Original Research Article

Study on the Challenges Encountered by Eri Silkworm Rearers in Tapioca Cultivation and Eri Rearing in Udalguri District of Assam

Abstract

Sericulture, specifically eri silk production, plays a crucial role in sustainable rural development and employment generation. This study investigated the constraints faced by eri silkworm rearers in tapioca cultivation in Udalguri district, Assam. Primary data were collected from 120 respondents through a snowball sampling technique. The rearers encountered personal, social, land utilization, rearing, managerial, economic, marketing, transportation, and institutional challenges. Notable issues included lack of formal education, high labour wages, land scarcity, inadequate rearing facilities, limited knowledge on scientific practices, insufficient capital, price fluctuations, poor marketing infrastructure, transportation costs, and lack of need-based training. The respondents suggested interventions such as government support for infrastructure and equipment, need-based training, formation of cooperatives, effective marketing channels, financial assistance, value-added product training, community rearing centers, land allocation, and extensive plantation of secondary feed plants. Addressing these constraints through targeted strategies is essential for fostering the long-term sustainability of eri silk production and enhancing the socio-economic status of rearers.

Keywords: Sericulture, Eri Silk, Tapioca Cultivation, Constraints, Sustainable Development, Rural Livelihoods, Udalguri

Introduction

Silk production through sericulture is an important contributor to sustainable development and rural economies (Mushtaq 2023, Savithri 2013). It provides employment to a large number of people, particularly in rural areas, and contributes to poverty alleviation and economic development (Savithri 2013, Ssemugenze 2021). Therefore, sericulture is not only a culturally significant industry, but also a key player in achieving sustainable development goals and promoting socio-economic development. India is the only country in the world that produces all five commercially exploited silk varieties, namely Mulberry, Tropical Tasar, Temperate Tasar, Eri, and Muga Silkworm. The non-mulberry silks which include MugaEri and Tasar, are also called as Vanya silk (Ahmed and Rajan, 2011). Out of four commercially exploited silk varieties Mulberry silk accounted for 73.97% (25,818 MT), Eri silk accounted for 21.10% (7,364 MT), Tasar silk accounted for 4.20% (1,466 MT), and Muga silk accounted for 0.73% (255 MT) of the total raw silk production of 34,903 MT in India during 2021-22 (Sericulture Annual Report, 2022).

Eri culture is a practice that involves cultivating eri silkworm host plants, producing eggs, rearing eri silkworms, spinning cocoons to produce yarn, and weaving eri silk fabrics. Eri silkworms belong to the family Sturnidae and are completely domesticated, polyphagous, and multivoltine. Depending on the availability of host plants, around 5-6 crops can be raised per year. Eri culture is widely practiced in the North Eastern states of India, including Assam, Meghalaya, Arunachal Pradesh, Nagaland, and Manipur. The biggest portion of eri silk production of India is contributed from Assam. In the year 2021-22, 2,39,810 families were involved in ericulture in Assam, and there were 29,096 hectares of land covered by Eri food plants in government and private farms. The total production of Eri cocoons was 6769 tons, and the production of Eri raw silk was 5420 tons (Statistical Handbook, Assam, 2022).

Udalguri, a prominent district of Assam under the Bodoland Territorial Region, is renowned for its eri silk production and tapioca cultivation. During 2023, the district boasted 408 sericultural villages (private), 7 government sericulture farms, and a total area of 557.54 hectares dedicated to silkworm food plant cultivation (Statistical Handbook, Assam – 2023). The region's climate is conducive for rearing silkworms and cultivating their food plants. Eri silk production and tapioca cultivation are significant economic activities in Udalguri district, contributing to employment generation, income generation, and enhanced livelihood opportunities for diverse populations. However, despite the district's conducive climate for sericulture and the State Government's development initiatives to improve the socioeconomic status of erirearers, there persist critical challenges that impede the long-term sustainability of tapioca farming by these rearers. A study by Hatibaruah et al. (2021) on "Constraints perceived by farmers in the Jorhat district of Assam in the adoption of sericulture production technologies" identified several major constraints hindering the adoption of sericulture technologies. These included a lack of knowledge regarding host plant training and pruning for host plant cultivation, inadequate temperature and humidity maintenance, insufficient consistent technical guidance, absence of protected storage facilities in villages, lack of accessible and sizable markets in proximity to villages, dearth of improved reeling and spinning equipment, lack of awareness regarding the adoption of improved technology, and the high cost of rearing equipment. Moreover, Phukan's (2022) study revealed that sericulture farmers faced challenges related to raw silk production for industries, inadequate working capital and capital to acquire fixed assets for enterprise management, technical knowledge gaps in machinery installation and operation, organizational issues, and marketing constraints for both raw silk and finished goods. Moreover, the study found that 23.33% of respondents encountered difficulties in accessing training facilities, while 20.83% grappled with labor-related concerns, which were deemed unavoidable. Keeping all the above factors in mind, an in-depth analysis of these challenges is imperative to devise targeted interventions and strategies that can address the specific constraints faced by the eri silkworm rearers in tapioca cultivation. By identifying and understanding the root causes of these challenges, policymakers and stakeholders can formulate evidence-based solutions to mitigate the barriers, thereby fostering a more conducive environment for tapioca farming and ensuring the long-term viability of this economic activity.

Materials and Methods (if possible please do not put the title as the last line on the page)

The present study was conducted in Udalguri district of Assam, selected purposively as it is one of the leading eri silk-producing districts in the state, and the eri silkworm rearers utilize tapioca as a host plant. The study employed a snowball sampling technique to select a total of 120 respondents for primary data collection. Three developmental blocks from Udalguri district, namely Udalguri block, Rowta block, and Mazbat block, were purposively selected owing to the traditional practice of eri rearing and tapioca cultivation in these areas. A total of 6 sericultural circles were identified from the 3 developmental blocks, and 3 villages from each sericultural circle were chosen for data collection. The data analysis employed various statistical techniques, including mean, percentage, frequencies and rank orders.

Results and discussion

The study identified and examined various constraints and challenges encountered by the silkworm rearers, which are presented under the following categories.

Personal Constraints

The data in Table 1 indicates that the majority of respondents cited "lack of formal education" as the primary and most severe issue, with a Weighted Mean Score (WMS) of 2.51. This could be attributed to limited access to education during childhood or a lack of financial resources, familial occupational demands, or familial support. To address this concern, various training or awareness programs should be provided to rearers to encourage the adoption of new technologies. The second-ranked issue, with a WMS of 1.55, was "lack of time due to family burden." The third-ranked issue, with a WMS of 1.44, was "lack of prior experience," which suggests that many respondents were unaware of the potential benefits of recommended tapioca rearing practices, possibly due to insufficient knowledge of new technologies and procedures. Extension agents should develop personal development programs to foster confidence and encourage the adoption of recommended practices among rearers. According to Table 1, the fourth-ranked personal issue was "lack of communication with other farmers," with a WMS of 1.37, while "lack of self-confidence" ranked last, with a WMS of 1.22.

Table 1. Rank wise distribution of personal problems faced by the eri silkworm rearers in tapioca cultivation

Sl. No.	Problems	WMS	Rank
a.	Lack of self confidence	1.22	V
b.	Lack of formal education	2.51	I
c.	Lack of time due to family burden	1.55	II
d.	Lack of prior experience	1.44	III
e.	Lack of communication with other farmers	1.37	IV

Social Constraints (if possible please do not put the title as the last line on the page)

According to Table 2, the respondents ranked "Lack of glamour" as the primary social problem, with the highest Weighted Mean Score (WMS) of 2.79. This issue could stem from inadequate extension contact, limited market exposure, or absence of marketing channels. To mitigate this concern, increased extension services and accessible marketing platforms should be made available to farmers, encouraging them to pursue eri cultivation as a source of income. "High labour wages" emerged as the second-highest ranked problem, with a WMS of 2.64, potentially related to the respondents' poor financial conditions. Fluctuating wage rates hindered their ability to save a fixed amount, exacerbated by labour shortages that resulted in losses in eri farming. The third-ranked social issue, with a WMS of 1.15, was the "lack of social support toward erirearers." "Lack of appreciation from other farmers in the locality" and "Lack of support from family members" were ranked fourth and fifth, respectively, both with a WMS of 1.1.

Table 2. Rank wise distribution of social problems faced by the eri silkworm rearers in tapioca cultivation

Sl. No.	Problems	WMS	Rank
a.	Lack of support from family members	1	V
b.	Lack of appreciation from other farmers in the locality	1.1	IV
c.	Lack of social support towards erireares	1.15	III
d.	Lack of glamour	2.79	I
e.	High labour wages	2.64	II

Land utilization problems

As shown in Table 3., the respondents ranked "lack of own land" as the primary land utilization issue, with a Weighted Mean Score (WMS) of 2.22. To address this concern, the sericulture department could allocate designated areas within government farms for host plant cultivation and eri silkworm production, catering to farmers interested in eri silk production but lacking personal land resources. The second-ranked issue, with a WMS of 2.14, was "lack of knowledge on proper land utilization." To mitigate this, relevant authorities and extension agencies should provide demonstrations on appropriate input utilization. The third-ranked land utilization issue, with a WMS of 1.48, was "people are not interested to lease their land for tapioca cultivation," as cited by most respondents.

Table 3. Rank wise distribution of land utilization problems faced by the eri silkworm rearers in tapioca cultivation(if possible please do not split the table on 2 pages)

Sl. No.	Problems	WMS	Rank
a.	Lack of own land	2.22	I
b.	Lack of knowledge on proper utilization of land	2.14	II
c.	People are not interested to lease	1.48	III

	their land for tapioca cultivation		

Problems in eri silkworm rearing

The majority of respondents cited "Lack of availability of rearing area" as the primary issue, with a weighted mean score (WMS) of 2.87. Given the space constraints faced by many farmers, the sericulture department could allocate dedicated areas within government farms for eri silkworm cultivation. "Lack of availability of improved reeling machines" emerged as the second major concern (WMS 2.76), owing to the high cost of machinery and the limited income of rearers. The sericulture department and relevant institutions should facilitate access to affordable or subsidized machinery and equipment to enhance silk production and quality, thereby improving the income prospects of rearers. "Lack of availability of proper place for post-cocoon operation" (WMS 2.61) and "Storage of cocoons" (WMS 2.54) were ranked third and fourth, respectively, highlighting the need for suitable facilities at the village level. Other issues included "Unavailability of seed in time" (WMS 1.59), "Incidence of disease in silkworm" (WMS 1.05), "Incidence of disease in host plant" (WMS 1.29), "Incidence of pest or natural enemies on silkworm" (WMS 1.19), and "Impact of environmental pollution" (WMS 1.09), necessitating interventions such as timely seed distribution, disease management training, pest control measures, and selection of pollution-free rearing sites. "Insufficient money for buying seeds" (WMS 1) was the least pressing issue (Table 4).

Table 4. Rank wise distribution of problems in eri silkworm rearing faced by the erirearers

Sl. No.	Problems	WMS	Rank
a.	Unavailability of seed in time	1.39	V
b.	Insufficient money for buying seeds	1	X
c.	Lack of availability of rearing area	2.87	I
d.	Impact of environmental pollution	1.03	IX
e.	Incidence of disease in silkworms	1.05	VI
f.	Incidence of disease in hostplants	1.29	VII
g.	Incidence of pest or natural enemies on silkworm	1.19	VIII
h.	Lack of availability of improved spinning machines	2.76	II
i.	Storage of cocoons	2.54	IV
j.	Lack of availability of proper place for post cocoon	2.61	III

Managerial problems

The primary managerial challenge faced by most respondents was the "Lack of adequate knowledge on protection measures and management," with a weighted mean score (WMS) of 2.79. The majority of respondents lacked proper understanding of protection

measures and management due to insufficient need-based training, making it difficult for them to independently address issues during tapioca cultivation and silkworm rearing. To mitigate this issue, farmers should receive comprehensive training to enhance their ability to undertake protection measures effectively. Another significant problem identified by many respondents was the "Lack of adequate knowledge and information on scientific practices," ranking third among managerial problems with a WMS of 2.79. The lack of training and limited extension contact could be attributed to the respondents' lack of proper knowledge regarding scientific tapioca cultivation and eri rearing practices. To address this, extension agents should provide timely and appropriate information on recommended practices through various training programs and method demonstrations, encouraging farmers to adopt them for improved productivity. Furthermore, "Untimely supply of inputs" was recognized as a critical problem by the majority of respondents, ranking third with a WMS of 2.58 (Table 5). The relevant authorities should take necessary steps to ensure timely delivery of inputs to prevent disruptions in the rearing process.

Table 5. Rank wise distribution of managerial problems faced by erirearers in tapioca cultivation

Sl. No.	Problems	WMS	Rank
a.	Lack of adequate knowledge and information on scientific practices	2.9	II
b.	Lack of adequate knowledge on protection measures and management	2.93	I
c.	Untimely supply of inputs	2.58	III

Economic problems

The majority of respondents cited "Lack of own capital" as a significant issue, ranking it first with a weighted mean score (WMS) of 2.75. This could be attributed to factors such as lack of income or savings. Furthermore, many respondents reported that the "Procedure for obtaining loan is complicated," ranking it second with a WMS of 2.64, potentially due to lower educational levels and a lack of awareness regarding the appropriate loan application process for sericulture or machinery. "Delay in getting loan" was also identified as a difficulty, ranking third among economic problems with a WMS of 2.51, which could be due to the respondents' impatience in awaiting loan approvals. Consequently, respondents should be educated about banking procedures and requirements. Some respondents highlighted "Inadequate loan from financial agencies" as a problem, ranking it fourth with a WMS of 2.28, possibly stemming from a lack of knowledge about agricultural financing agencies or programs offered by banks. Finally, the "High rate of interest" was mentioned as a concern, ranking last among economic problems with a WMS of 2.25 (Table 6).

Table 6. Rank wise distribution of economic problems in eri silkworm rearing faced by the erirearers(if possible please do not split the table on 2 pages)

Sl. No.	Problems	WMS	Rank

a.	Inadequate loan from financial agencies	2.28	IV
b.	Lack of own capital	2.75	I
c.	Procedure for obtaining loan is complicated	2.64	II
d.	Delay in getting loan	2.51	III
e.	High rate of interest	2.25	V

Marketing problems

The majority of respondents highlighted "Fluctuation of product prices" as a critical issue, ranking it first with a weighted mean score (WMS) of 2.72. The state department should prioritize price-fixing mechanisms to ensure that rearers receive fair returns on their investments, eliminating the exploitation by middlemen and enabling rearers to obtain remunerative rates for their products. "Poor marketing infrastructures and facilities" emerged as the second major concern, with a WMS of 2.68. Relevant authorities should take appropriate measures to enhance the efficiency of marketing infrastructure and facilities. The government may establish new market places where rearers can directly sell their silk products, fostering direct linkages between producers and buyers, and exploring new opportunities within the enterprise sector. Additionally, government organizations and institutions should collaborate to support rearers by establishing robust export marketing platforms and promoting eri silk on a global scale. "Lack of proper marketing facilities" was cited as the third-ranked issue, with a WMS of 2.61, necessitating assistance from extension agents and the government in providing marketing support. Furthermore, "Lack of knowledge about proper techniques of marketing," ranked last among marketing problems with a WMS of 2.44 (Table 7), highlighted the need for imparting adequate marketing knowledge to enable growers to distribute their produce at reasonable prices.

Table 7. Rank wise distribution of marketing problems in eri silkworm rearing faced by the erirearers

Sl. No.	Problems	WMS	Rank
a.	Lack of proper marketing facilities	2.61	III
b.	Fluctuation of product prices	2.72	I
c.	Lack of knowledge about proper techniques of marketing	2.55	IV
d.	Poor marketing infrastructures and facilities	2.68	II

Transportation problems

The primary transportation issue reported by the respondents was the "High cost of hiring vehicles," ranking first with a weighted mean score (WMS) of 2.43. Additionally, "Non-availability of own vehicles" emerged as another significant challenge, ranking second with a WMS of 2.12, as most respondents could not afford personal transportation due to

their limited income. Furthermore, "Poor condition of roads" posed a challenge for some respondents, particularly in areas with limited connectivity and inadequate road infrastructure, ranking third among transportation problems with a WMS of 1.45 (Table 8). However, not all respondents faced this issue.

Table 8. Rank wise distribution of transportation problems in eri silkworm rearing faced by the erirearers

Sl. No.	Problems	WMS	Rank
a.	Poor conditions of road	1.85	III
b.	Non availability of own vehicle	2.12	II
c.	High cost of hiring vehicle	2.43	I

Institutional problems

The respondents identified "Lack of need-based training" as the most significant issue, with a weighted mean score (WMS) of 2.56. It was observed that each respondent faced unique challenges and requirements. To address this, a comprehensive survey should be conducted to identify the diverse issues and demands of erirearers, enabling extension personnel to provide training tailored to their specific needs. "Less linkage between CSBs, sericulture department, and other related institutions" was ranked second among the institutional issues, with a WMS of 2.53. This could be attributed to a lack of manpower in the relevant institutions or the untimely scheduling of training programs. Consequently, training sessions should be organized according to the respondents' schedules. Another issue highlighted by the respondents was the "Lack of coordination among rearers and extension agencies," ranking third with a WMS of 2.25. This issue could be addressed by providing technical assistance to the rearers through regular visits and appropriate training, encouraging rearers to adhere to the processes and recommendations provided by extension agencies. The fourth most common technical issue, with a WMS of 2.02 (Table 9), was the "Lack of interest and non-availability of extension personnel in time," which could be related to fewer field visits by extension agencies.

Table 9. Rank wise distribution of institutional problems in eri silkworm rearing faced by the erirearers

Sl. No.	Problems	WMS	Rank
a.	Lack of need-based training	2.56	I
b.	Lack of coordination among rearers and extension agencies	2.25	III
c.	Less linkage between CSBs, sericulture department and other related institution	2.53	II
d.	Lack of interest and non-availability of extension personnel in time	2.02	IV

Measures suggested by farmers to solve the difficulties experienced by them

The respondents provided open-ended recommendations, opinions, or actions to address various challenges faced in tapioca cultivation in their respective localities, as summarized in Table 10. All respondents (100%) urged the government to take adequate measures by establishing various programs for infrastructure, machinery, and rearing equipment to support erirearers. 95.83% favouredproviding need-based training and demonstrations to erirearers. 81.67% suggested preventing the exploitation of commission agents. 72.50% believed in establishing suitable marketing channels to ensure fair returns for their produce. 66.67% recommended facilitating contact between erirearers and sericulture experts for timely information and solutions. 60.00% suggested the relevant department should provide subsidies to active eri farmers. 54.10% proposed providing adequate training on by-product making or value-added product processing to tribal women for additional income. 50.00% encouraged extensive plantation of secondary feed plants like Tapioca and Borkessaru to address feed shortages during castor crises. 45.00% recommended the government and sericulture department establish new community rearing centers, expand existing ones, and encourage private ericulture farms. Around 40.00% urged the state government to acquire wasteland and allocate it to local cooperatives, self-help groups, or diligent rearers for silk production expansion and addressing feed plant shortages to enhance cocoon output.

Table 10. Measures suggested by the respondents to solve problems regarding eri culture(if possible please do not split the table on 2 pages)

Sl. No.	Problems	F	%	Rank
1.	To assist erirearers the government should take appropriate measures by launching various schemes for infrastructure, machinery and rearing equipment.	120	100	I
2.	Eri rearers should be given instruction and demonstrations tailored on their specific needs.	115	95.83	II
3.	Co-operatives or self-help group should be formed to do away with the function of middleman traders who take advantage of the rearers by offering a low price for the cocoon.	98	81.67	III
4.	There should be proper marketing channels in place so that manufacturers may earn a good return on their products.	87	72.50	IV
5.	Contacts between erirearers and sericulture specialists should be made available so that information and timely solutions may be obtained	80	66.67	V
6.	Subsidies should be provided by the concerned authority to those who are truly involved in eri culture.	72	60.00	VI
7.	The government should give adequate training on biproduct making or value-added product processing to tribal women for earning extra income	65	54.10	VII
8.	Extensive plantation of secondary feed plants such as Tapioca, Borkesseru, etc. can also be encouraged to	60	50.00	VIII

	fulfillthe lack of feed leaves for eri silkworms during the castor crisis.			
9.	The government should work with the department of sericulture to create new community rearing centre, expand the ones that already exist, and encourage private business owners to start ericulture farms	54	45.00	IX
10.	The state government should purchase wasteland and give the same to the local cooperatives, self-help groups (if any), or diligent rearers for the expansion of silk production in order to fulfil the lack of feed plants for silkworms and to enhance cocoon output.	48	40.00	X

Conclusions

The study identified various issues faced by erirearers, including personal challenges like lack of formal education, time constraints due to family obligations, and lack of prior experience. Social issues such as lack of glamour, high labour wages, and lack of support from family and community were also reported. Land utilization problems, including lack of owned land and knowledge on proper utilization, were highlighted. Regarding eri silkworm rearing, the major issues were lack of rearing area, improved reeling machines, proper post-cocoon operation facilities, cocoon storage, seed availability, and diseases in silkworms and host plants. Managerial difficulties included inadequate knowledge on protection measures, scientific practices, and untimely input supply. Economic concerns revolved around lack of capital, complex loan procedures, delays, inadequate loans, and high interest rates. Marketing issues encompassed price fluctuations, poor infrastructure, and lack of knowledge on proper marketing techniques. Transportation challenges included high vehicle hiring costs, lack of personal vehicles, and poor road conditions. Institutional issues involved lack of need-based training, poor linkages between relevant institutions, lack of cooperation between rearers and extension agencies, and unavailability of extension personnel. Respondents suggested measures such as need-based training, government support for infrastructure and equipment, formation of cooperatives to avoid middlemen exploitation, effective marketing channels, financial assistance, training for value-added products, establishment of community rearing centers, acquisition of wasteland for silk production expansion, and extensive plantation of secondary feed plants.

References

Ahmed, S. A., and Rajan, R. K. (2011, December). Exploration of Vanya silk biodiversity in north eastern region of India: Sustainable livelihood and poverty alleviation. *In Proceedings of the international conference on management, economics and social sciences*,(MESS'11), Bangkok (pp. 485-489).

Hatibaruah, D.; Borah, D. and Saikia, N. (2021). Constraints perceived by farmers in adoption of sericulture production technologies in Jorhat district of Assam. *International Journal of Agricultural Science and Research*, 11(2): 175–182.

Mushtaq, R., Qadiri, B., Lone, F. A., Raja, T. A., Singh, H., Ahmed, P., and Sharma, R. (2023). Role of Sericulture in Achieving Sustainable Development Goals. *ProblemyEkorozwoju*, 18(1).

Phukan, R. (2022). Entrepreneurship development by agro-based farm in assam: optimism and opportunities (with special reference by muga, eri, and mulberry silk entrepreneur). *Journal of Positive School Psychology*, 1132-1156.

Savithri, G., Sujathamma, P., and Neeraja, P. (2013). Indian sericulture industry for sustainable rural economy. *International journal of Economics, commerce and research*, 3(2), 73-78.

Sericulture Annual Report. Note on Sericulture, Central Silk Board; c2022. p. 18-19.

Ssemugenze, B., Esimu, J., Nagasha, J., & Wandui Masiga, C. (2021). Sericulture: Agro-based industry for sustainable socio-economic development: A review.

Statistical Handbook, Assam; c2022. P. 121

Statistical Handbook, Assam; c2023. P. 136