**Economic Analysis and Financial Feasibility of Sericulture in Amravati District of Maharashtra, India**

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**Abstract:**

In India, sericulture is a significant agro-based rural sector, offering substantial employment and income, particularly in non-traditional regions such as Amravati district in Maharashtra. This study evaluates the economic viability and financial feasibility of cocoon production through mulberry sericulture. A purposive sample of 60 sericulture units across four Tehsils was studied for the agricultural year 2023–24. Cost and returns analysis were conducted along with financial appraisal using Payback Period, Net Present Value (NPV), Internal Rate of Returns (IRR), Benefit-Cost Ratio (BCR) and Profitability Index (PI). The average total cost per batch of 250 DFLs was ₹40,725.80, with annual gross returns of ₹4,42,620 and net income of ₹1,72,470. Financial metrics indicated a payback period of 1.80 years, NPV of ₹2,48,917, IRR of 11.04%, BCR of 1.82, and PI of 1.79, establishing sericulture as a financially viable and economically rewarding enterprise in the region.

***Keywords****: feasibility, sericulture, payback period, net present value, internal rate of returns, benefit cost ratio profitability index.*

**Introduction**

Sericulture in India has emerged as an ideal agro-based cottage industry that plays a pivotal role in rural development, particularly benefiting weaker sections of society. It ensures equitable income distribution from the urban affluent to the rural poor and has become a strategic tool for livelihood generation. With its vast potential to generate employment and enhance rural income, both the Government of India and State Governments have continued to support and expand silk production across non-traditional areas such as Vidarbha in Maharashtra.

Silk, popularly known as the “Queen of Fibres,” holds a unique place in Indian history and tradition. This lustrous natural fibre is known for its fineness, resilience, excellent dyeability, and elegant draping qualities. Over centuries, its unmatched attributes have made it the undisputed “Queen of Textiles” across the globe. India holds the unique distinction of being the only country in the world that produces all five known commercial varieties of silk—mulberry, tropical tasar, oak tasar, eri, and muga. Of these, muga silk, with its golden hue, is unique to India. Sericulture, derived from the Greek word sericos (silk) and the English word culture (rearing), involves the scientific cultivation of mulberry plants and the rearing of silkworms to produce silk fibre.

India is currently the second-largest producer of raw silk in the world and the largest consumer. In the year 2020–21, India produced 33,770 MT of raw silk, which increased to 34,903 MT in 2021–22 and further to 36,582 MT in 2022–23. The most recent data for 2023–24 shows production at 38,913 MT, reflecting consistent growth. However, while bivoltine silk production rose by 17.1 per cent in 2021–22, Vanya silk production witnessed a decline, mainly due to a significant drop in tasar output. In Maharashtra, sericulture has gained prominence, especially in the regions of West Maharashtra and Vidarbha, due to favourable climatic conditions and growing demand for silk-based garments. In Vidarbha districts like Gadchiroli, Bhandara, Gondia, and Chandrapur, tasar sericulture is also prominent, with the “Silk and Milk” model promoting integrated income through cocoon and milk production using mulberry residues as cattle feed. Amravati district, a non-traditional yet increasingly active sericulture zone, stands out as a successful example of this rural enterprise. Currently, about 184 farmers are involved in mulberry cultivation on 200 acres, collectively raising over 50,600 DFLs and producing around 31.862 MT of cocoons, valued at approximately ₹1.11 crore. Furthermore, 335 new farmers have registered under the 2024 Mahareshim Abhiyan to expand mulberry cultivation across another 375 acres.

**Objectives**

1. To study the cost and returns of cocoon production.
2. To analysed the financial feasibility of sericulture units.

**Material and Method**

 Amravati district was purposively selected for the study. Four Tehsils (Morshi, Chandur Bazar, Chandur Railway, and Nandgaon Khandeshwar) with maximum sericulture activity were selected. From each Tehsil, three villages and from each village, five sericulture units were surveyed, totalling 60 units.Primary data were collected for the year 2023–24 using a structured and pre-tested interview schedule.

**Cost of production and net returns**

The cost of production and net returns of cocoon production were calculated in order to assess the economic feasibility.

**Fixed Cost**

 It includes the data on the cost of iron pipe, iron sheet, cement, sand, bricks, and all equipment data on above items were collected separately for selected sericulture unit.

**Variable Cost**

Costs known as variable costs changed according to the volume of production. Short-term production decisions only needed to take into account variable costs, such as the price of silkworms, mulberry leaves, DFLs, labor utilization fees, disinfection prices, energy costs, and other expenses like fly traps and newspapers. Through interviews with the proprietor of the sericulture unit, data on these things were gathered individually.

**Financial Feasibility of Sericulture**

 The financial feasibility of investing in sericulture was evaluated by creating a five-year cash outflow plan that included 12% input cost inflation. The amount of money coming in was kept steady. The sericulture project's financial feasibility was evaluated using the Payback period, BCR, NPV, IRR, and PI techniques.

**Payback Period**

 The payback period is a project appraisal metric that is not discounted. The payback period was defined as the amount of years needed to recoup the initial expenditure. The shorter payback period is the basis for project choice. payback period of the project is estimated using the following equation.

$$Payback Period=\frac{Initial investment of project}{Annual net cash revenue}$$

**Net Present Value (NPV)**

 The difference between the present value of cash inflows and outflows over a given period of time is known as net present value. It is the cash flow stream's current value. It is calculated by discounting the investment's net cash flow. In comparison to projects with negative NPV, those with positive NPV are given more weight during the selection process.NPV of the project is estimated using the following equation.

$$NPV=Σ \frac{P1}{\left(1+i\right)^{t}}+\frac{P2}{\left(1+i\right)^{t}}……+\frac{Pn}{\left(1+i\right)^{t}}-C\_{0}$$

Where,

 P1= net cash flows for first year

 t = time period

 Co = initial cost of the investment

 i= discount rate (12 % per annum)

**Benefit-Cost Ratio**

 The benefit-cost ratio is a project appraisal metric that is discounted. The agribusiness's profitability is determined by the benefit-cost ratio. The benefit-cost ratio is the one that establishes whether the expenses incurred in the course of conducting business will be less or greater than the revenue generated by the enterprise.

The Benefit-Cost Ratio (BCR) = $\frac{Total Present Worth of  gross Returns}{Total Present Worth of Costs}$

**Internal Rate of Return**

 The discount metric that renders the net present value equal to zero is the internal rate of returns of sericulture activity. This indicates the average earning potential of a project investment. When calculating IRR, the time value of money is taken into consideration. Knowledge of the real rate of return from the various initiatives was made possible by the IRR working methods. IRR of the project is estimated using the following equation

$$\left(\genfrac{}{}{0pt}{}{Internal rate of }{return}\right)=\left(\genfrac{}{}{0pt}{}{Lower discount }{rate}\right)+\left(\begin{array}{c}Difference between\\the two discount \\rates\end{array}\right)× \left|\frac{NPW at lower discount rate}{\begin{array}{c}Absolute difference\\ between the NPW at the two discount rate \end{array}}\right|$$

**Profitability index (PI)**

 Here we relate the net present worth of cash flows of the project to total capital required for a project through "profitability index". It is defined as a ratio of NPV of the cash flows to the initial capital expenditure. Assuming that all the capital expenditure is incurred in year zero (at the beginning of project). The formula for profitability index (PI) is as follows

$$ PI=\frac{NPV}{I}$$

Where,

 PI = Profitability index

 I = Initial investment at zero year

 NPV = Net Present Value of Cash Flows

**Results and Discussion**

**Cost of silk cocoon production**

 The rearing of silkworms ends with cocoon formation, an activity that takes place indoors.

**Table 1. Cost of silk cocoon production per batch (Rs/250DFL)**

|  |  |  |
| --- | --- | --- |
| **Sr. No** | **Name of the operations** | **Cost (Rs)** |
|  |
| A | Variable cost |  |
| 1 | Silkworm egg  | 1750(4.30) |
| 2 | Human labour | 7500(18.42) |
| 3 | Disinfectants/ medicine |  |
|  | a) Bed disinfectants | 110(0.27) |
|  | b) Lime dust | 70(0.17) |
|  | c) Bleaching powder | 300(0.74) |
|  | d) Vijet supplement | 60(0.15) |
|  | e) Asthra | 180(0.44) |
|  | f) Supplement | 250(0.61) |
| 4 | Paraffin paper | 250(0.61) |
| 5 | News paper | 180(0.44) |
| 6 | Cost of mulberry leaves | 15000(36.85) |
| 7 | Transportation cost | 1000(2.46) |
| 8 | Interest on working capital | 1,599(3.93) |
|  | Per batch @ 6% |
| 9 | Sub total | 26,650(65.43) |
|  | Total variable cost | 28,249 (69.37) |
| B | Fixed cost |  |
| 1 | Depreciation of rearing room and equipment per batch @ 10 % | 6238.4(15.32) |
|  |  |
| 2 | Interest on fixed capital per batch @ | 6238.4(15.32) |
| 10% |
|  | Total fixed cost | 12476.8(30.63) |
|  | Total cost (A+B) | 40,725.80(100) |

(Figures in parenthesis indicate percentages to total cost) \*5 batch per year

**Cost of Silk Cocoon Production**

 The cost of mulberry silk cocoon production per batch, calculated for a standard input of 250 Disease-Free Layings (DFLs), was estimated at ₹ 40,725.80. This production system operated as an indoor rearing model, following standard sericultural practices. The total cost was disaggregated into variable costs ₹28,249 (69.37%) and fixed costs ₹12,476.80 (30.63%), indicating that recurring inputs and labour played a major role in influencing the overall cost structure.

 Among the variable cost components, the cost of leaves emerged as the most dominant, accounting for ₹15,000 (36.85%) of the total cost. The second major contributor was human labour, valued at ₹7,500 (18.42%), which included skilled and unskilled work related to cleaning, feeding, harvesting, and cocoon processing. Other variable costs included silkworm eggs ₹1,750 (4.30%), which initiated the production cycle, and transportation ₹1,000 (2.46%), incurred for leaf procurement and marketing of cocoons.

 Disinfectants and medicines, which were critical to larval health and hygiene, collectively contributed ₹ 970 (2.38%), and included bed disinfectants, lime dust, bleaching powder, Vijet supplement, Asthra, and other microbial control agents. Additionally, materials such as paraffin paper ₹ 250 (0.61%) and newspapers ₹180 (0.44%) were used during the late-age rearing phase to ensure hygiene and aid in proper cocoon formation. The interest on working capital, calculated at 6%, added ₹1,599 (3.93%) to the variable cost burden.

 The fixed costs comprised two components: depreciation of the rearing house and equipment, estimated at ₹6,238.40 (15.32%), and interest on fixed capital, also calculated at ₹6,238.40 (15.32%). These values reflected capital cost recovery and financing expenses associated with the establishment of the sericulture unit. Although fixed costs constituted a smaller portion of the total expenditure (30.63%), they remained essential for assessing the long-term economic sustainability of the production unit.

 On an annual basis, assuming five production batches per year, the total cost of mulberry silk cocoon production in the Amravati district was estimated at ₹ 2,03,629.00. This included an annual variable cost of ₹1,41,245.00 (69.37%) and a fixed cost of ₹ 62,384.00 (30.63%). The cost structure illustrated the input-intensive and labour-dependent nature of silk cocoon production.

**Returns from mulberry Cocoon Production**

 The returns from cocoon production include the revenue from cocoon sales and manure sales.

**Table 2. Returns obtained from Silk Cocoon** [ BATCH OF 250 DFLs] Bottom of Form

|  |  |  |  |
| --- | --- | --- | --- |
| **Sr.** | **Items** |  | **Overall** |
| **No.** | **Yield in kg** | **Receipt (RS .450)** |
| **A**  | Main production Cocoon |   |   |
| 1 | 1st rearing  | 189 | 85050 |
| 2 | 2nd rearing  | 192 | 86400 |
| 3 | 3rd rearing  | 188 | 84600 |
| 4 | 4th rearing  | 190 | 85500 |
| 5 | 5th rearing  | 187 | 84150 |
|   | **Total Production (A)**  | **946** | **425700** |
| **B**  | By product Manure (in q)  | **In (q)** | **(RS .6000/q)**  |
| 1 | 1st rearing  | 0.52 | 3120 |
| 2 | 2nd rearing  | 0.59 | 3540 |
| 3 | 3rd rearing  | 0.59 | 3540 |
| 4 | 4th rearing  | 0.57 | 3420 |
| 5 | 5th rearing  | 0.55 | 3300 |
|   | **Total B**  | **2.82** | **16920** |
|   | **TOTAL REVENUE (A + B)**  |   | **442620** |

The returns from silk cocoon production comprise earnings from the sale of cocoons as the primary product and manure as a by-product. The financial analysis of a batch consisting of 250 DFLs is presented in Table 2, highlighting the revenue from different rearings.

 The total yield of cocoons across five rearings was 946 kg, generating a total income of ₹4,25,700. Among these, the highest yield and returns were obtained in the 2nd rearing (192 kg, and ₹ 86,400), while the lowest yield and returns was observed in the 5th rearing (187 kg, and ₹ 84,150). The earnings from cocoon production contributed the major share of total revenue, making it the primary source of income in sericulture.

 In addition to the main product, the farmers also earned revenue from manure, which is a valuable by-product in silk production. The total quantity of manure produced across all rearings was 2.82 quintals, contributing ₹16,920 to total revenue. The highest manure production was observed in the 2nd and 3rd rearings (0.59 quintals each, ₹3,540 per rearing), whereas the lowest was in the 1st rearing (0.52 quintals, ₹3,120). Despite being a secondary income source, manure accounted for a notable portion of the overall earnings.

 The total revenue from both cocoon production and by-products was ₹4,42,620. This highlights the significant profitability of silk cocoon rearing. The results confirm that sericulture is a viable and profitable venture, with high returns from both primary and secondary products.

**Table 3. Financial Feasibility of Sericulture units**

|  |  |
| --- | --- |
| **Particulars** | **Values** |
| Payback Period (Years) | 1.80 years |
| Net Present Value (NPV) @ 10% | 248,917 Rs |
| Internal Rate of Return (IRR) | 11.04% |
| Benefit-Cost Ratio (BCR) | 1.82 |
| Profitability index (PI) | 1.79 |

 The financial viability of sericulture units was assessed using standard investment appraisal techniques. Based on the results presented in Table 3, the payback period was found to be 1.80 years, indicating that the initial capital investment was recovered within less than two years of operation. This reflects a relatively rapid capital recovery cycle and suggests moderate liquidity of investment in sericulture enterprises.

 The Net Present Value (NPV), calculated at a 10 per cent discount rate, was estimated to be ₹2,48,917, which implies that the net cash inflows, discounted over the project lifespan, substantially exceeded the initial investment. A positive and substantial NPV is a strong indicator of the project’s capacity to generate returns above the opportunity cost of capital, affirming the economic soundness of sericulture as a sustainable venture.

 The Internal Rate of Return (IRR) was calculated at 11.04 per cent, which slightly exceeds the assumed benchmark discount rate of 10 per cent. This suggests that the investment is marginally attractive and capable of yielding returns greater than or equal to the cost of capital.

 The Benefit-Cost Ratio (BCR) stood at 1.82, signifying that for every rupee invested, a return of ₹1.82 was realized. Since this ratio is significantly above the threshold value of 1.0, it indicates strong economic justification for investment in sericulture, with benefits substantially outweighing costs.

 Lastly, the Profitability Index (PI) was estimated at 1.79, which further corroborates the positive NPV findings. A Profitability Index greater than 1.0 signifies that the present value of future cash flows exceeds the initial investment, validating the financial efficiency and return-generating potential of the sericulture unit.

 The analysis revealed that sericulture in the Amravati district presents a financially viable and moderately profitable enterprise, characterized by a reasonable payback period, positive NPV, and favourable BCR and PI values. These indicators collectively confirm the economic feasibility and investment worthiness of sericulture as a sustainable income-generating activity in the region.

**Conclusions**

1. The average cost of cocoon production per batch (250 DFLs) was ₹ 40,725.80, comprising 69.37 percent variable cost and 30.63 percent fixed cost. Mulberry leaves were the major component, accounting for 36.85 per cent of total cost.
2. Returns from five rearings amounted to ₹4,25,700 from cocoons and ₹ 16,920 from manure by-products, leading to a total annual revenue of ₹ 4,42,620 per unit.
3. The benefit-cost ratio (BCR) was 1.82, indicating a profitable scenario where every rupee invested yielded ₹1.82 in returns.
4. The net present value (NPV) of sericulture activity at a 10 per cent discount rate was ₹2,48,917, which confirmed the economic viability of the enterprise.
5. The internal rate of return (IRR) was found to be 11.04%, slightly higher than the discount rate, reflecting positive investment returns.
6. The payback period for recovering the initial investment was 1.80 years, demonstrating rapid recovery of capital in less than two years.
7. The profitability index (PI) was calculated to be 1.79, indicating that the present value of benefits substantially exceeded initial investment costs.

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**Policy Implication:**

Investment in sericulture is both profitable and economically viable therefore, farmers should be encouraged to take it up by utilizing government schemes such as MNREGA, NABARD, and ATMA.

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