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Economizing waste: Cost-effective waste management in moriculture and sericulture

[1]Rashi MN, [2]YS Ramesha, [3]Dr. Kiran Kumar R Patil, [4]Dr. Basavaraj I Halingali and [5]Dr. NL Naveena

[1]PG Scholar, Department of Agricultural Economics, KSNUAHS, College of Agriculture, School of Post Graduation Studies, Main Campus, Iruvakki, Shivamogga, Karnataka, India

[2]Associate Professor, Department of Agricultural Economics, KSNUAHS, College of Agriculture, Shivamogga, Karnataka, India

[3]Assistant Professor, Department of Agricultural Economics, KSNUAHS, College of Agriculture, School of Post Graduation Studies, Main Campus, Iruvakki, Shivamogga, Karnataka, India

[4] Professor, Department of Agricultural Statistics, KSNUAHS, College of Agriculture, Shivamogga, Karnataka, India

[5]Assistant Professor, Department of Entomology, KSNUAHS, College of Agriculture, School of Post Graduation Studies, Main Campus, Iruvakki, Shivamogga, Karnataka, India

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Corresponding Author: Rashi MN

Abstract

Sericulture, an important agro-based rural enterprise in India, particularly in Karnataka, not only supports livelihoods but also generates significant organic waste such as leaf litter, silkworm litter, pierced cocoons and rearing bed residues. If left unmanaged, this waste poses environmental and health challenges; however, it holds potential for conversion into valuable products like compost, contributing to sustainable agriculture and improved farm economics. This study was conducted to assess the economics of efficient waste management in moriculture and sericulture through composting, with primary data collected from 30 farmers in Maddur and Malavalli taluks of Mandya district, Karnataka. Using the enterprise budgeting technique, the study estimated costs and returns associated with composting sericulture waste. Results showed that the average total cost incurred per acre per year was Rs. 25,472.20, of which variable costs dominated at Rs. 24,692.20, primarily due to human labour and cow dung inputs. The process yielded 19.55 tonnes of compost annually, generating gross returns of Rs. 36,167.50 and net returns of Rs. 10,695.30 per acre per year. The findings demonstrate that composting is economically viable and enhances income while reducing reliance on chemical fertilizers and improving soil fertility. The study supports the hypothesis that efficient waste management in sericulture can transform a disposal problem into a revenue-generating opportunity. With proper extension support, training and policy incentives, composting can play a strategic role in promoting sustainable practices and inclusive growth in the sericulture sector.

Keywords: Sericulture, moriculture, waste management, composting, enterprise budgeting, sustainable agriculture, economic analysis, mulberry

1. Introduction

Sericulture, derived from the Greek word *'sericos'* (silk) and the English word *'culture'*, is the rearing of silkworms along with mulberry cultivation. It represents a unique convergence of agriculture, traditional craftsmanship and modern industry, making it a vital component of rural livelihoods and agro-based economies. Globally, silk has been a symbol of luxury and elegance for millennia, with its origins tracing back to 2640 BC in ancient China. Today, silk is cherished for its natural luster, lightness and durability, earning it the title of the "Queen of Textiles." In India, sericulture holds immense socio-economic and cultural significance. It is a labor-intensive, rural-based enterprise that provides employment to over 92.6 lakh people, with a large share being women and small-scale farmers. India is the second-largest silk producer in the world, after China and is uniquely positioned as the only country producing all four major varieties of silk, Mulberry (76.82%), Eri (18.46%), Tasar (4.08%) and Muga (0.65%). Among these, Mulberry silk dominates the Indian silk industry, with production increasing from 31,906 metric tons in 2017-18 to 38,913 metric tons in 2023-24, owing to an expansion in the area under mulberry cultivation from 2.23 lakh hectares to 2.63 lakh hectares (PIB Report, 2025). Karnataka stands as the leading state in mulberry silk production, contributing 43 per cent of India's total silk output. The state's sericulture tradition dates back to the Mysore kingdom, where it was introduced by Tippu Sultan in 1785. Currently, Ramanagara district is recognized as the "Silk City" of India, with over 26,000 sericulturists, playing a pivotal role in India's silk economy (Annual Report, Department of Sericulture, 2023-24).

As sericulture evolves with modern technologies, it becomes imperative to examine its sustainability, especially in the context of waste management. The cultivation of mulberry and rearing of silkworms generate considerable

organic waste in the form of leaf litter, silkworm litter (frass), pierced cocoons, pupal waste and rearing bed residues. If left unmanaged, these wastes can pose environmental and health hazards. However, when appropriately handled, they hold significant potential to be converted into valuable by-products, aligning with the principles of circular economy and sustainable agriculture. Composting these residues not only addresses the problem of waste disposal but also transforms them into nutrient-rich organic manure, enhancing soil fertility and reducing dependency on chemical fertilizers. For example, silkworm litter is rich in nitrogen, phosphorus and potassium, making it a suitable input for organic farming. Studies have shown that vermicomposting of sericultural waste improves plant growth and can be economically beneficial for farmers by reducing input costs. The economic sustainability of sericulture, therefore, is closely tied to how effectively its by-products are managed. Converting waste to wealth not only improves farm income but also reduces the environmental footprint of the sector. Moreover, integrated waste management practices can create micro-enterprise opportunities, especially for women in rural areas, contributing to inclusive growth. In the backdrop of increasing emphasis on sustainable agricultural practices and resource recycling, sericulture offers a viable model. With proper extension support, training and policy incentives, waste management in sericulture can evolve into a revenue-generating component rather than a disposal challenge. This study, hence, aims to assess the economic benefits of modern technologies in sericulture and the sustainability of waste utilization, particularly composting, as a strategic approach to improving income and environmental outcomes in Karnataka's sericulture sector. In line with this aim, the study has been undertaken to access the economics of efficient waste management in moriculture and sericulture.

2. Materials and Methods

To work out the economics of efficient waste management in moriculture and sericulture, the primary data was collected from Mandya district, Karnataka, which ranks highest in cross-breed cocoon production in Karnataka. A multistage sampling procedure was employed, beginning with the purposive selection of Maddur and Malavalli taluks based on highest cross-breed silk cocoon production. From each taluk, two villages were chosen: Madarahalli and Harechaknalli (Maddur) and Banasandra and Anakanahalli (Malavalli). Data was gathered from a total of 30 farmers practicing composting in a relatively acceptable manner and the economics of waste management was worked out using the enterprise budgeting technique.

Enterprise Budgeting Technique

Economics of waste management in the form of composting was estimated using enterprise budgeting technique. It included costs, returns and profit associated with composting of sericulture wastes. Variable costs included expenditure on human labour for collection of sericulture waste after every rearing cycle, addition of cow dung slurry, watering, rotation of heap etc. Fixed costs included depreciation of equipment used in composting. Returns was estimated by multiplying quantity of compost produced with the prevailing market price of compost. Net returns or profit was arrived at by deducting total cost of composting in gross returns. The economics was worked out considering average number of DFLs reared per crop and the wastes generated thereof from the number of crops reared per year.

3. Results and Discussion

The economics of waste management from sericulture in the form of composting presented in Table 1, indicated that sample farmers on an average incurred total expenses of Rs. 25,472.20 per acre per year to process waste generated from all the rearing cycles in moriculture and sericulture. Availability of wastes depends on number of DFLs reared and number of rearing cycles undertaken. Sample farmers in the study region were found to practice 10 rearing cycles per acre per year with 200 DFLs per cycle. The number of DFLs reared relied on the dimension of sericulture unit, availability of mulberry leaves and human labour. For the study purpose, 30 farmers practicing composting were selected. The economics of composting indicated that the variable cost cornered lion share at Rs. 24,692.20. The cost of raw material i.e., sericulture waste, was accounted in the form of human labour required to collect the wastes after every rearing cycle and to dump in the slot meant for compost preparation. Hence, the major chunk of variable costs was human labour. Human labour was required to collect the wastes, form the heap, apply cow dung to speed up the process of composting, apply water to maintain optimum level of moisture, collection of compost ready to apply to the farm. The other crucial variable cost included cow dung which was used in the proportion of 70:30. Around five tractor loads of cow dung for speeding up the process of composting to 24.25 tonnes of sericulture waste on an average collected per year from 10 rearing cycles amounted to Rs. 12,000. The wastes were allowed to compost for a year. Farmers have hardly incurred fixed cost of Rs. 780 towards depreciation of minor equipment used in the process of composting like spades, baskets, buckets etc. On composting, farmers obtained close to 60 per cent of compost from sericulture wastes of 24.25 tonnes. The produced compost was multiplied by the prevailing price of compost of Rs. 1850 per tonne to obtained gross return of Rs. 36,167.50. Thus, farmers on composting sericulture wastes generated net returns of Rs. 10,695.30 per acre per year. The results are in similar line with the findings of Wani *et al*. (2019) [4], Chanotra *et al*. (2022) [6] and Ganesan *et al*. (2022) [7], who emphasized that vermicomposting sericulture waste have enriched the soil nutrient, lowered fertilizer costs and increased farmers's income. According to Manjunath *et al*. (2020) [5] and Kannihalli *et al*. (2024) [3] stated that successful use of sericulture by-products adds substantial economic value and increases the feasibility of sericulture as a livelihood alternative. The hypothesis of economic returns obtained from efficient waste management was accepted.

Table 1: Economics of sericulture waste management through composting (n=30)

Particulars	Qty	Rate (₹)	Value (₹)
A) Variable cost			
Labour (mandays)	34.00	373.30	12692.20
Sericulture waste generated (tons) / year from 200 DFLs per crop for 10 crops	24.25		
Cow dung (tons)	10.00	1200.00	12000.00
Total variable cost			24692.20
B) Fixed cost			
Depreciation of equipment used in composting			780.00
Total fixed cost			780.00
Total cost (A+B)			25472.20
C) Returns			
Sale of Manure (tons)	19.55	1850.00	36167.50
Net Returns			10695.30

4. Conclusion

The study clearly demonstrates that efficient waste management in sericulture, particularly through composting, offers a viable and economically beneficial solution to the problem of organic waste disposal. Farmers practicing composting in the Mandya district of Karnataka were able to generate notable net returns of Rs.10,695.30 per acre per year, primarily by converting sericultural waste into nutrient-rich compost. This not only reduced dependency on chemical fertilizers but also improved soil health, contributing to sustainable agricultural practices. The high share of variable costs, especially labour and cow dung, indicates the need for targeted interventions to improve cost efficiency. Moreover, the integration of composting into sericulture has the potential to enhance farm income, promote environmental sustainability and create rural employment opportunities, particularly for women. With appropriate policy support, training and extension services, waste management can evolve from a disposal challenge into a revenue-generating and environmentally sustainable component of the sericulture value chain. The findings underscore the importance of promoting circular economy practices within traditional agricultural sectors like sericulture to ensure long-term sustainability and inclusive growth.

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