



# International Journal of Research in Agronomy

E-ISSN: 2618-0618

P-ISSN: 2618-060X

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2024; SP-7(9): 962-967

Received: 24-07-2024

Accepted: 30-08-2024

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## Business analysis of silkworm production: A case study of gayatri Kitak Sangopan Kendra, Terkheda, District - Dharashiv

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DOI: <https://doi.org/10.33545/2618060X.2024.v7.i9Sm.1639>

### Abstract

The research project titled "Business Analysis of Silkworm Production: A Case Study of Gayatri Kitak Sangopan Kendra, Terkheda" focuses on understanding the economic and operational dynamics of a silkworm rearing unit in Dharashiv district. The study evaluates the capital investment, cost structures, returns, and marketing strategies involved in silkworm production, particularly during the early stages of chawki rearing. The analysis of the silkworm rearing project revealed that the total capital investment was Rs. 15.09 lakhs, with major expenses directed toward building and land, comprising 46.39% and 33.13%, respectively. The fixed cost averaged Rs. 9.08 lakhs annually, with building depreciation (58.59%) and permanent labor charges (22.47%) being significant contributors. Variable costs were dominant, amounting to Rs. 54.11 lakhs, with raw materials (77.45%) and casual labor (19.96%) forming the majority. Marketing costs were minimal at Rs. 0.28 lakhs, primarily driven by transportation and packaging expenses. Overall, the total cost incurred by the producer was Rs. 63.19 lakhs, with variable costs accounting for 54.11%. The gross returns were Rs. 80.10 lakhs, yielding a net return of Rs. 16.91 lakhs, while the market margin stood at Rs. 16.63 lakhs, with no price spread due to direct sales to farmers. The break-even point was 92641 dfls in physical terms and Rs. 27.79 lakhs in monetary terms. The major challenges faced in production were securing initial capital, lack of skilled labor, and climate control, while marketing difficulties included damage during transport and inadequate storage facilities.

**Keywords:** Silkworm production, Chawki rearing, economic viability, sericulture

### Introduction

Sericulture is a key rural agro-based sector in India that combines farming and manufacturing, offering significant opportunities due to its high quality, employment potential, low capital requirements, and substantial returns. This sector, crucial for socio-economic growth, employs around 8.60 million people in India, including many from economically disadvantaged backgrounds, particularly women. The constant domestic demand for silk, which holds religious significance in India, supports the country's leadership in the silk industry. Employment in sericulture increased by 1.06% from 8.51 million in 2016-17 to 8.60 million in 2017-18, but saw a slight decrease of 0.7% in 2020-21 compared to 2019-20. (Source: Central Silk Board, Bangalore, Karnataka 2020-21).

Sericulture involves the cultivation of silkworms to produce cocoons, which are then processed into silk. Revered as the "queen of fabrics," silk has been highly esteemed from ancient Vedic times to today. There are four main types of silkworms: Mulberry (*Bombyx mori*), Tassar (*Antheraea paphia*), Eri (*Philosamia ricini*), and Muga (*Antheraea assama*). This agro-based industry has a significant potential to create substantial employment opportunities in rural areas, improving the financial conditions of the poor. The process includes growing mulberry plants to feed the silkworms, rearing the silkworms to produce cocoons, and then converting these cocoons into silk yarn through reeling and spinning.

The cultivation of mulberry plants and the rearing of silkworms are essential for silk cocoon production. Known as moriculture, mulberry cultivation includes several farming techniques. Among the approximately 20 species of mulberry, four are most commonly used: *Morus alba*, *Morus indica*, *Morus serrata*, and *Morus lalifolia*.

The quality of silk cocoons is greatly influenced by the nutritional content of the mulberry leaves.

**The Present scenario of global silk industry:** India is the second-largest raw silk producer globally, after China. In 2022, the global raw silk production was 91319 MT, with China producing 50000 MT. India's production for 2022 was 36582 MT, including 27654 MT of mulberry silk. (Source <https://www.inserco.org/en/statistics>)

#### Regarding Need and importance of the sericulture

This study emphasizes the crucial role of sericulture in tackling socio-economic issues in India. Agriculture, a vital sector, supports approximately half of the population. However, with around 70% of people living in rural areas and over 40% of them living below the poverty line, the sector faces significant challenges. Rapid population growth has led to a reduction in the size of agricultural land holdings, exacerbating rural poverty and stalling agricultural progress. The limited availability of land, combined with modest financial returns and the seasonal nature of agriculture, constrains its capacity to generate stable employment. This situation highlights the need for alternative income sources. Agro-based industries, particularly sericulture, offer a promising solution by generating employment opportunities and providing a consistent income throughout the year. This is particularly important in densely populated regions like India, where many rural residents are either unemployed or landless. Sericulture presents a valuable opportunity for socio-economic advancement, potentially improving the economic conditions of the rural poor and supporting their livelihoods throughout the year.

#### Scope of the study on sericulture

Sericulture, when compared to other agricultural crops and rural industries, requires relatively low investment for maintaining mulberry gardens and rearing silkworms after the initial setup. Once a mulberry garden is established, the ongoing costs for upkeep and silkworm rearing are minimal. This makes sericulture a cost-efficient enterprise with the potential to create significant employment and income opportunities. The initial expense of starting a mulberry garden is relatively low, and the recurring costs associated with silkworm rearing are modest compared to other sectors. Therefore, sericulture presents an affordable and sustainable option for enhancing employment and income, making it an attractive choice for individuals and communities seeking low-cost economic opportunities. Therefore, this study intends to explore the cost structure, income generation, marketing approaches for silkworms, and the difficulties encountered by farmers in the sericulture

#### Company Profile

- Name of unit:** Gayatri Kitak Sangopan Kendra
- Owner Name:** Mr. Mangesh Jagganath Kadavakar
- Establishment Year:** 2016
- Business Type:** Argo-based industry
- Type of ownership:** Self owned
- Address:** At Post Terkheda, Tal- Washi, Dist- Dharashiv 413525.
- Initial Investment:** 15 lakhs
- Annual Turnover:** 80 lakhs
- Annual Profit:** 15 lakhs

#### Objectives of study

- To study the capital requirement of selected silkworm

rearing unit

- To work out cost and returns of silkworm
- To estimate breakeven point of selected unit
- To study the marketing of silkworm
- To identify the constraints faced by owner in production and marketing.

#### Methodology

##### Area of Study

The present study was conducted at Gayatri Kitak Sangopan Kendra, Terkheda dist. Dharashiv.

##### Period of Study

The data was collected for FY 2023-2024 i.e., from April 2023 to March 2024.

##### Source of Data

Primary data was collected by pretested schedule from concern person, officials of selected firm by personal interview method regarding the production and marketing of silkworm.

##### Analytical Tools

##### Cost and Returns of Silkworm Rearing

The collected data related to required cost and returns from silkworm were analyzed, tabulated on the following different aspects viz.

##### Fixed Cost

The fixed cost includes the data regarding the cost of machinery, building, land, furniture, wages of payment employed labour, salary of staff, electricity charges, insurance premium and taxes. These information were collected from Gayatri Kitak Sangopan Kendra, Terkheda

##### Variable Cost

The variable cost consists of expenditure on purchase of raw material, wages of casual labour, oil and lubricants, repair and maintenance of machinery, electricity and stationary charges, etc.

##### Total Cost

Total cost was comprised of the total fixed cost and total variable cost and will be calculated by adding all these costs together.

Total cost = Fixed cost + Variable cost

##### Gross Returns

The gross returns for production of silkworm rearing was calculated by adding together value of main product received after production of silkworm rearing. The gross returns defined as the total rate of return on an investment before the deduction of any expenses.

Gross returns = Quantity of product X Price per unit

##### Net Returns

The net returns refer to returns after deducting all expenses from the gross return generated by the investment.

Net returns = Gross returns – Total cost

##### B:C ratio

The benefit cost ratio compares the present value of all benefits

with that of the cost and investment of the project.

$$B:C \text{ ratio} = \text{Gross returns} / \text{Total cost}$$

### Breakeven Point Analysis

The point at which the two curves i.e. total cost curve and total revenue curve intersect is called as breakeven point, which indicates the level of production at which neither losses money nor makes profit.

Computation in physical quantity,

$$BEP = F / (P - V)$$

Computation in monetary value,

$$BEP = F/[1 - (V/P)]$$

Where,

F = Annual fixed cost in Rs.

P = Selling price per unit in Rs.

V = Variable cost per unit in Rs.

### Margin of safety

- Margin of Safety (in physical units) = Total output - output at BEP
- Margin of Safety (in monetary value) = Total revenue - Revenue at BEP
- Percentage of margin of safety =  $BEP / \text{Volume of total output} \times 100$

### Marketing of Silkworm

Initially the marketing cost, market margins and price spread were calculated required for silkworm.

**Marketing Cost:** The total cost incurred by the producer involved in packaging, transportation, sell and purchase of silkworms till it reaches to farmers.

### Market Margin

It refers to difference between the prices prevailing as successive stages of marketing at given period of time.

$$\text{Market Margin} = \text{Selling Price} - (\text{Purchase Price} + \text{Marketing Cost})$$

### Price Spread

The price spread indicates shares of various agencies involved in marketing along with the cost incurred by them. The price spread of the produce was the difference between the net price received by producer in the assembling market and price paid by consumer for equivalent quantity of produce.

$$\text{Price Spread} = \text{Price paid by consumer} - \text{Net Price received by producer}$$

### Constraints faced by Owner

The different constraints in production and marketing of Silkworm Rearing were identified by personal interview method.

### Results and Discussion

#### Capital Requirement of Selected Silkworm Rearing Unit

To fulfil the first objectives of the study in respect of organizational study of the Silkworm rearing, the results has been obtained on capital investment, summary of capacity utilization are given as under.

#### Capacity Utilization of Selected Unit

**Table 1:** Capacity utilization of Silkworm Rearing unit

Sr. No.	Particulars	Value in dfls	Percentage (%) share
1	Capacity of production per month	30000	-
2	Capacity of unit per year	360000	100.00
3	Actual production per year in 2023-24	267000	74.17

Table 1. shows that, In the financial year 2023-2024, the unit produced 267,000 DFLs, achieving a capacity utilization rate of 74.17%.3.1.2 Capital investment for Silkworm Rearing

#### Capital investment for Silkworm Rearing unit

Capital investment is the acquisition of physical assets by a company or a unit for use in furthering its long-term business goals and objectives.

**Table 2:** Capital investment for Silkworm Rearing

Sr. No.	Particulars	Amount (Rs in lakhs)	Percentage share (%)
1	Investment on land	5.00	33.13
2	Establishment of Mulberry Garden	0.90	5.96
3	Building (Rearing house)	7.00	46.39
4	Machinery	0.63	4.18
5	Furniture and Electrical appliances	1.41	9.35
6	Installation charges	0.15	0.99
	Total	15.09	100.00

Table 2. shows that the total capital investment in the silkworm rearing project was ₹15.09 lakhs, with the building and land being the major components, contributing 46.39% and 33.13% respectively. Furniture, machinery, and the mulberry garden accounted for smaller shares of the total investment.

### Cost and returns of selected unit

To fulfill the second objectives of the study in respect of

organizational study of the Silkworm rearing results has been obtained on cost required, returns obtained from the unit are given as under.

#### Fixed cost for Silkworm Rearing

The fixed cost for a silkworm rearing project includes several essential components, such as the construction of buildings, purchase of machinery, furniture, and electrical appliances.

Additionally, it covers permanent labor charges and interest on the fixed capital invested in the project. These costs are crucial

for establishing and maintaining the infrastructure necessary for successful silkworm rearing operations.

**Table 3: Fixed cost for Silkworm Rearing**

Sr. No.	Particulars	Amount (Rs in lakhs /year)	Amount (Rs/100dfls)	Percentage share (%)
1	Depreciation on machinery	0.23	8.61	2.53
2	Depreciation on building	5.32	199.25	58.59
3	Depreciation on furniture and electricity	0.66	24.72	7.27
4	Permanent labour charges	2.04	76.4	22.47
5	Interest on fixed capital	0.83	31.09	9.14
	Total	9.08	340.07	100

Table No. 3. reveals that the total average fixed cost for the silkworm rearing project was 9.08 lakhs, with building depreciation accounting major share of 5.32 lakhs followed by permanent labor charges 2.04 lakhs.

#### Variable cost required for Silkworm Rearing

The variable cost consists of expenditure on purchase of raw material, wages of casual labor, repair and maintenance of machinery, energy charges, postage, and stationery etc.

**Table 4: Variable cost for Silkworm Rearing**

Sr. No.	Particulars	Amount (Rs in lakhs /year)	Amount (Rs/100dfls)	Percentage share (%)
1	Cost of raw materials	41.91	1569.66	77.45
2	Casual labour charges	10.80	402.09	19.96
3	Repair and maintenance	0.30	11.24	0.55
4	Electricity charges	0.96	35.96	1.77
5	Stationery charges	0.14	5.24	0.26
	Total	54.11	2024.19	100.00

Table No. 4. shows that the average variable cost for silkworm rearing was 54.11 lakhs, with raw materials accounting major share for 41.91 lakhs followed by casual labor charges 10.8 lakhs.

#### Total cost incurred by producer for production of Silkworm.

Total cost incurred by producer for production of Silkworm is the sum of fixed cost and variable cost incurred by producer.

**Table 5: Total cost for production of Silkworm**

Sr. No.	Particulars	Amount (Rs in lakhs /year)	Amount (Rs/100 dfls)	Percentage (%) share
1	Fixed cost	9.08	340.07	14.37
2	Variable cost	54.11	2024.19	85.63
	Total cost	63.19	2364.26	100

Table 6. reveals that the total cost incurred by the producer was 63.19 lakhs, with variable costs comprising 54.11 lakhs and Fixed costs accounted for 9.08 lakhs.

financial aspects of silkworm rearing, focusing on production costs, revenue, and profitability. By evaluating these economic factors, it provides insights into the financial viability and sustainability of silkworm rearing as a business by calculating the benefit cost ratio.

**Economics of production of Silkworm:** It explores the

**Table 6: Economics of production of Silkworm**

Sr. No.	Particulars	Value per year	Value per 100 dfls
1	Production (dfl)	267000	-
2	Gross return (Rs)	80.10 lakhs	3000
3	Total cost incurred by producer (Rs)	63.19 lakhs	2364.26
4	Net return (Rs)	16.19 lakhs	635.74
5	Benefit cost ratio	1:1.27	1:1.27

Table 6. shows that the gross return from the silkworm product was 80.10 lakhs, calculated by multiplying the quantity of the product by the price per DFL. With total costs of 63.19 lakhs, the net return was 16.19 lakhs. The benefit-cost ratio was 1:1.27, reflecting the ratio of total returns to total costs.

#### Breakeven point analysis

The break-even point is the number of silkworms reared to cover all costs associated with the rearing process, including both fixed and variable expenses. It is the level at which the total revenue from sell silkworms matches the total costs incurred, meaning that no profit or loss is achieved.



**Table 7:** Break-even point analysis for production of silkworm

Sr. No.	Particulars	Value
1	Actual quantity produced per year (dfis)	267000
2	Annual fixed cost (Rs)	904000
3	Selling price per 100 dfis (Rs)	3000
4	Variable cost per 100 dfis (Rs)	2024.19
5	Breakeven point [physical quantity] (dfis)	92641
6	Breakeven point [monetary value] (Rs)	2779230
7	Margin of safety [physical quantity] (dfis)	174359
8	Margin of safety [monetary value] (Rs)	5230770
9	Percentage of margin of safety (%)	34.70

Table 7. reveals that the Gayatri Kitak Sangopan Kendra needs to process at least 92641 DFLs to cover both fixed and variable costs, achieving a

breakeven point. The breakeven point in monetary terms was 27.79 lakhs. The margin of safety, both in terms of physical quantity and monetary value, was 34.70%.

### Marketing of Silkworm

After completing the second stage of moulting at the silkworm rearing center, the silkworms are sold to farmers for further rearing and development. The silkworms are directly sold to the consumer I.e., farmers therefore only one marketing channel involved i.e., from producer to consumer farmers.

### Marketing cost of silkworm

The marketing cost consists of cost of packaging material, sealing and packaging, transportation charges, etc. required for the selling of silkworms to the farmer.

**Table 8:** Marketing cost for Silkworm

Sr. No.	Particulars	Amount (Rs in lakhs /year)	Amount (Rs/100dfis)	Percentage (%) share
1	Packaging material	0.10	3.75	35.71
2	Sealing and packaging	0.06	2.24	21.43
3	Transportation cost	0.12	4.49	42.86
	Total	0.28	10.48	100.00

Table 8. shows that the total marketing cost for silkworm was 0.28 lakhs, with transportation being the largest expense at 0.12 lakhs (42.86%). Packaging materials followed at 35.71%, and sealing and packaging costs accounted for 21.43%.

which a product is sold to the consumer and the total cost incurred by the producer or seller in getting the product to the market. This includes production, processing, marketing, and distribution costs. the silkworm rearing unit directly sells to the consumer (with no intermediary), the Purchase Price will essentially be the total cost of production.

### Estimation of Market Margin

Market Margin refers to the difference between the price at

**Table 9:** Estimation of Market Margin for silkworm rearing

Sr. No.	Particulars	Amount (Rs in lakhs /year)	Amount (Rs/100dfis)
1	Price paid by the consumer	80.10	3000
2	Price received by producer	80.10	3000
3	Purchase Price (Total cost)	63.19	2364.26
4	Marketing cost	00.28	10.48
	Market Margin	16.63	625.26

Table 9. shows that the market margin for silkworm rearing is 16.63 lakhs, representing the amount retained by the producer after covering all production and marketing costs. This margin reflects the profit from sales after deducting all incurred expenses.

### Estimation of Price Spread

Price Spread refers to the difference between the price paid by the consumer and the price received by the producer. It represents the amount that is absorbed by intermediaries, marketing costs, or distribution expenses throughout the marketing chain.

As the producer their produce directly to the farmers so there is no price spread in the silkworm rearing.

### Constraints in production and marketing of Silkworm

Silkworm rearing faces various constraints when it comes to production and marketing. These constraints can impact the efficiency and success of their operations. Here are some main constraints.

### Constraints in production of silkworm

**Table 10:** Constraints faced by owner in production of silkworm

Sr. No.	Particular	Rank
1	Difficulty in securing initial capital for infrastructure	I
2	Lack of skilled labour	II
3	Maintaining the required climate	III
4	Improper to ensure consistent product quality	IV
5	Irregular electricity supply during rainy season.	V

Table 10. reveals that the primary constraint faced by the owner of the silkworm rearing unit is securing initial capital for infrastructure, followed by the challenge of finding skilled labor for silkworm rearing.

### Constraints in the marketing of silkworm

**Table 11:** Constraints faced by owner in the marketing of silkworm

Sr. No.	Particulars	Rank
1	Damage to the silkworms while transportation	I
2	Lack of storage facility	II

Table 11. shows that the constraints faced by the owner in marketing silkworms include damage to the silkworms during transportation and a lack of storage facilities.

### Acknowledgement

I sincerely express my gratitude to my guide and mentors for their valuable guidance and support throughout the research. Their insights and encouragement were instrumental in the successful completion of this research paper.

### Conclusion

1. The analysis of the silkworm rearing project revealed that the total capital investment was Rs. 15.09 lakhs, with major expenses directed toward building and land, comprising 46.39% and 33.13%, respectively.
2. The fixed cost averaged Rs. 9.08 lakhs annually, with building depreciation (58.59%) and permanent labor charges (22.47%) being significant contributors.
3. Variable costs were dominant, amounting to Rs. 54.11 lakhs, with raw materials (77.45%) and casual labor (19.96%) forming the majority.
4. Marketing costs were minimal at Rs. 0.28 lakhs, primarily driven by transportation and packaging expenses.
5. Overall, the total cost incurred by the producer was Rs. 63.19 lakhs, with variable costs accounting for 54.11%.
6. The gross returns were Rs. 80.10 lakhs, yielding a net return of Rs. 16.91 lakhs, while the market margin stood at Rs. 16.63 lakhs, with no price spread due to direct sales to farmers.
7. The break-even point was 92641 dfls in physical terms and Rs. 27.79 lakhs in monetary terms.
8. The major challenges faced in production were securing initial capital, lack of skilled labor, and climate control, while marketing difficulties included damage during transport and inadequate storage facilities.

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