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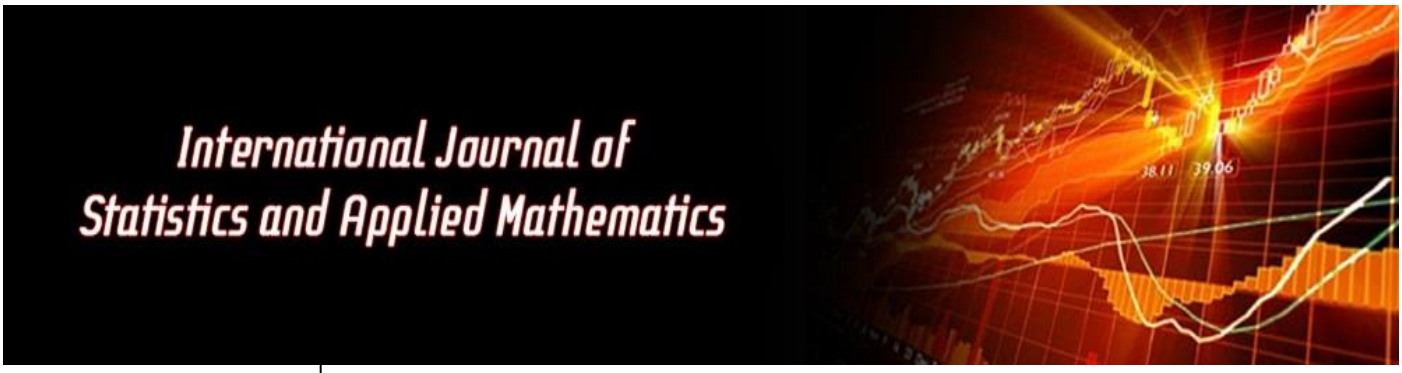


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**Susikaran S**
Directorate of Open Distance Learning, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu, India

**Bhuvana S**
Department of Sericulture, Forest College and Research Institute, Mettupalayam, Tamil Nadu, India

**Kiruthika C**
Department of Sericulture, Forest College and Research Institute, Mettupalayam, Tamil Nadu, India

**Karthick Mani Bharathi B**
Department of Sericulture, Forest College and Research Institute, Mettupalayam, Tamil Nadu, India

**Corresponding Author:**
**Kiruthika C**
Department of Sericulture, Forest College and Research Institute, Mettupalayam, Tamil Nadu, India

# Studies on cost and returns of cocoon production in Krishnagiri district of Tamil Nadu

**Susikaran S, Bhuvana S, Kiruthika C and Karthick Mani Bharathi B**

**Abstract**
This study examines the cost and returns of cocoon production in the Krishnagiri district of Tamil Nadu, a significant area for sericulture. By analyzing primary data from local sericulturists and secondary agricultural reports, the research identifies key factors affecting production costs, such as labor, inputs, and land use. Findings reveal that labor constitutes the largest expense, significantly impacting overall production costs. However, the study also highlights the potential for substantial returns on investment, especially for farmers employing best practices and efficient rearing techniques. The research underscores cocoon production's viability as an agricultural enterprise in Krishnagiri, contributing to local economies and providing employment opportunities. This study aims to inform stakeholders and policymakers about the economic dynamics of sericulture, promoting informed decisions to improve the livelihoods of farmers in the region.

**Keywords:** Constitutes, opportunities, promoting, informed

## Introduction
India is a unique country that produces four varieties of silk namely, Mulberry, Eri, Tasar and Muga. It is the second largest producer of silk after china with 43% share in the total silk production. In India, sericulture practiced in major five states are Karnataka, Andhra Pradesh, Tamil Nadu, West Bengal and Jammu Kashmir. Cocoon production plays a vital role in the silk industry, which is one of the oldest and most lucrative sectors in India. Tamil Nadu, particularly Krishnagiri district, has emerged as a significant player in sericulture, leveraging its favorable agro-climatic conditions and traditional farming practices. Sericulture not only provides farmers with an alternative source of income but also contributes to rural development, employment generation, and women's empowerment (Kumar *et al*., 2021) [1]. As the demand for silk continues to rise, it becomes increasingly important to analyze the economic viability of cocoon production in this region, focusing on its costs and returns.Cocoon production encompasses several stages, including the cultivation of mulberry, rearing of silkworms, and harvesting of cocoons. Production of high leaf yielding mulberry varieties is a major step towards high cocoon productivity. Various techniques *viz*., combining ability, mini clonal technology were used to producing novel mulberry varieties (Bhuvana *et al.*, 2020 and Kiruthika *et al.*, 2020) [7, 11]. Each stage involves specific costs related to inputs such as seeds, fertilizers, labor, and equipment. The complexity of this production system necessitates a thorough understanding of its economic aspects to enable farmers to optimize their investments and maximize returns. Recent studies have highlighted that a significant proportion of farmers lack adequate knowledge about the economic dynamics of sericulture, which can lead to suboptimal decision-making (Ravi and Kumar, 2022) [21]. Thus, this study aims to fill that gap by providing detailed insights into the cost structures and profit margins associated with cocoon production in Krishnagiri. Sericulture has been recognized as a promising alternative to conventional agriculture, especially in regions where farmers face challenges such as water scarcity, fluctuating crop prices, and climate change (Babu *et al*., 2023) [3]. In Krishnagiri, the integration of mulberry cultivation and cocoon production offers a sustainable approach to farming that utilizes existing land resources efficiently. The practice supports biodiversity and contributes to the ecological balance by promoting agroforestry.

However, the financial aspects of cocoon production can be daunting. Initial investments are often substantial, covering expenses related to land preparation, mulberry saplings, and the necessary infrastructure for silkworm rearing. Studies indicate that farmers can invest anywhere from ₹40,000 to ₹1,00,000 per acre, depending on the scale of production and technology used (Subramanian *et al*., 2022) [25]. Moreover, the cyclical nature of sericulture, where returns may take several months to materialize, requires effective financial planning and management. The prices of cocoons and silk can be volatile, influenced by market demand, quality of production, and external economic factors, which complicate the profitability, landscape (Sharma & Singh, 2023) [24].

The importance of analyzing the costs and returns of cocoon production in Krishnagiri cannot be overstated. First, this research provides empirical data that can empower local farmers to make informed decisions regarding their investments in sericulture. Understanding the economic viability of their operations will help them optimize their resource allocation and improve overall profitability. Additionally, insights derived from this study can guide government policies and intervention strategies aimed at supporting sericulture development in the region (Manoharan *et al*., 2022) [18]. Furthermore, the findings of this research will contribute to the broader field of agricultural economics, specifically within the context of sericulture. By documenting the financial dynamics of cocoon production, this study will serve as a valuable resource for policymakers, NGOs, and researchers interested in sustainable agriculture. It will also highlight best practices and potential areas for improvement, ultimately contributing to the enhancement of livelihoods and the promotion of rural development in Krishnagiri. In conclusion, the study of costs and returns in cocoon production in Krishnagiri district is crucial for understanding the economic viability of sericulture in Tamil Nadu. By examining the intricate relationships between production costs.

labor inputs, and market conditions, this research aims to provide valuable insights that will benefit local farmers and stakeholders in the silk industry. The results will contribute to sustainable development efforts, enhancing the livelihoods of those involved in this traditional yet evolving agricultural practice. As the global demand for silk increases, understanding the financial landscape of cocoon production will be essential in positioning Krishnagiri as a competitive player in the silk market.

## Methodology

The study was carried out in Northern part of Tamil nadu, especially Krishnagiri district. 45 farmers who own marginal, small, and medium-sized land plots made up the study's sample. For the study, these farmers were selected at random. The farmers were selected by random sampling. To conduct personnel interviews with farmers, a specially prepared questionnaire for data collection was created in collaboration with officials from the Sericulture Department. The primary data was collected through in-person interviews with farmers using a well-organized and tried-and-true schedule that covered socioeconomic profile, mulberry area, costs and returns, cocoon production and marketing costs and returns obtained, including value of by-products (Susikaran, 2020) [11]. There are two types of cost analysis. Fixed cost includes land, equipments like rearing trays, storage and infrastructure facilities. Variable cost includes for inputs such as silkworm eggs, feed and fertilizers, labors both hired and family labor, utilities like water and electricity etc., and return estimation was done based on market price of cocoons, average yield per acre from the collected survey. Determination of profit by subtracting total cost from total revenue. Then the data were analyzed using statistical tool to calculate mean, median and standard deviation for cost and returns. Further, the entire Benefit: Cost ratio for cocoon production is successful (Reddy, B.M *et al*.2019) [22].

## Results and Discussion

The current analysis demonstrated that Krishnagiri district contribute 5,069 ha of the 24.000 ha of mulberry area contributed by Tamil Nadu. For marginal farmers, the total cost of starting a mulberry garden was Rs. 1,23,170/ha. (Table1& Figure1). On the other hand, the annual cost of producing mulberry leaves was Rs. 1,52,547.60/ha. Babu *et al.* (2011) [2] concluded from their study as the adoption of organic cultivation practice by substituting all the required nutrients for the mulberry through available organic and biological resources, the cost of mulberry leaf production can be reduced to a great extent which in turn can make sericulture a more profitable enterprise. The cost of planting and fertilizing (Rs. 20,134.00 and 17,733.00) and labour costs (Rs. 75,565.00) contributed significantly more than all other costs during the establishment of the mulberry garden and leaf production respectively. By selling cocoons, a gross return of Rs. 6,95,320.20/ha/year was recorded. The overall annual expenditure for producing cocoons is Rs. 3,25,962.53/ha. In that, the general annual variable cost was Rs. 2,89,778.66/ha, while the total annual fixed cost was Rs. 39,183.87/ha. With a benefit cost ratio of 1:2.11, the net income generated was Rs. 3,66,357.67/ha/year (Table 3& Fig.2).

For small farmers, the total cost of starting a mulberry orchard was Rs. 1, 30,056.95/ha (Table 4). Table 5 shows that the annual expenditure of growing mulberry leaves was Rs. 1, 64,191.56 per hectare. The cocoon's return value per hectare per year was Rs.4,25,594.43. Previous small-scale mulberry production cases showed similar trends of labor, manuring expenditures, and planting supplies contributing the most. The cost of producing cocoon was Rs. 3, 70,544.47 in total, which Rs. 44,897.20 was the total fixed cost and Rs. 3, 25,677.27 was the total variable cost. These expenses added up to Rs. 3, 70,544.47/ha /year, which was the total cost of producing cocoons. Finally, the benefit-cost ratio was 1:2.148 and the net revenue generated was Rs 4,25,594.43/ha/year (Table 6).

For medium-sized farmers, the total cost of starting a mulberry orchard was Rs. 1,37,653.00 per hectare (Table 7). According to Table 8, the annual cost of producing mulberry leaves was recorded at Rs 1, 79,480.56 per hectare. As was previously noted, the cost of labour, manuring and planting supplies accounted for a larger portion of the expenditure than other costs involved in the production of mulberries. The cocoon's return value was 9,15,569.30/ ha /year. The entire cost of producing cocoons was calculated by adding the recorded total fixed cost of Rs. 46,788.00/ha/year and the total variable cost of Rs. 3,49,314.52/ha/year. This results are in accordance with the findings of Raju and Sanappa (2018). This came to a total of Rs. 3,96,102.52/ha/year. With a benefit-cost ratio of 1:2.31, the net revenue generated per hectare per year was Rs 5,19,466.78 (Table 9). The economics of sericulture in the Karnataka district of Haveri was examined by Roopa Hosali and Murthy (2015) [23], who came to the conclusion that marginal farmers' costs of mulberry cultivation were Rs. 23,278.54 per acre, while small and medium-sized farmers' costs were Rs. 25,116.18/- and

26,358.52/- per acre respectively. Similarly, it was discovered that medium farmers paid Rs. 50,046.54/- per acre for cocoon production while small and marginal farmers paid Rs. 55,036.06/- per acre and Rs. 59,187.20/- per acre respectively. According to Kumaresan *et al.* (2008) [13], large farmers in the Udumalpet area of the Coimbatore district faced higher production costs per kilogram of cocoon than small farmers. This was mostly because the large farmers employed more labour. Dandin *et al.* (2005) [8], Balasarswathi *et al.* (2010) [5], and Beula Priyadarshini and Vijaya Kumari (2017) [6] have also provided reports that are similar. According to Shukla (2018), the establishment of fields cost the largest amount of expenditures connected to human labor with FYM application in the Udaipur area of Rajasthan.

In sericulture, recorded a net return of Rs. 5, 20, 39.32/- and a benefit-cost ratio of 1.49. In a 2017 study, Manjunatha *et al.* evaluated the profitability of silkworm cocoon production in five taluks in the Kolar district of Karnataka. They discovered that the total cost of rearing 8,000 dfl's annually was Rs. 7, 30,224/- with the production of mulberry leaves accounting for the largest portion of these costs. Since many agricultural inputs are always subject to price fluctuations, Tamil Nadu is one of the pioneer states in India when it comes to mulberry sericulture. The state's mulberry farms are primarily located in the western (Coimbatore, Tiruppur, Erode, Dindigul, and Theni) and northwestern (Dharmapuri, Krishnagiri, Salem, Namakkal, and Permabalur) zones. Balasaraswathi *et al.*, (2006) [4] supported the result and reported that the net return per acre/ year was higher in Dharmapuri district (25629.03) when compared to Erode district (17834.33). The cost benefit ratio was worked out to be 1:1.38 and 1:1.61in Erode and Dharmapuri districts respectively. Likewise, Mane, (2012) [16] reported the cost benefit ratio of the sericulture business in Osmamabad district of Maharastra was 1:1.58. The present study results were confirming with the results obtained by Lakshmanan *et al*., (1997;2006) [14-15] in regard to human labour and disease free layings in cocoon production. It was also noted that the cost of cultivation went up due to the increased transportation costs associated with mobilizing inputs at different output levels. It was also discovered that the expense of hiring labour to complete numerous tasks related to the rearing of silk worms significantly raises the cost of production. As a result, there would be ample opportunity for mechanizing numerous sericulture procedures. This will make things easier to work with and help cut costs. It might also lessen the issue of a labour shortage. In various sericulture operations, the labour of family women should also be efficiently utilized in order to significantly lower the cost of producing cocoons and raise the net benefit. On the other hand, price fluctuations of the cocoon price also influence the net returns of the farmer. Dyavappa *et al.*, (2016) [9] estimated The cost of rearing 100 DFL's is worked out to be Rs.33738.84 and returns amounts Rs.38604.96 with a marginal net returns of Rs.4866.12. The inadequately established markets in non-traditional places and low yield (cocoon yield per 100 DFLs) are the reasons for the lower net returns.

**Table 1:** Cost of establishment of mulberry garden by marginal farmers

| S. No | Variables | Units | Physical Quantity | Cost (Rs) | Share Of Total Cost (%) |
|---|---|---|---|---|---|
| 1 | Human Labour | Mandays | 89.735 | 22433.75 | 18.22 |
| 2 | Animal Power | Hours | 21.73 | 9343.90 | 7.59 |
| 3 | Machine Power | Hours | 17.20 | 12040.00 | 9.77 |
| 4 | Farm Yard Manure | Tonnes | 14.93 | 14930.00 | 12.12 |
| 5 | Chemicalfertilizer | Kg | 900.00 | 22500.00 | 18.27 |
| 6 | Cuttings | Rs | | 20134.70 | 16.34 |
| 7 | Irrigation | Rs | | 10000.00 | 8.12 |
| 8 | Miscellaneous | Rs | | 3360.00 | 2.72 |
| 9 | Land Tax | Rs | | 370.70 | 0.30 |
| 10 | Working Capital (7%) | Rs | | 8057.85 | 6.55 |
| | Total | | | 123170.00 | 100.00 |

**Table 2:** Cost of mulberry leaf production by marginal farmers

| S. No | Variables | Units | Physical Quantity | Cost (Rs) | Share of Total Cost (%) |
|---|---|---|---|---|---|
| | I. **Operational Cost** | | | | |
| 1 | Human Labour | Mandays | 302.6 | 75565.00 | 49.54 |
| 2 | Animal Power | Hours | 0.73 | 365.00 | 0.23 |
| 3 | Farm Yard Manure | Tonnes | 17.733 | 17733.00 | 11.62 |
| 4 | Chemicalfertilizer | Kg | 1100 | 27500.00 | 18.03 |
| 5 | Irrigation | Rs | - | 10000.00 | 6.56 |
| 6 | Miscellaneous | Rs | - | 3360.00 | 2.20 |
| 7 | Land Tax | Rs | - | 370.70 | 0.24 |
| 8 | Working Capital (7%) | Rs | - | 9442.56 | 6.18 |
| | II. Total operational cost | Rs | - | 144336.26 | 94.6 |
| | Fixed cost (share of establishment of mulberry garden per ha/annum) | Rs | - | 8211.34* | 5.38 |
| | Total cost ( I+II) | Rs | - | 152547.60 | 100 |

Note: * indices that total cost of establishment was divided and accounted for 15 years.

**Table 3:** Cost and return studies of cocoon production by marginal farmers

| S. No | Variables | Cost | Share of total cost (%) |
|---|---|---|---|
| **I. Fixed Cost** | | | |
| 1 | Depreciation on rearing house | 18425.60 | 5.60 |
| 2 | Depreciation on equipments | 16560.00 | 5.03 |
| 3 | Interest on fixed capital (12%) | 4198.27 | 1.28 |
| | Total Fixed Cost (I) | 39183.87 | 11.91 |
| **II. Variable cost** | | | |
| 1 | Human labour | 46600.00 | 14.17 |
| 2 | Dfls | 58733.33 | 17.85 |
| 3 | Disinfectant | 14240.00 | 4.33 |
| 4 | Transport charge | 6066.67 | 1.84 |
| 5 | Miscellaneous cost | 2613.33 | 0.79 |
| 6 | Interest on working capital (7%) | 8977.73 | 2.73 |
| 7 | Mulberry leaf cost | 152547.60 | 46.37 |
| | Total variable cost | 289778.66 | 88.08 |
| | Total cost (I+II) | 328962.53 | 100 |
| **III. Return** | | | |
| 1 | Gross return | 695320.20 | |
| 2 | Total cost | 328962.53 | |
| 3 | Total return | 366357.67 | |
| | B:C ratio | 1:2.11 | |

**Table 4:** Cost of establishment of mulberry garden by small farmers

| S. No | Variables | Units | Physical Quantity | Cost (Rs) | Share of Total Cost (%) |
|---|---|---|---|---|---|
| 1 | Human Labour | Mandays | 85.77 | 24015.60 | 18.46 |
| 2 | Animal Power | Hours | 19.93 | 9665.00 | 7.43 |
| 3 | Machine Power | Hours | 17.86 | 12502.00 | 9.61 |
| 4 | Fym | Tonnes | 14.20 | 14200.00 | 10.91 |
| 5 | Chemicalfertilizer | Kg | 950.75 | 23768.75 | 18.28 |
| 6 | Cuttings | Rs | - | 21667.20 | 16.66 |
| 7 | Irrigation | Rs | - | 12000.00 | 9.23 |
| 8 | Miscellaneous | Rs | - | 3363.30 | 2.59 |
| 9 | Land Tax | Rs | - | 366.70 | 0.28 |
| 10 | Working Capital (7%) | Rs | - | 8508.40 | 6.54 |
| | Total | | | **130056.95** | 100 |

**Table 5:** Cost of Mulberry Leaf Production by small farmers

| S. No | Variables | Units | Physical Quantity | Cost (Rs) | Share of Total Cost (%) |
|---|---|---|---|---|---|
| | I. **Operational Cost** | | | | |
| 1 | Human Labour | Mandays | 302.6 | 84576.60 | 51.51 |
| 2 | Animal Power | Hours | 0.89 | 430.00 | 0.26 |
| 3 | Farm Yard Manure | Tonnes | 15.86 | 15860.00 | 9.66 |
| 4 | Chemical fertilizer | Kg | 1150 | 28750.00 | 17.51 |
| 5 | Irrigation | Rs | - | 12000.00 | 7.31 |
| 6 | Miscellaneous | Rs | - | 3363.33 | 2.05 |
| 7 | Land Tax | Rs | - | 366.70 | 0.22 |
| 8 | Working Capital (7%) | Rs | - | 10174.27 | 6.2 |
| | **II. Total operational cost** | Rs | - | 155521.10 | 94.72 |
| | Fixed cost **(**Share of establishment of mulberry garden per ha/annum**)** | Rs | - | 8670.46* | 5.3 |
| | Total cost ( I+II) | Rs | - | 164191.56 | 100 |

**Table 6:** Cost and return studies of cocoon production by small farmers

| S. No | Variables | Cost | Share of total cost (%) |
|---|---|---|---|
| | **I. Fixed Cost** | | |
| 1 | Depreciation on rearing house | 22500.00 | 6.07 |
| 2 | Depreciation on equipments | 17560.00 | 4.74 |
| 3 | Interest on fixed capital (12%) | 4807.20 | 1.30 |
| | Total Fixed Cost (I) | 44867.20 | 12.1 |
| **II. Variable cost** | | | |
| 1 | Human labour | 69381.20 | 18.72 |
| 2 | Dfls | 58933.33 | 15.9 |
| 3 | Disinfectant | 13800.00 | 3.72 |
| 4 | Transport charge | 6446.70 | 1.74 |
| 5 | Miscellaneous cost | 2360.00 | 0.64 |
| 6 | Interest on working capital (7%) | 10564.48 | 2.85 |

| | | | |
|---|---|---|---|
| 7 | Mulberry leaf cost | 164191.56 | 44.31 |
| | Total variable cost | 325677.27 | 87.9 |
| | Total cost (I+II) | 370544.47 | 100 |
| **III. Return** | | | |
| 1 | Gross return | 796138.90 | |
| 2 | Total cost | 370544.47 | |
| 3 | Total return | 425594.43 | |
| | B:C ratio | 1:2.148 | |

**Table 7:** Cost of establishment of mulberry garden by medium farmers

| S. No | Variables | Units | Physical Quantity | Cost (Rs) | Share Of Total Cost (%) |
|---|---|---|---|---|---|
| 1 | Human Labour | Mandays | 89.10 | 26730.00 | 19.41 |
| 2 | Animal Power | Hours | 24.06 | 12030.00 | 8.73 |
| 3 | Machine Power | Hours | 18.06 | 12642.00 | 9.2 |
| 4 | Fym | Tonnes | 15.20 | 15200.00 | 11.04 |
| 5 | Chemicalfertilizer | Kg | 1000.00 | 25000.00 | 18.2 |
| 6 | Cuttings | Rs | - | 19506.33 | 14.2 |
| 7 | Irrigation | Rs | - | 13500.00 | 9.8 |
| 8 | Miscellaneous | Rs | - | 3662.00 | 2.7 |
| 9 | Land Tax | Rs | - | 377.33 | 0.27 |
| 10 | Working Capital (7%) | Rs | - | 9005.34 | 6.5 |
| | Total | | | 137653.00 | 100 |

**Table 8:** Cost of mulberry leaf production by medium farmers

| S. No | Variables | Units | Physical Quantity | Cost (Rs) | Share Of Total Cost (%) |
|---|---|---|---|---|---|
| **I. Operational Cost** | | | | | |
| 1 | Human Labour | Mandays | 304.86 | 91458.00 | 51 |
| 2 | Animal Power | Hours | 0.86 | 430.00 | 0.24 |
| 3 | Fym | Tonnes | 17.86 | 17860.00 | 10 |
| 4 | Chemicalfertilizer | Kg | 1275.00 | 31875.00 | 17.8 |
| 5 | Irrigation | Rs | - | 13500.00 | 7.5 |
| 6 | Miscellaneous | Rs | - | 3662.00 | 2 |
| 7 | Land Tax | Rs | - | 377.33 | 0.21 |
| 8 | Working Capital (7%) | Rs | - | 11141.37 | 6.2 |
| | Total operational cost | Rs | - | 170303.70 | 94.9 |
| | II. Fixed cost (share of establishment of mulberry garden per ha / annum) | Rs | - | 9176.86* | 5.1 |
| | III. Total (I+II) | Rs | - | 179480.56 | 100 |

*Indices that total cost of establishment was divided and accounted for 15 years.

**Table 9:** Cost and return studies of cocoon production by medium farmers

| S. No | Variables | Cost | Share of total cost (%) |
|---|---|---|---|
| **I.Fixed Cost** | | | |
| 1 | Depreciation on rearing house | 23500.00 | 5.9 |
| 2 | Depreciation on equipments | 18275.00 | 4.6 |
| 3 | Interest on fixed capital (12%) | 5013.00 | 1.30 |
| | Total Fixed Cost (I) | 46788.00 | 11.81 |
| **II. Variable cost** | | | |
| 1 | Human labour | 75300.00 | 19.01 |
| 2 | Dfls | 59706.67 | 15.1 |
| 3 | Disinfectant | 14980.00 | 3.8 |
| 4 | Transport charge | 6333.33 | 1.6 |
| 5 | Miscellaneous cost | 2403.33 | 0.6 |
| 6 | Interest on working capital (7%) | 11110.63 | 2.8 |
| 7 | Mulberry leaf cost | 179480.56 | 45.3 |
| | Total variable cost | 349314.52 | 88.2 |
| | Total cost (I+II) | 396102.52 | 100 |
| **III. Return** | | | |
| 1 | Gross return | 915569.30 | |
| 2 | Total cost | 396102.52 | |
| 3 | Total return | 519466.78 | |
| | B:C ratio | 1:2.31 | |

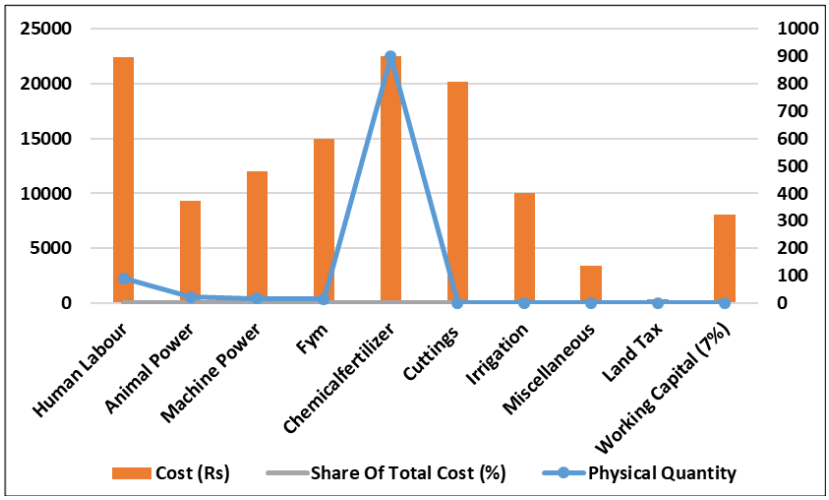


**Fig.1.** Cost of establishment of mulberry garden by marginal farmers

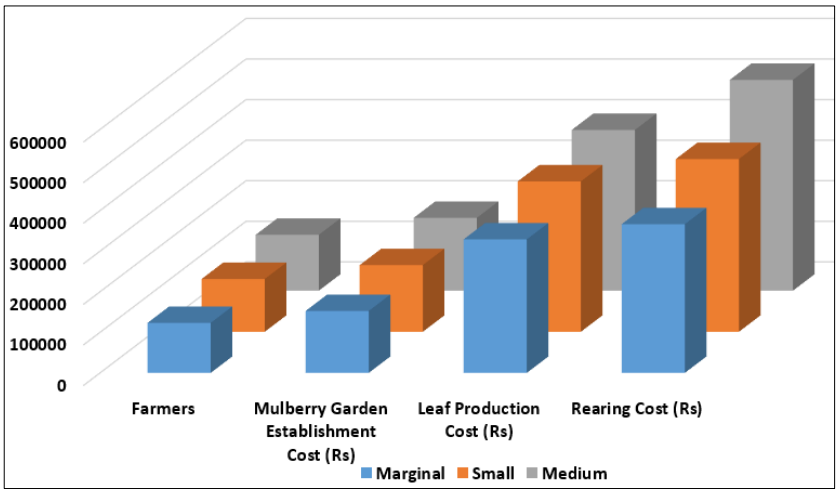


**Fig 2:** Cost and return studies of marginal, small and medium farmers

## Conclusion

The study was carried out in Krishnagiri district, it is the traditional sericulture area of Tamil Nadu. This study estimated that the costs and benefits related to producing cocoons for marginal, small and medium farmers. The industry of sericulture generates high revenue to the farmers compare to other agricultural crops. Sericulture industry plays a vital role in facilitating the flow of money from the wealthy to the under privileged. The current findings clearly show that medium farmers with the maximum benefit-cost ratio (1:2.31) had the highest costs and returns associated with cocoon production followed by small (1:2.148) and marginal farmers (1:2.11).

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