



Assessment of Socio-Personal and Management Factors Affecting Farmer's Income from Sericulture in West Bengal, India

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Abstract

Among all the agricultural practices, sericulture plays a vital role in income generation by the rural population worldwide. In India, West Bengal is such a state where sericulture had been introduced long back and farmers are being economically benefitted from it. Several factors associated with sericulture and allied activities becoming challenging here and hence income is being critically hampered. In this situation, our study was conducted to assess the farmer's income in respect to a total of 21 socio-personal and management variables associated with sericulture. A total of 127 respondents were selected randomly at village level under the three districts of West Bengal *i.e.*, Murshidabad, Nadia and South 24 Parganas. The independent 14 socio-personal and 7 management variables were statistically analyzed using path and regression analysis. Path analysis showed the direct effect on X_{17} , X_6 , and X_{13} which have been substantial and occupied the 1st, 2nd and 3rd position respectively, in terms of modal values. The extracted regression equation showed that the variables X_6 , X_{13} , X_{17} , and X_{20} were critically affected on the predicted character income (y). However, based on the findings of this study, if the identified factors can be addressed in terms of income generation, the number of sericulture farmers and overall progress will increase in the future.

Keywords: - farmer's income, path analysis, regression analysis, sericulture, socio-management factor.

Introduction

Sericulture is an agriculture-based, labor-intensive cultural practices which promotes employments to a large number of rural people worldwide generating a consistent stream of revenue throughout the year (Dewangan 2013). It provides a successful livelihood of an approximately 7.5 million people in India (ITC - Silk Review 2001) and in addition to its allied and other businesses (Girish *et al.*, 2020). Generally, the success of any agricultural endeavour and their future prospects are significantly influenced by the socio-economic background of a farmer. This is also true in case of the sericulture sector, where various types of management skills developed by the farmers can help to increase their income and ultimately lead to an increased generation in profit from the business.

The sericulture industry is mainly categorized into two major sectors; agricultural, and industrial. Growing of food plants and rearing of silkworms to produce cocoons and eggs are all part of farming, whilst industry includes reeling, twisting, dyeing, printing, finishing, and knitting (Sharma and Kapoor 2020; Ssemugenze *et al.*, 2021). As a result of its short gestation period (Ganga & Chetty 1991), lower requirements for investment and high employment potential, sericulture has become a promising rural occupation in India (Bharathi 2016). It improvises the socio-economic standard and life-style of the rural people by generating sufficient employment and income opportunities followed by

controlling the migration of people from rural areas to urban areas in search of jobs for income (Kiruthika et al., 2017; Ekka and Bais 2023). Sericulture is conducted under a few districts of West Bengal unlike other traditional silk producing states in India (CSB, Ministry of Textiles, Govt. of India 2003) and as a result, spatial concentration is one of the unique characteristics of West Bengal, which leads in uneven development of a specific region resulting poor livelihood (Roy & Mukherjee 2015; Roy & Sarkar 2015). Income generation from sericulture and factors affecting on it had already been assessed previously through hypothesis and survey-based data analysis (Roy & Mukherjee 2015; Shabreentaj et al., 2022; Sengupta et al., 2023). In this study, we have assessed the socio-personal and management factors as causal variables of the sericulture farmers of West Bengal associated with income generation at domestic level.

Material and Methods

Locale of study area and sampling

The study was conducted under the three districts of West Bengal i.e., Murshidabad, Nadia, and South 24 Parganas where sericulture is prominent compared to the other districts. Sericulture had occupied a stable position for long time in the said districts and farmers are highly responsive which helped us to judge their income sustainability and to carry out the survey intensively. The pilot study was executed by personal interviews with a total of 127 respondents randomly at village level under the district's blocks. The purposive studies were conducted under the block Nabagram and Khargram in Murshidabad district, Karimpur-II in Nadia district and Kulpi in South 24 Parganas district. The independent socio-personal and management variables denoted as 'x_n' and dependent income variable denoted as 'y' used in this study are shown in table 1.

Table1: Path Analysis - Direct, Indirect and Residual effect of antecedent variables on the dependent variable Income (y)

No.	Variables	Total Effect	Direct Effect	Indirect Effect	Highest Indirect Effect
x ₁	Age	0.109	0.024	0.085	0.092 (x ₁₃)
x ₂	Occupation	-0.043	0.102	-0.145	-0.055(x ₁₇)
x ₃	Education	-0.159	-0.050	-0.109	-0.064 (x ₁₇)
x ₄	Family type	-0.157	-0.015	-0.142	-0.105 (x ₁₇)
x ₅	Family size	0.004	-0.023	0.027	0.052 (x ₁₃)
x ₆	Land holding	0.432	0.298	0.134	0.188 (x ₁₇)
x ₇	Area under mulberry cultivation (acre)	0.228	-0.176	0.404	0.247 (x ₆)
x ₈	Social participation	-0.128	0.084	-0.212	-0.151 (x ₁₃)
x ₉	Training received	-0.123	-0.053	-0.070	-0.130 (x ₁₃)
x ₁₀	Utilization of information source	-0.076	-0.087	0.011	0.071 (x ₁₄)
x ₁₁	Mass media exposure	0.021	0.107	-0.086	0.051 (x ₁₄)
x ₁₂	Economic motivation	0.541	0.041	0.500	0.281 (x ₁₇)
x ₁₃	Marketing support	0.512	0.294	0.218	0.252 (x ₁₇)
x ₁₄	Socio-economic status	-0.029	0.138	-0.167	-0.082 (x ₁₃)
x ₁₅	Types of rearing house	-0.018	0.064	-0.082	-0.055 (x ₁₃)
x ₁₆	No. of family member engaged in sericulture activities	0.288	0.047	0.241	0.142 (x ₁₇)
x ₁₇	Production of mulberry leaf per unit area (kg)	0.796	0.523	0.273	0.141 (x ₁₃)
x ₁₈	Cocoon production in kg	0.351	0.115	0.236	0.191 (x ₁₇)
x ₁₉	No of employment days / year / labour	-0.216	-0.076	-0.140	-0.086 (x ₁₇)
x ₂₀	Benefit: cost ratio	0.022	-0.244	0.266	0.093 (x ₁₃)
x ₂₁	No. of years engaged in silkworm rearing	0.111	0.077	0.034	0.031 (x ₆)

Statistical analysis

The collected independent data of 21 variables were statistically analyzed by *path* and *regression* using SPSS software to understand and identify the degree of effectiveness on dependent variable income. In path analysis, direct, indirect and residual effect of antecedent variables whereas in regression analysis, two-step and multiple steps were recorded respectively on the dependent variable income.

Ethical consideration

The ethical approval has been obtained from the Ethical Committee of Raiganj University, West Bengal, India vide ref no. 06/EA/RGU/2023 dated 28th November 2023.

Results

Path analysis and dependencies among the independent variables

The table 1 & figure 1a represents the direct, indirect and residual effect of 21 exogenous variables (x_1 - x_{21}) on the dependent variable income (y) of sericulture farmers of West Bengal. Result showed that the direct effect of 'production of mulberry leaves' (x_{17}), 'land holding' (x_6), and 'marketing support' (x_{13}) have been substantial and occupied the 1st, 2nd and 3rd rank respectively in terms of modal values. The indirect effect of 'economic motivation' (x_{12}), 'area under mulberry cultivation' (x_7) and 'production of mulberry leaves' (x_{17}) have also been found substantial in characterizing the performance of other variables indirectly. This implies that the implicit effects of all these variables on the other are substantial and imbibing. It has found that the highest indirect effect of as many as 9 variables had been routed through the variable production of mulberry leaves (fig. 1b). The residual effect is being 0.241, it indicates that even with the combination of these 21 variables 24.10 per cent of the variability of the predicted character, *i.e.*, income from sericulture, could not be explained.

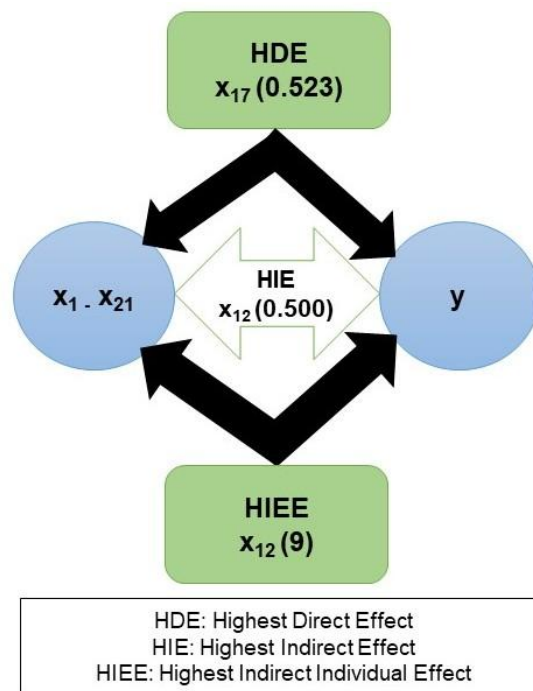


Fig. 1a: Path diagram showing the effect of antecedent variables on income (y).

Regression analysis among all the independent variables (x_1 - x_{21}) for income (y)

The two-step (table 2) and multiple regression (table 3) were extracted separately for income (y) as the dependent variable and MDS (Minimum Data Set) as the predictor set. The ' F ' value probability ranged from 0.05 to 0.10. It had been found that the variables 'land holdings' (x_6), 'marketing support'

(x_{13}), 'production of mulberry leaf per unit area' (x_{17}), and 'benefit – cost ratio' (x_{20}) were critically affected on the predicted character income (y). These variables were being pulled out with 69.80% impact out of total 76.00% impact exerted by total 21 causal variables on the consequent factor i.e., income (figure 2).

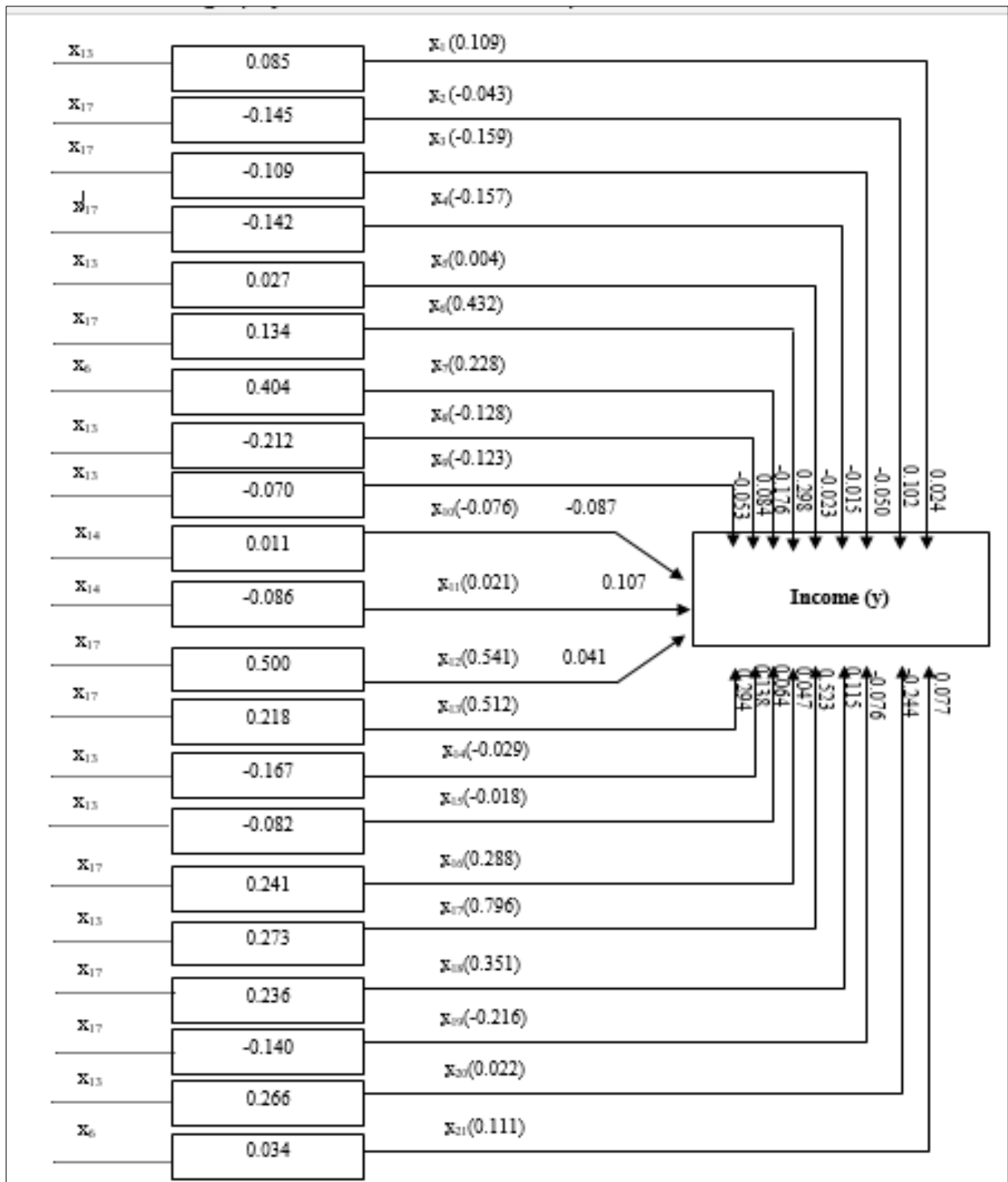


Fig. 1b: Path diagram showing the tendency of antecedent variables on income (y).

Table 2: Two-step regression analysis of the independent variables for income.

Income (y)	$43627.765 + 46.266 x_{17}^{**} + 20509.829 x_6^{**} + 7907.694 x_{13}^{**} - 112426.185 x_{20}^*$
	$R^2 = 0.698, \text{Adj. } R^2 = 0.688, \text{SE (est)} = 44553.55$

** : $P < 0.01$; * : $P < 0.05$

Table 3: Multiple regression analysis of income (y) vs. 21 causal variables (x_1 - x_{21}).

Variables	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
Age (x_1)	109.640	340.926	0.024	0.322	0.748
Occupation (x_2)	20688.970	11285.045	0.104	1.833	0.070
Education (x_3)	-2015.642	3206.629	-0.051	-0.629	0.531
Family type (x_4)	-2661.484	9243.225	-0.015	-0.288	0.774
Family size (x_5)	-1275.813	2955.406	-0.023	-0.432	0.667
Land holding (x_6)	41025.740	13651.250	0.299	3.005	0.003
Area under mulberry cultivation (acre) (x_7)	-28493.925	15830.046	-0.177	-1.800	0.075
Social participation (x_8)	10433.076	8946.452	0.086	1.166	0.246
Training received (x_9)	-5813.735	7432.553	-0.053	-0.782	0.436
Utilization of information source (x_{10})	-1037.012	822.880	-0.088	-1.260	0.210
Mass media exposure (x_{11})	2583.333	1683.085	0.107	1.535	0.128
Economic motivation (x_{12})	454.911	1085.971	0.039	0.419	0.676
Marketing support (x_{13})	10815.855	3544.399	0.296	3.052	0.003
Socio-economic status (x_{14})	5998.974	2995.311	0.139	2.003	0.048
Types of rearing house (x_{15})	13414.637	12676.825	0.065	1.058	0.292
No. of family member engaged in sericulture activities (x_{16})	2686.727	3526.388	0.048	0.762	0.448
Production of mulberry leaf per unit area (kg) (x_{17})	36.664	5.193	0.523	7.060	0.000
Cocoon production in kg (x_{18})	399.341	247.672	0.115	1.612	0.110
No of employment days / year / labour (x_{19})	-433.770	314.644	-0.077	-1.379	0.171
Benefit : Cost ratio (x_{20})	-200692.507	49532.194	-0.245	-4.052	0.000
No. of years engaged in silkworm rearing (x_{21})	407.033	302.369	0.078	1.346	0.181

[$R^2 = 76.00\%$, Adj. $R^2 = 71.20\%$ SE (est) = 42774.80]

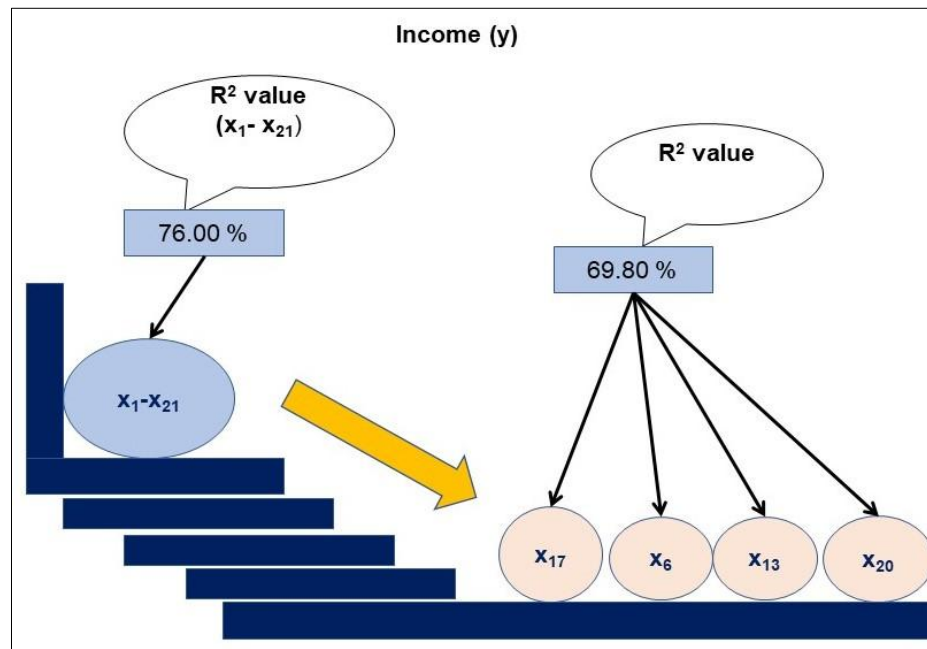


Fig. 2: Pictorial presentation of regression of income (y) and analysis of the responsive variables

Discussion

In path analysis several factors were identified among the 21 socio-personal and management variables which showed impact on farmer's income. As silkworm mainly feed on mulberry leaves, so if there is scope of more production of mulberry leaves, farmers can rear more silkworm. This in turn,

they will produce more cocoon and will get more amount of raw silk (Fambayun et al., 2022). Therefore, more income will be possible by selling more products. Again, it has been found that causal variable 'social participation' (x_8) exerts highest negative indirect effect on consequent variable income. Sericulture farmers who have more social participation get a chance to be introduced with new livelihood ideas with much better income as compare to other agricultural activities. As a result, lots of time they are changing their main livelihood option to other enterprise and keeping sericulture as secondary source of income (Rathore et al., 2019). As a result, income from sericulture is decreasing because of less investment in all aspects of sericulture. Experts in this sector believe that there is a big gap between farmer productivity and yield potential in West Bengal (Roy et al., 2012).

In regression analysis, it had been found that if 'land holding' is more naturally farmers will use more area for sericulture activities which will bring more production of mulberry leaves by area expansion of mulberry plantation. Additionally, if there are well managed 'marketing support' farmers can sell produce with higher profit (Bankar et al., 2023). So, more the benefit-cost ratio more will be income (Manjunatha et al., 2023). Here, in the study area the farmer and the family members who are working under different activities of sericulture and as a result his or her income about it are increasing day by day. More the number of family members more will be the chances of increase in income.

Conclusion

Sericulture is mostly done by small and marginal farmers in West Bengal, India, who are unable to grow their revenue due to social and management problems. Development initiatives have not been able to strengthen the hands of these small and marginal farmers, resulting in a deduction to obtain the most benefits for those socio-economic and management issues. Sericulture in West Bengal remains an unimproved rural-based sector reliant on unskilled laborers as compared to traditional silk-producing regions like Karnataka and Andhra Pradesh, owing to productivity disparities.

In this study, the assessment of social and management aspects connected with farmer income in sericulture is examined. However, based on the findings of this study, if the highlighted factors/variables can be addressed in terms of income, the number of sericulture farmers will increase in the future.

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Conflict of Interest:

The authors declare no conflict of interest.

References

- Bankar DR, Mahajan RS, Pushpalatha M and Thakre B (2023) Sericulture An Additional Source of Income. In book: *Novel Approaches in Plant Protection*. Integrated Publications, New Delhi pp.83-97. <https://doi.org/10.22271/int.book.330>
- Bharathi D (2016) Sericulture industry in India – A source of employment generation. *International Journal of Advanced Engineering Research and Science* 3(10):144-147. <https://dx.doi.org/10.22161/ijaers/310.23>
- Central Silk Board (2003) Sericulture & Statistics, CSB, Ministry of Textiles, Govt. of India.
- Dewangan S (2013) Livelihood opportunities through sericulture a model of gharghoda tribal block, Raigarh dist. *American Journal of Environmental Sciences* 9(4):343-347. <https://doi.org/10.3844/ajessp.2013.343.347>
- Ekka V and Bais P (2023) Contribution of Sericulture in the Socio-economic Transformation of the Workers. *Asian Journal of Applied Science and Technology* 7(2):217-224. <https://doi.org/10.38177/ajast.2023.7223>
- Fambayun RA, Agustarini R and Andadari L (2022) Cultivation and Breeding Techniques for Increase Silk Productivity in Indonesia. *Earth and Environmental Science* 995:012055. <https://doi.org/10.1088/1755-1315/995/1/012055>

Ganga G and Chetty J Sulochana (1991) An Introduction to Sericulture. IBH Publishing Company, Oxford and New Delhi. [ISBN-10- 9788120411791](https://doi.org/10.1007/9788120411791)

Girish CE, Kadian KS, Meena BS and Mandi K (2020) Socio-Economic Profile of Farmers in Sericulture Based Dairy Farming System in Karnataka State. *International Journal of Current Microbiology and Applied Sciences* 9(4):2071-2078. <https://doi.org/10.20546/ijcmas.2020.904.248>

ITC -Silk Review (2001) <http://www.intracen.org/> Date accessed 12/1/2014.

Kiruthika R, Ram D and Satyasiba B (2017) Vulnerability to climate change: a sub-regional analysis of socio-economic and agriculture sectors in Karnataka, India. *Journal of Development Policy and Practice* 2(1):24-55. <https://doi.org/10.1177/245513331667640>

Manjunatha GR, Sangannavar PA, Halagundegowda GR, Nazeer AS, Moorthy SM and Sivaprasad V (2023) Comparative economics of vanya with mulberry cocoon production in India. *Journal of Environmental Biology* 44:519-523. [https://doi.org/10.22438/jeb/44/3\(SI\)/JEB-01](https://doi.org/10.22438/jeb/44/3(SI)/JEB-01)

Rathore RA, Sonawane MA and Roy C (2019) Sericulture: An Economic Boon for Madhya Pradesh (special reference to Burhanpur District). *MPRA Paper No. 94843*. <https://mpra.ub.uni-muenchen.de/94843/>

Roy C and Mukherjee SR (2015) An analytical study on determinants of income generation in rural sericulture sector of West Bengal. *Indian Journal of Economics and Development* 3(2):168-180. SSRN: <https://ssrn.com/abstract=2606962>

Roy C, Mukherjee Sanchari SR and Ghosh S (2012). Sericulture as an Employment Generating Household Industry in West Bengal (A Study on its Current Problems & Prospects). *SSRN Electronic Journal* 1-31. <https://doi.org/10.2139/ssrn.2601924>

Roy P and Sarkar R (2015) Work Participation and Income Generation from Sericulture: A Case Study of Alomtola Village of Kaliachak-II Block in Malda District, West Bengal. *Social and Economic Geography* 1(1):31-36. <https://doi.org/10.12691/seg-1-1-5>

Sengupta M, Biswas S, Mallick P and Saha S (2023) Influence of Socio-personal and Management Factors to Generate the Knowledge Level of the Farmers Associated with Sericulture of West Bengal, India. *Asian Journal of Agricultural Extension, Economics & Sociology* 41(2):47–61. <https://doi.org/10.9734/ajaees/2023/v41i21847>

Shabreentaj H, Ashalatha KV, Poornachandra SH and Kambrekar DN (2022) Factors influencing on income generation of sericulturists. *The Pharma Innovation Journal* 11(11):335-338. [Dated 26-09-2-22.](https://doi.org/10.21961/tpi.1111.335-338)

Sharma K and Kapoor B (2020) Sericulture as a Profit-Based Industry – A Review. *Indian Journal of Pure & Applied Biosciences* 8(4):550-562. <http://dx.doi.org/10.18782/2582-2845.8210>

Ssemugenze B, Esimu J, Nagasha J, Masiga CW (2021) Sericulture: Agro-Based Industry For Sustainable Economic Development: A Review. *International Journal of Scientific and Research Publications* 11(9):474-482. <https://doi.org/10.29322/IJSRP.11.09.2021.p11756>