-Poor Livestock Policy Initiative*. FAO & BAIF: Rome. 2009.
20. PandeyRK, Kaul S, Dhar A. Case Study: Regional Sericultural Research Station, Jammu. 2014.
21. Anonymous. Annual Report, Central Silk Board, Bangalore. 2010.
22. GanieNA, KamiliAS, BaqualMF, SharmaRK, Dar KA, Khan IL. Indian Sericulture Industry with particular reference to Jammu and Kashmir. *International Journal of advanced biological research*. 2012;2(2):194-202.
23. Anitha R, Kanimozhi V. Women Entrepreneurs in Sericulture: Their Participation & Problems faced. *Asia Pacific Journal of Research*. 2013;1(7):114-126.
24. Sirajudeen. Sericulture industry: An overview. *Tamil Nadu Journal of Cooperation*. 2011;62-65.
25. Sharma K, BaliK. Evaluation of indigenous and introduced bivoltine silkworm hybrids. *Journal of Pharmacognosy and Phytochemistry*. 2019;8(4):1459-1464.

26. Seri-States of India 2019: A Profile
27. Economic Survey 2015-16, Government of Jammu and Kashmir.
28. HiwareCJ. Farmer's empowerment through sericulture industry from Aurangabad District, Maharashtra State, India. *Entomology and Applied Science Letters*. 2016;3(2):22-28.
29. DewanganSK. Livelihood opportunities through sericulture a model of Gharghoda tribal block, Raigarh district. *American Journal of Environmental Science*. 2013;9(4):343-347.
30. Hugar II, Jadhav DV, Kalyankar A, Pande AB. *Tasar for Tribal Prosperity-An Experience of Baif in Promotion of Tasar Sericulture Based Livelihood Promotion in Maharashtra*. 2016.
31. Government of Assam, Department of Agriculture.
32. AnithaR. Indian Silk Industry in the Global scenario. *International Journal of Multidisciplinary management studies*. 2011;1(3):100-110.
33. Jayaram H, Mahadevegowda LG, Boregowda MH. *Seri-Entrepreneurship: Current Status and Potential Opportunities*. *Current Agriculture Research Journal*. 2024;12(1):385-399.
34. Massand A, Lodi MK, AmbreenL. *Atmanirbhar Bharat: Economic, legal, and social aspects*. *International Journal of Management*. 2020;11(6):1038-1046.
35. Sharma S, Acharya S, Regmi S, Poudel A, Adhikari G. *Production Activities and Value Chain Analysis of Sericulture in Western Inner Terai Region of Nepal*. *International Journal of Social Sciences and Management*. 2021;8(2):362-371.