Factor and ~~constrains~~ constraints involved in income generation from sericulture: a study in three districts of West Bengal

Abstract

Sericulture is an important sector ~~in~~ for income generation in rural ~~area~~areas. Socio-personal and management factors along with relevant ~~constrains~~ constraints were identified for income generation from sericulture in West Bengal. A total of 127 respondents were taken under the three districts *i.e*., Murshidabad, Nadia and South 24 Pargana. ~~Total~~ A total 14 socio-personal and 7 management factors were taken as independent variables and were statistically analyzed to understand their relationship with dependent variable income (y). The statistic used ~~were~~ was correlation coefficient (*r*). Only 7 from socio-personal and 5 from management variables were found positively correlated with income. A total of 14 and 3 ~~constrains~~ constraints were identified against mulberry and cocoon production, respectively. For mulberry production, 7 ~~constrains~~ constraints were disease-pest related where root rot disease and tukra pest (mealy bug) contributed 8.66% and 18.11% with 6th and 1st rank respectively. For cocoon production 2 ~~constrains~~ constraints were solely disease related where grasserie infection and muscardine infection contributed 62.20% and 29.92% with 1st and 2nd rank respectively. In the socio-personal and management ~~category~~categories, a total of 4 major ~~constrains~~ constraints were identified against income generation. However, based on the findings, it is to be mentioned that for any future income generation policy in sericulture, care should be taken on identified factors and constraints based on their importance identified in this study.

Keywords

Sericulture, farmer's income, ~~constrains~~constraints, socio-management factor.

Introduction

Sericulture is ~~considering~~ ~~considered~~as ~~a~~ labor-intensive ~~agriculture oriented~~agriculture-oriented cultural ~~practices~~ practicethat promotes ~~employments~~ employmentto a large number of people worldwide for quality silk production. In India, it provides a solid livelihood of approximately 7.5 million people, in addition to a few allied businesses (ITC - Silk Review, 2001). It ~~had~~ hasbeen reported that this cash crop pays well to the marginal as well as large farmers with an average annual income of around rupees 40,000/hectare (Jagannath 1995; Chatterjee et al. 2015). Sericulture controls the migration of rural people to urban areas in search of jobs and income (Savithri et al. 2013) followed by providing a year-round source of income contributing to the rural economy's dynamism and vitality (Dewangan 2011). In sericulture, ~~the~~ improved cultural practices and new technology adoption ~~behaviour~~ behaviorplays vital role in income generation followed by improvement of quality ~~life style~~lifestyle and socio-economic standard of the rural population (Raju et al. 2017). Sericulture is practiced in fewer concentrated areas of West Bengal than in the other traditional ~~silk producing~~silk-producing states (*e.g*., Karnataka, Andhra Pradesh, Tamil Nadu, Jammu and Kashmir), as evidenced by the largest number of sericulture families per village ratios, *i.e.*, 48.9 percent in West Bengal (CSB, Ministry of Textiles, Govt. of India., 2003; Roy et al. 2013). As a result, spatial concentration is one of West Bengal's unique characteristics, which would result in the uneven development of a specific region as a result of this livelihood (Roy & Mukherjee 2015; Roy & Sarkar 2015).

Mulberry sericulture serves ~~the~~ social objectives like providing off-farm employment of the farmers from leaf production to cocoon marketing through various steps involved in it. Gaps are noticed in the production of quality cocoon for better ~~economy~~ economicreturn due to several

~~constrains~~constraints associated with these practices. Ultimately, farmers are getting low returns due to the poor productivity of mulberry leaf followed by poor quality of cocoon production in comparison to other ~~agricultural~~ crops. It ~~had~~ hasbeen reported that mulberry production is hampered due to ~~constrains~~constraints like; disease-pest ~~attack~~ attacks(Ramkumar 1997; Mishra 2001), poor knowledge on manure application (Shivalingaiah et al. 1999), shortage of irrigation water (Shivamurthy 1988; Mathaiya 1997), poor technological know-how (Dayananda Patel 1985), unavailability of improved mulberry variety (Gopala 1991), poor extension support (Kumar et al. 1999) etc. Similarly, in quality cocoon production the~~constrains~~constraints are reported mainly on poor knowledge about disease-pest control (Srinivasalu 1991; Gopala and Krishna 1993; Singhvi et al. 1994, Nikhade et al. 1995), cocoon marketing issues (Sreenivasa 1989; Kumar et al. 1994, Jagadisha 1999) etc. Planning for a suitable intervention strategy to bridge this gap, it is necessary to identify the constraints faced by the farmers ~~under~~ incertain ~~region~~regions.

The present study envisages ~~to assess~~assessing the socio-economic and management factors and related constraints facing by the sericulture farmers at ~~grass root~~the grassroots level in relation to generate higher income in sericulture enterprise.

Materials and methods

Study area and sampling

The present study was puposively conducted in the block Nabagram and Khargram in Murshidabad district, Karimpur-II in Nadia district and Kulpi block ofSouth 24 Pargana district of West Bengal followed by our previous study locale (Sengupta et al. 2023). Total 10 number of villages were selected randomly from the selected blocks.Personal interview method was carried

out with randomly selected a total of 127 respondents. The socio-personal and management variables are denoted as 'x_n' whereas income is denoted as 'y' (table 1).

Statistical data analysis

The collected independent data of 21 variables were statistically measured by coefficient of correlation (*r*) using SPSS software to understand and identify the degree of relationship in between independent variables with dependent variable income.

Constraints data collection and analysis

The respondents were asked to mention the constraints they experienced in mulberry production and cocoon production Later, the identified constraints are categorized as socio-personal and management constraints.Further in one category there is differences in importance among different constraints. Importance of constraints vary from farmer to farmer. The constraints under each category were ranked based on their percentage of importance to the total respondents. The number of respondents and percentage of contribution are summarized s per table 2. The graphical representation of the same are shown in figure 3 for mulberry production and figure 4 for cocoon production under three districts.

Results and discussion

Relationship status between independent and dependent variables

The correlation coefficient (r) of the farmer's income (y) ~~in~~ concerning~~respect to~~ all independent variables (x_1-x_{21}) ~~were~~ was established. Individually, all the independent socio-personal variables (x_1-x_{14}) and management variables (x_{15}-x_{21}) were analyzed with dependent variable income (y) using correlation coefficient (table 1) and graphically presented in ~~figure~~ Figure1&2. Amongst 14 independent socio-personal variables 7 were found positively correlated and they are x_1, x_5, x_6, x_7, x_{11}, x_{12}, and x_{13} in which x_6, x_7, x_{12}, x_{13} showed 1% significant level whereas the

remaining seven variables x_2, x_3, x_4, x_8, x_9, x_{10} and x_{14} were found negatively correlated ~~with respect to~~concerning dependent variable income (y) which are summarized in table 1. For income (y), the variable 'production of mulberry leaf per unit area in kilograms' (x_{17})showed highest positive value (0.796) and whereas 'no. of employment days / year / labour' (x_{19})showed the highest negative value (-0.216) at 5% significant level. It means income directly depends on the 'production of mulberry leaf per unit area in kilograms' while the 'no. of employment days/year/labour' hampers the income. Again, amongst the independent socio-personal variables 'economic motivation' (x_{12})is found having highest positive correlation with income indicating a social message to the rural unemployed youth and farmers to start practicing sericulture for income generation.

Assessment of socio-personal and management variables for income generation

Among all agricultural activities, sericulture farmers found to be experienced with a set of factors where more the 'land holding' (x_6), the more the income (y) generation from here. Farmers having more ~~lands~~land, has more scope to continue sericultural activities at maximum level by establishing more mulberry garden, and silk production units which will ultimately promote income. The 'area under mulberry cultivation' (x_7) plays a significant role in getting more income from sericulture because more area under sericulture for different activities like plantation, silk worm rearing, cocoon production etc. will provide more employment opportunity to the family member. 'Economic motivation' (x_{12}) also triggers a favorable attitude of farmers towards achieving higher income from sericulture. Farmers who already motivated economically are ready to adopt new improved package & practices with recommended technologies to increase production in sericulture and thus generate more income. In other way, the 'economic motivation' also encourages the farmers to upgrade their knowledge level about how to update

themselves for modern communication and marketing ~~channel~~channels, and technology adoption behaviour which further ~~enhanced~~ enhancesthe income. 'Marketing support' (x_{13}) is ~~an important backup system for higher income from sericulture too~~also an important backup system for higher income from sericulture. A well-defined marketing strategy leads to an increase of income from sericulture which directly helps them to reach out the production. With a strong and wide marketing support, a sericulture farmer can sale the production nationally and internationally. 'Number of family member engaged in sericulture' (x_{16}) activities has a positive impact on income generation. As many as a greater number of family members is efficient in sericulture activities there will be less demand for outside labour. As a result, there will be a save in labour cost and income will be more. 'The production mulberry leaf per unit area' (x_{17}) is an important variable for getting higher income in sericulture. If the leaf production is more, then more number of silkworms rearing is possible followed by more number of cocoon production will be achieved. Therefore, production of mulberry leaf is positively correlated and significant for income generation in sericulture. Again 'no. of employment days/ year/labour' (x_{19}) has negative impact for income because more the number of employment days, more will be the labour engagement and it will lead to more payment for labour followed by increase of operational cost. Hence, the total cost for production will be higher and profit will be lesser and thus the number of employments days has negative impact on income generation of sericulture farmers.

~~Constrains~~Constraints faced by the respondents

In table 2, the rank-wise identified ~~constrains~~constraints are summarized of this study which are grouped into general ~~constrains~~constraints, socio-personal and management ~~constrains~~constraints. The number of respondents and percentage of contribution are graphically

represented in figure 3 for mulberry production and in figure 4 for cocoon production under the three districts.

In general category, the ~~constrains~~constraints are identified against mulberry production and cocoon production related issues. A total of 14 ~~constrains~~constraints are recorded against mulberry production activities in which 7 are disease-pest related. Major disease as ~~constrains~~constraints is identified of root rot disease and pest of tukra (mealy bug) of mulberry plant where they have contributed 8.66% and 18.11% respectively. Apart from disease-pest, about 10.24% contribution is recorded for poor supply of manure and disinfectants. On the other hand, a total of 3 ~~constrains~~constraints are recorded against cocoon production in which 2 are solely disease related *i.e*., grasserie infection and muscardine infection where they contributed 62.20% and 29.92% respectively. Interestingly, cocoon market related issue is identified of 7.88% as ~~constrains~~constraints for selling the cocoons specifically in south 24 pargana district.

In socio-personal and management category, a total of 4 major ~~constrains~~constraints are identified which have direct effects on farmer's income generation (table 3). The socio-personal factors 'land holding' and 'marketing support' are recorded as major ~~constrains~~constraints whereas 'poor mulberry production' and 'benefit-cost ratio' are recorded as management ~~constrains~~constraints. Overall, farmers those are having small amount of cultivation land, less production of mulberry leaves and hence less income generation which ultimately affect the benefit-cost ratio.

The candidate manuscript does not have a robust scientific discussion, I suggest the authors incorporate the suggested paragraphs, in this way it would improve the scientific quality of the manuscript:

This study on the factors and constraints involved in income generation from sericulture in three districts of West Bengal holds significant scientific relevance in the context of rural development and agricultural economics. The identification and analysis of 14 socio-personal and 7

management factors as independent variables, and their correlation with income, contribute valuable insights into the intricate dynamics of sericulture-based income generation. By employing statistical measures such as correlation coefficients, the study establishes a nuanced understanding of the factors influencing income in this sector.

The comparison with socioeconomic studies in agricultural territories of Latin America underscore the universality of challenges faced by rural communities engaged in income generation through agriculture (Campos, 2014a; Camacho et al. 2018; Guevara et al. 2012a). While the specific variables may differ, the broader framework of identifying socio-personal and management factors, along with constraints, aligns with the methodology employed in similar agricultural studies in Latin America (Campos, 2014b; Cortez et al. 2016; Campos, 2023). This cross-regional analysis enhances the generalizability of findings and contributes to the broader scientific discourse on sustainable rural development (Olivares and Franco, 2015; Olivares et al. 2017).

The identification of constraints against mulberry and cocoon production, particularly the disease-pest-related challenges, provides actionable information for policymakers and stakeholders (Rodriguez et al. 2015; Hernandez and Olivares, 2020; Olivares et al. 2020). The study's emphasis on specific issues such as root rot disease, tukra pest, grasserie infection, and muscardine infection, with associated percentages and rankings, adds precision to the understanding of challenges faced in sericulture. Furthermore, the identification of major constraints in socio-personal and management categories offers a comprehensive perspective on the multifaceted nature of obstacles hindering income generation (Guevara 2012b; 2013; Zingaretti et al. 2016).

In conclusion, this study contributes significantly to the scientific literature on sericulture and agricultural income generation. Its findings not only offer practical insights for policymakers and practitioners in West Bengal but also establish a comparative framework with agricultural studies in Latin America, contributing to the broader field of rural development and agricultural economics (Olivares, 2014; Montenegro et al. 2021a). The identified factors and constraints should inform future policies aimed at enhancing income generation in the sericulture sector, fostering sustainable economic development in rural communities (Montenegro et al. 2021b; Pitti et al. 2021).

Conclusion

In West Bengal, sericulture is mostly done by small and marginal farmers. These farmers are mostly unable to earn their revenue from their livelihood due to social and management problems. Development initiatives are not enough to strengthen the hands of these small and marginal farmers, resulting a deduction to obtain the most benefits because of those socio-economic and management issues. This research study has been carried out to identify the socio-personal and management factors and sericulture related ~~constrains~~constraints those are associated with farmer's income. However, based on the findings of this study, if the identified

factors can be addressed in terms of income generation, the income of sericulture farmers will increase in the future.

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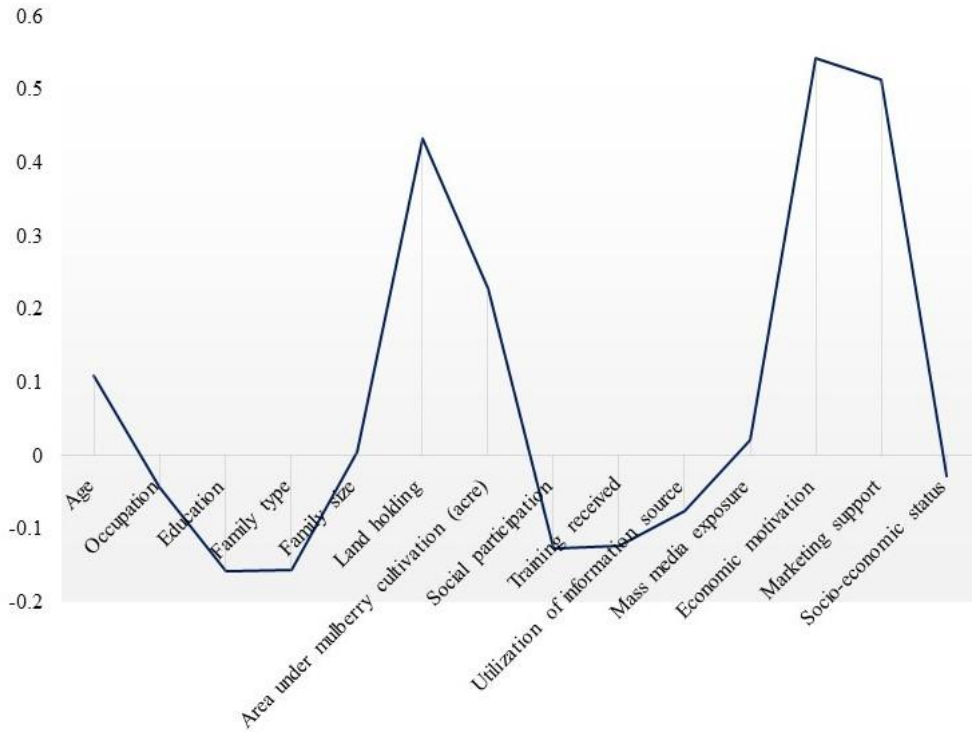

Fig. 1: Graphical representation of correlation coefficient (r) values of socio-personal variables (x_1-x_{14}) against farmers' income (y).

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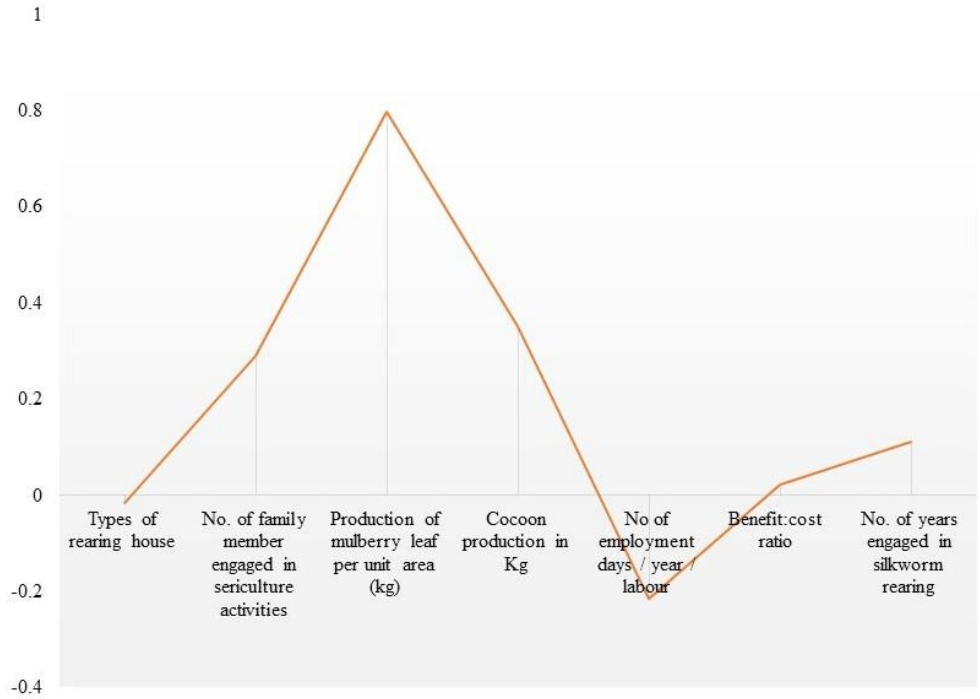

Fig. 2: Graphical representation of correlation coefficient (r) values of management variables (x_{14}-x_{21}) against farmers' income (y).

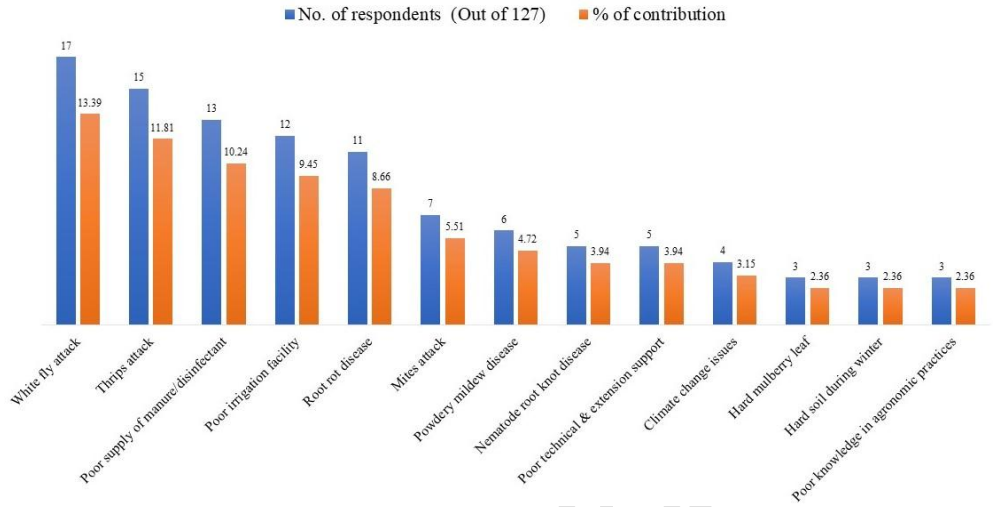

Fig. 3: Graphical presentation of identified ~~constrains~~constraints and % contribution in mulberry production.

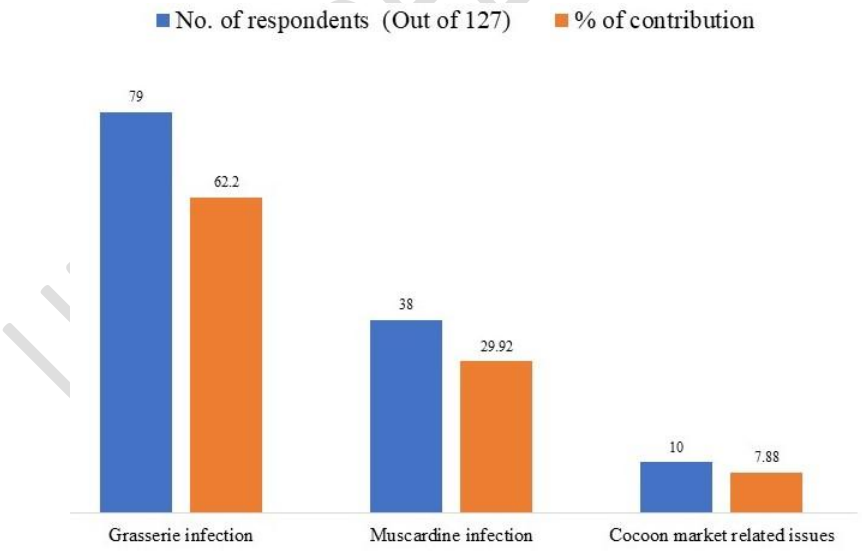

Fig. 4: Graphical presentation of identified ~~constrains~~constraints and % contribution in cocoon production.

Table 1: Correlation coefficient (*r*) of income (y) with the causal variables ($x_1 - x_{21}$).

Sl. no.	Independent variables	Symbol	'*r*' value
	Socio-personal variables		
1.	Age	x_1	0.109
2.	Occupation	x_2	-0.043
3.	Education	x_3	-0.159
4.	Family type	x_4	-0.157
5.	Family size	x_5	0.004
6.	Land holding	x_6	0.432**
7.	Area under mulberry cultivation (acre)	x_7	0.228**
8.	Social participation	x_8	-0.128
9.	Training received	x_9	-0.123
10.	Utilization of information source	x_{10}	-0.076
11.	Mass media exposure	x_{11}	0.021
12.	Economic motivation	x_{12}	0.541**
13.	Marketing support	x_{13}	0.512**
14.	Socio-economic status	x_{14}	-0.029
	Management variables		
15.	Types of rearing house	x_{15}	-0.018
16.	No. of family member engaged in sericulture activities	x_{16}	0.288**
17.	Production of mulberry leaf per unit area (kg)	x_{17}	0.796**
18.	Cocoon production in Kg	x_{18}	0.351**
19.	No. of employment days / year / labour	x_{19}	-0.216*
20.	Benefit:cost ratio	x_{20}	0.022
21.	No. of years engaged in silkworm rearing	x_{21}	0.111

**Correlation is significant at the 1% level.
*Correlation is significant at the 5% level.

Table 2. List of general ~~constrains~~constraints identified in this study.

Sl. No.	~~Constrains~~Constraints against mulberry production	No. of respondents (Out of 127)	% of contribution	Rank
1.	Tukra (Mealy Bug) attack	23	18.11	I
2.	White fly attack	17	13.39	II
3.	Thrips attack	15	11.81	III
4.	Poor supply of manure/disinfectant	13	10.24	IV
5.	Poor irrigation facility	12	9.45	V
6.	Root rot disease	11	8.66	VI
7.	Mites attack	7	5.51	VII
8.	Powdery mildew disease	6	4.72	VIII
9.	Nematode root knot disease	5	3.94	IX
10.	Poor technical & extension support	5	3.94	
11.	Climate change issues	4	3.15	X
12.	Hard mulberry leaf	3	2.36	XI
13.	Hard soil during winter	3	2.36	
14.	Poor knowledge in agronomic practices	3	2.36	
Sl. No.	**~~Constrains~~Constraints against cocoon production**	**No. of respondents (Out of 127)**	**% of contribution**	**Rank**
1.	Grasserie infection	79	62.20	I
2.	Muscardine infection	38	29.92	II
3.	Cocoon market related issues	10	7.88	III

Table 3. List of Socio-personal and management ~~constrains~~constraints identified for income.

Domain	Socio-personal	Management
Income	• Small amount of land holding, • Poor marketing support	• Low rate production of mulberry leaves,

		• Lower Benefit: cost ratio