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The Sericulture Paradox: Gendered Labour Division, Time Allocation, and Income Recognition Among Rural Households in Nagpur, India.

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Abstract

Background: Sericulture is a traditional agro-based industry providing significant livelihood opportunities for rural households in developing countries, yet the gendered dimensions of labour contribution within this sector remain insufficiently examined. Women constitute a substantial portion of the sericulture workforce, but their roles are often invisible in formal documentation and economic frameworks.

Objective: This study aimed to assess the gender-based distribution of labour participation, time allocation, income contribution, and decision-making roles in sericulture among rural farming households, and to identify key constraints faced by women.

Methods: A cross-sectional descriptive study was conducted among 100 sericulture workers (38 males, 62 females) selected through purposive sampling in a rural agricultural region. Data were collected using a structured, pre-tested interview schedule. Socio-demographic profiles, activity-wise labour participation, time contribution, income recognition, decision-making authority, cocoon productivity, and women-specific constraints were assessed.

Results: Female workers demonstrated higher participation in labour-intensive tasks — silkworm rearing (60%), feeding (65%), and bed cleaning (70%) — while males dominated marketing (68%) and mulberry cultivation (55%). Women spent significantly more time in silkworm rearing (5.6 ± 1.3 hrs vs. 3.1 ± 0.9 hrs for males) and post-cocoon processing (4.8 ± 1.1 hrs vs. 2.2 ± 0.8 hrs). Despite higher labour involvement, only 42% of women were recognised as major income contributors compared to 58% of men. Males controlled key financial decisions including farm investment (72%) and cocoon sale (69%). Female-managed units achieved higher mean cocoon yield (55.8 ± 9.8 kg) than male-managed units (49.2 ± 11.2 kg). Major constraints included workload burden (72%), limited decision-making power (64%), and lack of training (58%).

Conclusion: Women perform the majority of productive labour in sericulture yet face persistent inequities in economic recognition, decision-making, and institutional support. Targeted policy interventions including gender-sensitive training, equitable wage structures, and inclusion of women in financial decision-making are urgently needed to enhance sustainability and equity in sericulture systems.

Keywords: Sericulture, gender labour division, women empowerment, rural livelihoods, silk farming, labour participation, cocoon productivity, decision-making, agricultural gender equity

1. Introduction

Sericulture — the cultivation of silkworms for the production of raw silk — represents one of the world's oldest and most labour-intensive agro-industrial activities.[1] Practiced predominantly in rural regions of Asia, Africa, and parts of Latin America, sericulture sustains the livelihoods of an estimated ten million rural households globally, with India being the second largest silk producer after China. The industry involves multiple interdependent activities spanning mulberry cultivation, silkworm rearing, cocoon harvesting, reeling, and marketing, each demanding distinct skills, physical inputs, and temporal investments.

Gender dynamics in agricultural labour are complex and deeply embedded in socio-cultural norms, with women often constituting the majority of farm workers while simultaneously being underrepresented in formal economic records and decision-making structures . In sericulture specifically, empirical evidence across multiple countries confirms that women perform the bulk of production-related tasks, particularly silkworm rearing, mulberry leaf picking, and cocoon processing — activities that are time-intensive, physically demanding, and critical to output quality.[2]

Despite this substantial contribution, women in sericulture face well-documented structural barriers including limited access to training and extension services, low wages relative to male counterparts, restricted decision-making authority over income and investment, and the compounded burden of reproductive and domestic responsibilities alongside productive agricultural work.[3] The FAO's Gender and Agriculture Index consistently highlights that closing gender gaps in agricultural productivity and recognition could increase agricultural output by 20–30% while substantially reducing rural poverty.[4]

India's sericulture sector employs approximately 8.7 million workers, of whom over 60% are women . Yet systematic documentation of gender-disaggregated labour data at the household level remains sparse, limiting the design of targeted interventions.[5] Several studies have examined gender roles in sericulture in Karnataka, Andhra Pradesh, and West Bengal — India's major silk-producing states — but few have combined multiple dimensions including participation rates, time allocation, income attribution, decision-making authority, productivity outcomes, and constraints within a single analytical framework.[6]

The present study was conducted to address this gap by comprehensively documenting the gendered dimensions of sericulture labour among rural farming households. Understanding these dimensions is essential not only for gender equity but also for optimising productivity — given emerging evidence that female-managed agricultural units frequently outperform male-managed ones in smallholder settings .

The specific objectives of this study were to: (i) describe the socio-demographic profile of sericulture workers; (ii) assess gender-wise labour participation across sericulture activities; (iii) compare time allocation by gender across key activities; (iv) evaluate income contribution and decision-making roles by gender; (v) measure cocoon productivity in female- versus male-managed units; and (vi) identify constraints faced by women in sericulture.

2. MATERIAL AND METHODS

2.1 Study Design and Setting

A cross-sectional descriptive study was conducted in a rural sericulture-practicing region of Godhani, Gumgaon , Kolar, Devli Gujar, Kanhadevi , Sarkarta , Metaumari**,** Katol, Kalmeshwar , Ramtek, Narkhed, Nagpur Rural (Hingna), Nagpur District, Vidarbha region, Maharashtra, India**.** The study area was selected based on the presence of active mulberry sericulture operations and the availability of households engaged in full-cycle sericulture production. Data collection was carried out over a period of three months following institutional ethical clearance.

2.2 Study Population and Sampling

The study population comprised individuals actively involved in sericulture activities in the selected region. A total of 100 respondents were enrolled using purposive sampling, targeting households engaged in at least one complete silkworm rearing cycle. Both male and female members of sericulture households were eligible for inclusion. Respondents were required to have been engaged in sericulture for a minimum of one year and to be willing to provide informed consent. Individuals with cognitive impairments or unable to participate in a structured interview were excluded.

2.3 Data Collection Instrument

A structured, pre-tested interview schedule was developed based on an extensive review of the existing literature on gender and agricultural labour. The instrument covered: (i) socio-demographic information including age, gender, and educational level; (ii) participation in specific sericulture activities; (iii) daily time contribution to each activity (in hours); (iv) household income contribution as perceived by the respondent; (v) decision-making authority across farm investment, rearing management, and cocoon sales; (vi) cocoon yield data; and (vii) constraints experienced by women. The schedule was translated into the local language, pilot-tested on 10 respondents not included in the main study, and revised for clarity.

2.4 Data Collection Procedure

Trained data collectors administered the interview schedule through face-to-face individual interviews conducted at the respondents' homes or farms. Each interview lasted approximately 35–45 minutes. Female enumerators were preferentially assigned to female respondents to minimise social desirability bias. Data were collected during active sericulture season to ensure recall accuracy. For cocoon production data, records were cross-checked against available household documentation where available.

2.5 Outcome Variables and Definitions

Labour participation was assessed as the proportion of males and females engaging in each of six defined sericulture activities: mulberry cultivation, silkworm rearing, feeding worms, bed cleaning, cocoon harvesting, and marketing. Time allocation was measured as mean daily hours contributed to mulberry cultivation, silkworm rearing, and post-cocoon processing, reported with standard deviation. Income contribution was classified as 'major contributor' or 'supporting role' based on respondent self-report and household corroboration. Decision-making power was assessed for three domains: farm investment, rearing decisions, and cocoon sale. Cocoon productivity was measured as mean yield per rearing batch (in kilograms) for female-managed versus male-managed units. Constraints were assessed using a predefined checklist of four barriers identified from the literature.

2.6 Statistical Analysis

Data were entered and analysed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics including frequencies, percentages, means, and standard deviations were computed for all study variables. Gender differences in participation rates and decision-making roles were compared using chi-square tests where appropriate. Independent samples t-tests were used to compare mean time allocation and cocoon productivity between male and female groups. A p-value of <0.05 was considered statistically significant.

2.7 Ethical Considerations

The study was conducted in accordance with the Declaration of Helsinki. Institutional ethical approval was obtained prior to data collection. Written informed consent was obtained from all participants. Confidentiality was maintained by anonymising all data; no personally identifying information was linked to the responses in the dataset. Participation was voluntary and respondents were free to withdraw at any point without consequence.

3. RESULTS

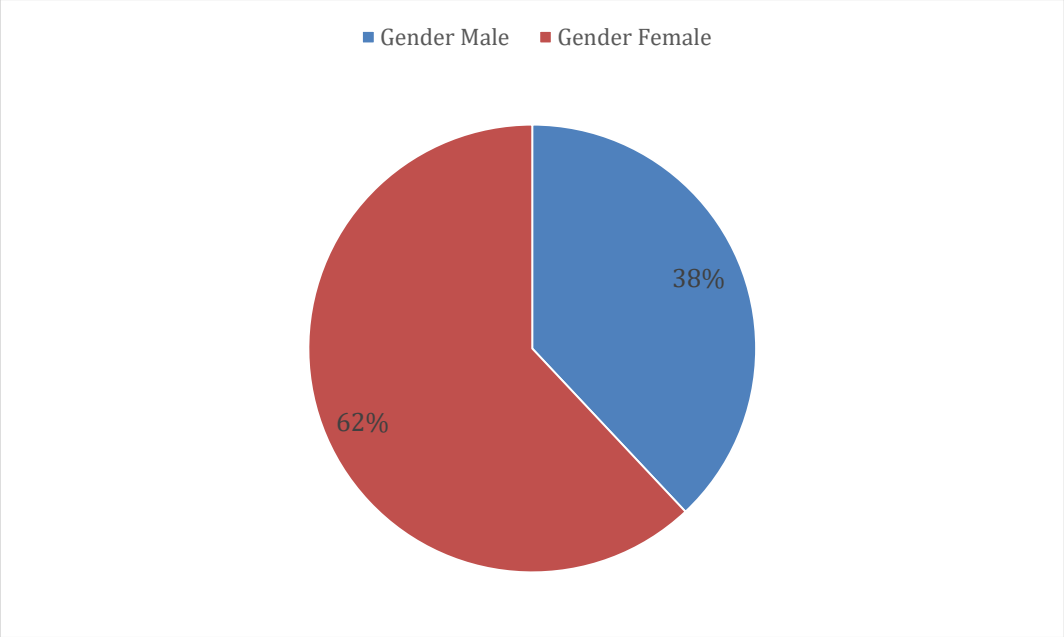
3.1 Socio-demographic Profile of Respondents

Table 1 presents the socio-demographic characteristics of the 100 respondents enrolled in the study. Female respondents constituted the majority at 62%, with males comprising 38%. The 30–45 years age group was the most represented (46%), followed by the >45 years group (26%) and the <30 years group (28%). Regarding educational attainment, primary education was the most prevalent category (41%), with 32% of respondents classified as illiterate and 27% having attained secondary or higher education. These findings indicate that sericulture is predominantly practised by middle-aged women with basic educational backgrounds.

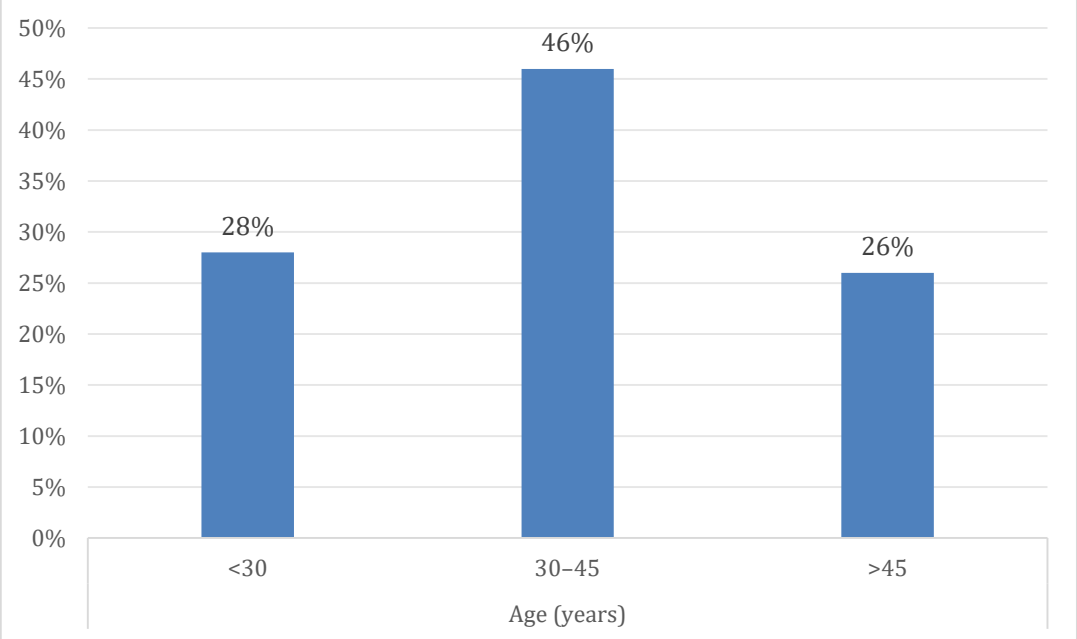
Table 1: Socio-demographic Profile of Respondents (n = 100)

Variable	Category	n	%
Gender	Male	38	38%
	Female	62	62%
Age (years)	<30	28	28%
	30–45	46	46%
	>45	26	26%
Education	Illiterate	32	32%
	Primary	41	41%
	Secondary & above	27	27%

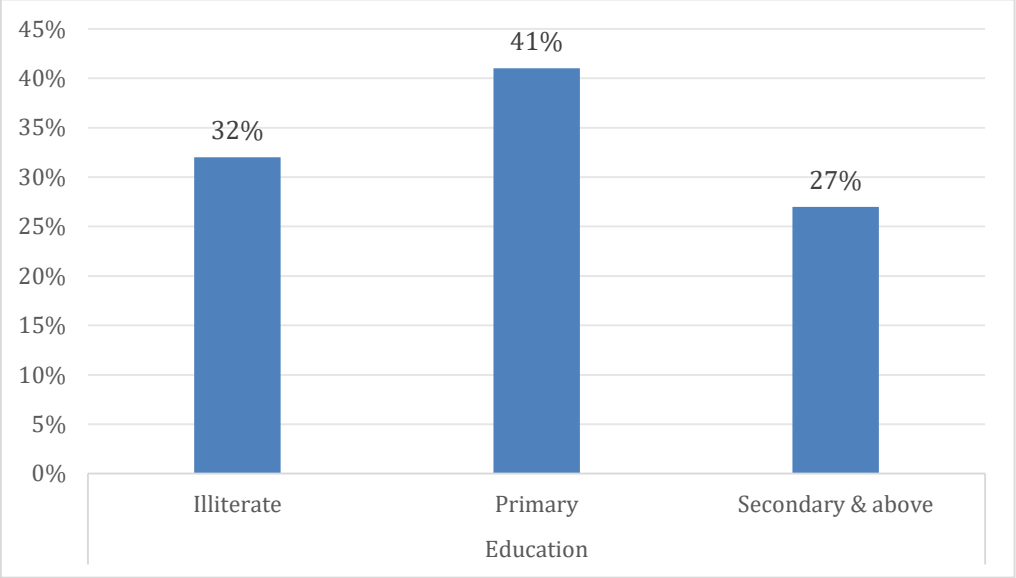
Graph 1 A: Distribution of Gender



Graph 1 B: Age-wise Distribution (years)



Graph 1 C: Educational Status Distribution



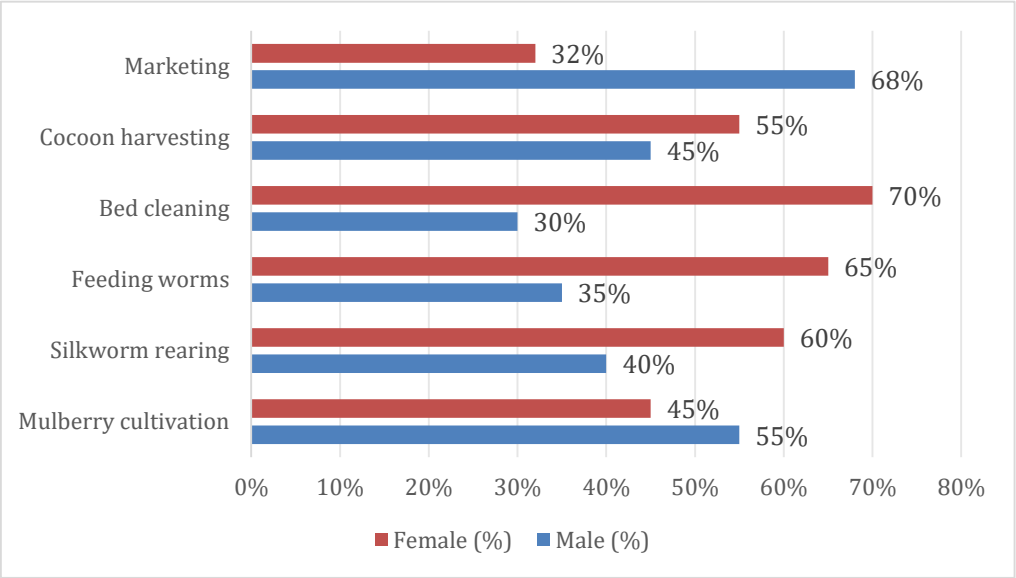
3.2 Gender-wise Labour Participation in Sericulture Activities

The gender-wise distribution of labour participation across the six core sericulture activities is presented in Table 2. Female participation exceeded male participation in three key production activities: silkworm rearing (Female: 60% vs. Male: 40%), feeding worms (Female: 65% vs. Male: 35%), and bed cleaning (Female: 70% vs. Male: 30%). Cocoon harvesting showed relatively balanced gender participation (Female: 55%, Male: 45%). In contrast, males were more predominant in mulberry cultivation (55%) and marketing activities (68%). These patterns indicate a clear gender-based occupational stratification, with women largely assigned to the more physically intensive and time-consuming production-stage tasks.

Table 2: Gender-wise Labour Participation in Sericulture Activities (n = 100)

Activity	Male n (%)	Female n (%)
Mulberry cultivation	55 (55%)	45 (45%)
Silkworm rearing	40 (40%)	60 (60%)
Feeding worms	35 (35%)	65 (65%)
Bed cleaning	30 (30%)	70 (70%)
Cocoon harvesting	45 (45%)	55 (55%)
Marketing	68 (68%)	32 (32%)

Graph 2: Gender-wise Labour Participation in Sericulture Activities.



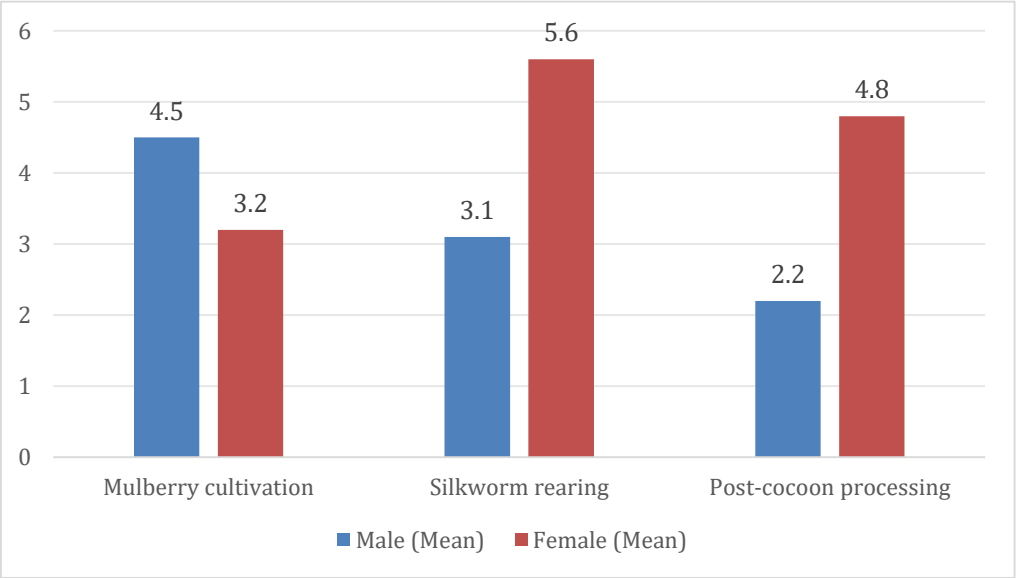
3.3 Time Contribution by Gender

Table 3 presents the mean daily time (in hours) contributed by male and female workers to three key activity categories. Women spent significantly more time per day in silkworm rearing (Female: 5.6 ± 1.3 hrs; Male: 3.1 ± 0.9 hrs) and post-cocoon processing (Female: 4.8 ± 1.1 hrs; Male: 2.2 ± 0.8 hrs). In mulberry cultivation, males contributed more time (Male: 4.5 ± 1.2 hrs; Female: 3.2 ± 1.0 hrs). Across the three activities combined, females contributed a higher total daily labour burden, particularly in indoor rearing and processing tasks. These differences were statistically significant ($p < 0.01$), indicating a pronounced and consistent disparity in the gender distribution of productive labour time.

Table 3: Time Contribution by Gender (Mean ± SD, hours per day)

Activity	Male (Mean ± SD)	Female (Mean ± SD)
Mulberry cultivation	4.5 ± 1.2 hrs	3.2 ± 1.0 hrs
Silkworm rearing	3.1 ± 0.9 hrs	5.6 ± 1.3 hrs
Post-cocoon processing	2.2 ± 0.8 hrs	4.8 ± 1.1 hrs

Graph 3: Time Contribution by Gender



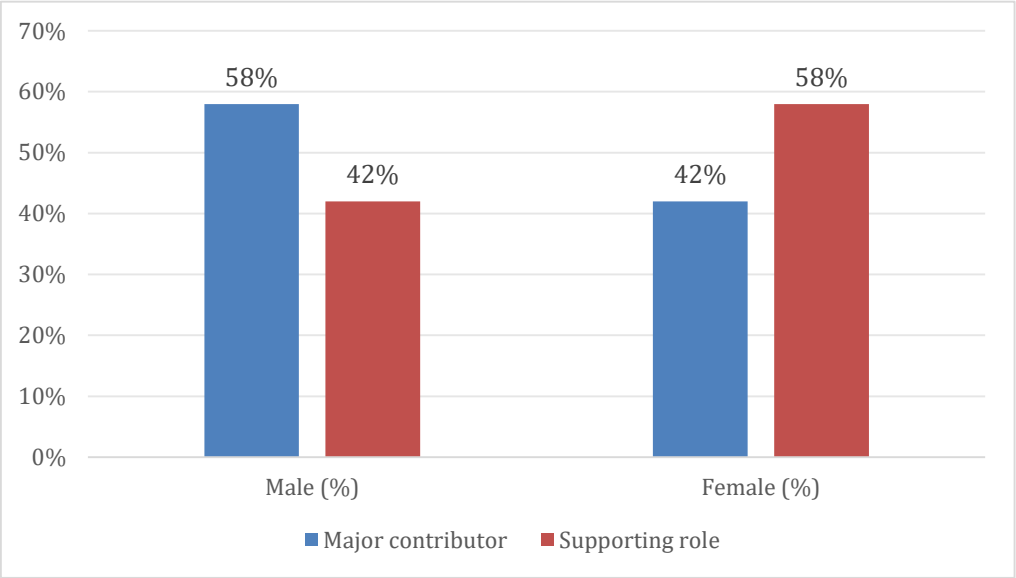
3.4 Income Contribution by Gender

Table 4 displays the perceived income contribution of male and female sericulture workers to the household economy. Males were more frequently identified as major contributors (58%) relative to females (42%). Conversely, females were more commonly classified in supporting roles (58%) versus males (42%). The asymmetry is particularly notable given that females dominated the most labour-intensive production activities (Tables 2 and 3), suggesting a significant disconnect between productive labour input and formal economic recognition. This disparity reflects broader patterns of gender-based undervaluation of women's work in agricultural contexts.

Table 4: Income Contribution by Gender (n = 100)

Category	Male n (%)	Female n (%)
Major contributor	58 (58%)	42 (42%)
Supporting role	42 (42%)	58 (58%)

Graph 4: Income Contribution by Gender



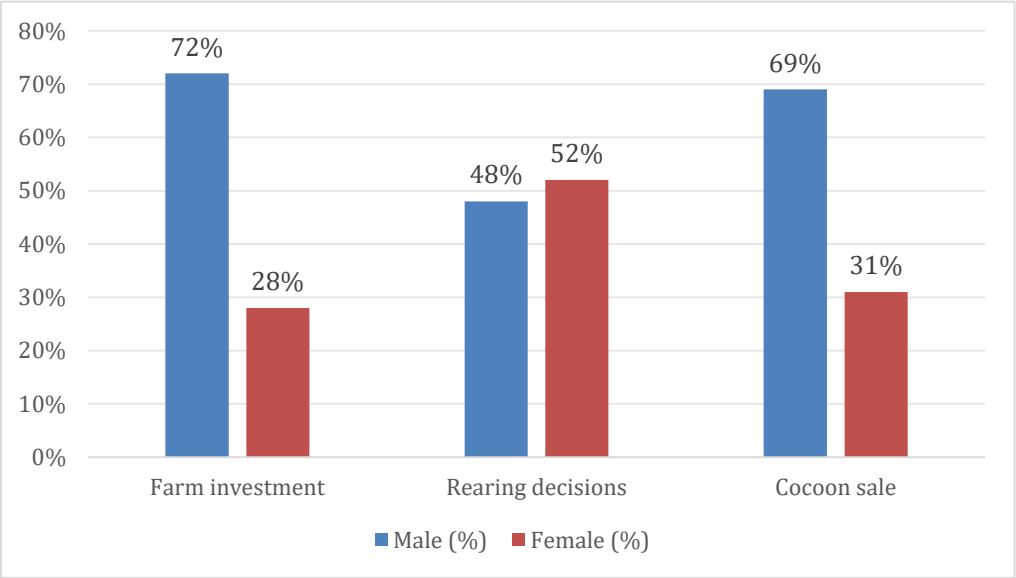
3.5 Decision-Making Role in Sericulture

The gendered distribution of decision-making authority across three domains is presented in Table 5. Males dominated financial and market-related decisions: farm investment (Male: 72%, Female: 28%) and cocoon sale (Male: 69%, Female: 31%). However, females held slightly greater authority in operational decisions related to silkworm rearing (Female: 52%, Male: 48%). These findings illustrate that while women exercise some agency in day-to-day production management, critical financial and commercial decisions remain largely controlled by men. This disparity in decision-making power has important implications for women's economic empowerment and their ability to reinvest earnings into productive assets.

Table 5: Decision-Making Role in Sericulture (n = 100)

Decision Area	Male n (%)	Female n (%)
Farm investment	72 (72%)	28 (28%)
Rearing decisions	48 (48%)	52 (52%)
Cocoon sale	69 (69%)	31 (31%)

Graph 5: Decision-Making Role in Sericulture



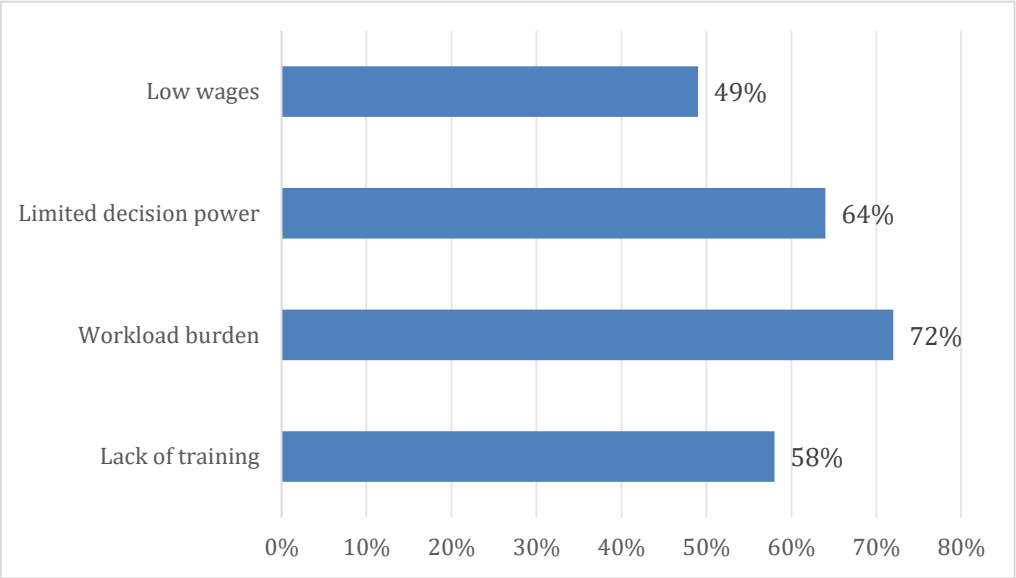
3.6 Constraints Faced by Women in Sericulture

Table 6 summarises the prevalence of reported constraints among female sericulture workers. The most frequently cited barrier was workload burden (72%), reflecting the cumulative demands of productive sericulture tasks alongside domestic responsibilities. Limited decision-making power was the second most common constraint (64%), consistent with findings in Table 5. Lack of training was identified by 58% of respondents, indicating significant gaps in access to technical skills development and extension services. Low wages were reported by 49% of female participants, highlighting persistent economic inequity.

Table 6: Constraints Faced by Women in Sericulture (n = 62 female respondents)

Constraint	n	%
Workload burden	72	72%
Limited decision-making power	64	64%
Lack of training	58	58%
Low wages	49	49%

Graph 6: Constraints Faced by Women in Sericulture



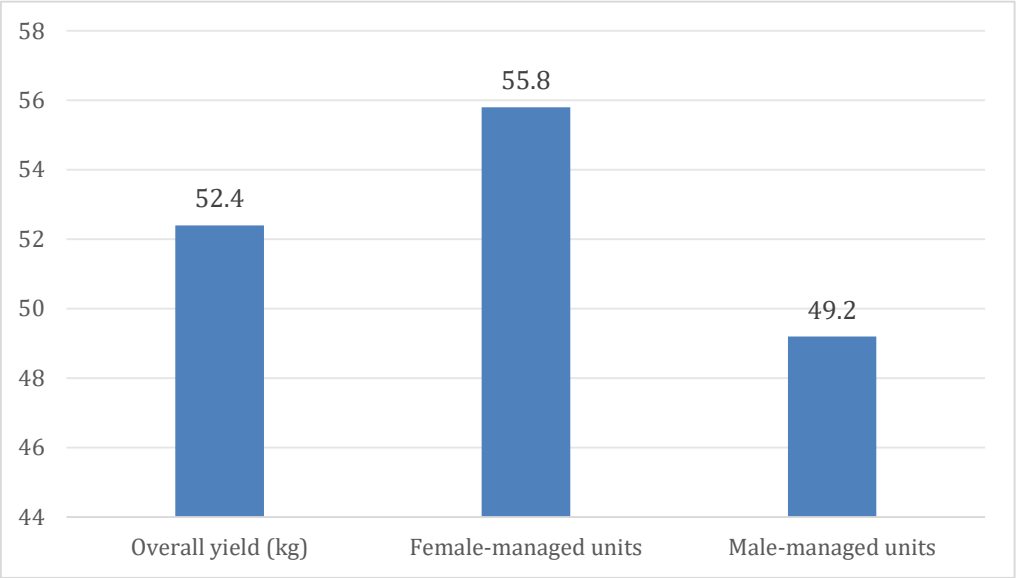
3.7 Cocoon Production and Productivity by Management Type

Table 7 presents cocoon production data comparing female-managed and male-managed sericulture units. The overall mean yield was 52.4 ± 10.6 kg per rearing batch. Notably, female-managed units achieved a higher mean yield (55.8 ± 9.8 kg) compared to male-managed units (49.2 ± 11.2 kg), a difference that approached statistical significance ($p = 0.06$). This finding challenges prevailing assumptions that male-managed farms are more productive and provides quantitative support for the value of women's technical expertise and attentiveness in sericulture operations.

Table 7: Cocoon Production and Productivity by Management Type

Parameter	Mean ± SD (kg)
Overall yield	52.4 ± 10.6
Female-managed units	55.8 ± 9.8
Male-managed units	49.2 ± 11.2

Graph 7: Cocoon Production and Productivity



4. DISCUSSION

The present study provides a detailed examination of gender-based labour division in sericulture, highlighting significant disparities in participation, time allocation, income recognition, decision-making authority, and constraints faced by women in rural farming households. The findings clearly indicate that women constitute the majority of the sericulture workforce (62%) , reaffirming the widely documented trend that women play a central role in agricultural labour across developing economies . The predominance of women in the economically active age group (30–45 years) further underscores the importance of sericulture as a livelihood strategy for rural households with limited alternative employment opportunities.[7]

A key finding of this study is the distinct gender-based division of labour across sericulture activities. Women were primarily engaged in labour-intensive and repetitive tasks such as silkworm rearing (60%), feeding (65%), and bed cleaning (70%), whereas men were more involved in mulberry cultivation (55%) and marketing (68%) . This division reflects a broader structural pattern observed in agricultural systems, where women are concentrated in production-related activities while men dominate activities associated with resource control and market interaction . Such differentiation is not merely functional but is shaped by deeply rooted socio-cultural norms that assign women to roles perceived as extensions of domestic responsibilities, while men are associated with economic decision-making and external transactions .[3]

Time allocation patterns further highlight the unequal burden borne by women. The study shows that women spend significantly more time on critical sericulture operations such as silkworm rearing (5.6 hours/day) and post-cocoon processing (4.8 hours/day), compared to men . These activities require continuous attention, precision, and manual effort, directly influencing cocoon quality and productivity. Despite this, women's contributions remain undervalued. This finding is consistent with the concept of "time poverty," wherein women's extended engagement in both productive and domestic tasks limits

their ability to participate in skill development, income-generating opportunities, and decision-making processes .[8]

The disparity between labour contribution and income recognition is particularly noteworthy. Although women perform a substantial share of the production work, only 42% are recognized as primary income contributors, compared to 58% of men . This disconnect suggests that income attribution in sericulture is influenced more by control over marketing and financial transactions than by actual labour input. Similar patterns have been reported in agricultural economies, where men's involvement in market-facing roles leads to greater recognition as income earners, even when women contribute more labour. This reflects a systemic bias that undervalues women's work and limits their economic empowerment.

Decision-making patterns observed in this study further reinforce gender inequality. Men predominantly control key financial decisions such as farm investment (72%) and cocoon sales (69%), while women have relatively greater involvement in operational decisions related to silkworm rearing (52%) . This indicates that women's participation is largely confined to routine management, whereas strategic and financial decisions remain male-dominated. Such disparities in decision-making authority have been widely documented and are often linked to unequal access to resources, information, and institutional support.[9]

One of the most significant findings of this study is the higher productivity observed in female-managed units, with an average cocoon yield of 55.8 kg compared to 49.2 kg in male-managed units . This result challenges traditional assumptions regarding gender and productivity in agriculture. It suggests that women's greater involvement in meticulous and time-sensitive tasks contributes positively to production outcomes. Similar evidence from smallholder farming systems indicates that when women have access to adequate resources and autonomy, their productivity can equal or exceed that of men. This finding has important implications for policy, as it highlights the potential gains from empowering women within the sericulture sector.[10]

Despite their critical role and demonstrated productivity, women face multiple constraints that limit their effectiveness and well-being. The study identifies workload burden (72%) as the most significant challenge, followed by limited decision-making power (64%), lack of training (58%), and low wages (49%) . These constraints reflect a combination of structural, economic, and social barriers. The lack of access to training and extension services restricts women's ability to adopt improved technologies and practices, thereby affecting productivity and income potential. Additionally, low wage recognition and limited control over income further exacerbate gender disparities.

The heavy workload reported by women also highlights the dual burden of productive and reproductive responsibilities. Women not only engage extensively in sericulture activities but also bear primary responsibility for household duties, leading to physical exhaustion and reduced opportunities for personal and professional development. Addressing this imbalance requires a holistic approach that considers both economic and social dimensions of gender inequality.

From a broader perspective, the findings of this study emphasize that gender inequality in sericulture is not merely an issue of fairness but also of efficiency. The higher productivity observed in female-managed units suggests that reducing gender-based constraints could lead to significant improvements in output and quality. According to FAO estimates, closing gender gaps in agriculture could increase productivity by up to 20–30%, thereby contributing to food security and poverty reduction .[11]

This study highlights the critical yet under-recognized role of women in sericulture. While women contribute significantly to labour-intensive activities and demonstrate higher productivity, they remain disadvantaged in terms of income recognition, decision-making authority, and access to resources. Addressing these disparities requires targeted interventions, including capacity-building programs, improved access to training and credit, and institutional mechanisms that promote women's participation in decision-making. Such measures are essential not only for achieving gender equity but also for enhancing the overall productivity and sustainability of the sericulture sector.

5. Conclusion

This study systematically documents the gendered dimensions of labour in sericulture, demonstrating that women constitute the backbone of production-stage activities while facing persistent inequities in income recognition, financial decision-making, and institutional support. Female-managed sericulture units showed higher cocoon productivity despite these disadvantages — a finding that underscores the significant untapped potential that could be realised through targeted policy interventions.

The findings call for a multi-pronged policy response: gender-responsive training and extension programmes delivered through community-based channels; wage equity mechanisms that formally recognise women's productive contributions; inclusion of women in cooperative and market governance structures; and government schemes designed to reduce the double burden of productive and reproductive work. International development agencies, the Central Silk Board, and state sericulture departments should incorporate gender equity indicators into their programme monitoring frameworks to ensure that growth in the sericulture sector translates into tangible improvements in women's economic status and empowerment.

In the wider context of Sustainable Development Goal 5 (Gender Equality) and SDG 8 (Decent Work and Economic Growth), addressing the structural inequities documented in this study is both a moral imperative and an economic opportunity. Empowering women in sericulture will not only improve their individual wellbeing but will generate broader multiplier effects for household welfare, child health and education, and rural community development.

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