Mulberry Sericulture: An Alternative, Farm-based Livelihood for Small Farmers

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Establishing mulberry sericulture as an alternative farm-based livelihood activity was a slow and steady endeavour of the PRADAN team in Betul district of Madhya Pradesh, leading to income-generation and a degree of prosperity for women farmers

INTRODUCTION

An overwhelming share of the Indian population resides in villages; considering the trend over the last few decades, however, this is expected to change only marginally in the near future. As per the Socio-Economic Caste Census (SECC) 2011 data, more than three-fourth of rural households live on a monthly income of less than Rs 5,000, and around 70 per cent of the households are either directly or indirectly dependent on agriculture for a living. Widespread poverty in the rural areas, in the face of high and consistent growth in the national economy, indicates the declining state of the agriculture sector.

Since 2009–10, there has been a continuous decline in the share of agriculture and allied sectors in the national GDP. In the last three years, the yield of major food grains, including pulses, has increased only marginally and a few cases have observed negative growth. Similarly, the productivity of major horticulture crops has remained almost stagnant for last four to five years. The reasons for the low or stagnant productivity and the low return from the farm sector are many. Small and scattered land-holdings, poor infrastructure, lack of market access and lack of extension services are some of the key reasons.

With the monsoon becoming more and more erratic over the last 10 years, the struggles of small farmers have increased manifold. Erratic rains along with a volatile local market and inaccessible formal markets, have reduced the predictability of production, and contributed to people losing interest in farming. At the same time, no other gainful employment opportunities could absorb the workforce opting out of agriculture.

The situation calls for action towards making farms diversified and climate-resilient, on the one hand, and for putting mainstream support systems such as infrastructure, credit, knowledge- support and appropriate institutional arrangements for the backward and forward linkages in place, on another.

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In Betul district of Madhya Pradesh, PRADAN, in collaboration with the Department of Sericulture (DoS), Government of Madhya Pradesh (MP), has been working for the last seven years to establish mulberry sericulture as an alternative farm-based, livelihoods activity. This article attempts to examine the potential that this activity holds for small-holders, as a response to the challenges articulated above.

OVERVIEW OF THE SERICULTURE SECTOR

The silk industry in India involves both farm and non-farm sector participation and provides employment to seven million families, from rural as well as urban populations. Sericulture encompasses all the activities involved in raising the mulberry plantation, rearing silk-worms on mulberry leaves for obtaining cocoons, yarn production and twisting it to make it suitable for weaving. The different activities in the silk industry are in Figure 1.

In the global scenario, India is the largest natural silk producer, after China, and contributes around 23 per cent to the global silk production. It is the highest consumer of silk and silk products (8 per cent of the global consumption). Table 1 explains the share of the major natural silk producing countries and their respective share in the total global production.

Figure 1: Different Activities in Silk Industry

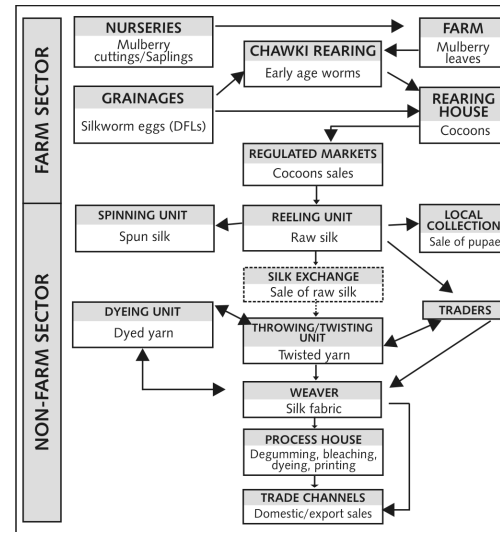

Table 1: Silk Production (in Metric Tonnes) in Major Silk Producing Countries

Country	2011	2012	2013	2014	Share in Global Production (%) *2011–12
China	1,04,000	1,26,000	1,30,000	1,46,000	79.86
India	23,060	23,679	26,480	28,708	14.91
Thailand	655	655	680	692	0.93
Brazil	558	614	550	560	1.08
Uzbekistan	940	940	980	1100	0.96

Being the second largest silk producer, India's share in global silk export is quite low. The high demand for raw silk and its allied products in the domestic market is one of the reasons for this. In fact, in the last three years, on an average, about 8,000 metric tonnes of silk is being imported from China, Indonesia and other silk producing countries, to meet in the internal demand. The final report of National Fibre Policy, prepared by the sub-group on silk says, "Domestic consumption of raw silk is estimated to increase at 3.5 per cent, per annum during the period between FY10 to FY15 and 4.0 per cent, per annum during FY16 to FY20. This would be achieved on the back of 9–9.5 per cent growth in consumption of man-made fibres, 6–7 per cent increase in private final consumption expenditure on clothing, and 4 per cent growth in the world GDP." This clearly presents the scope for increasing the production and expanding the producer base.

There are four different varieties of silk, namely, tasar, eri, muga and mulberry. India is the only country that produces all the four types of natural silks. Of the total natural silk produced, mulberry accounts for more than 90 per cent of the silk production.

At present, Andhra Pradesh, Karnataka, Tamil Nadu, Jammu and Kashmir and West Bengal collectively account for 85 per cent of the total area covered under mulberry cultivation and around 96 per cent of the total cocoon production. In the last 10 years, because of the efforts of the Central Silk Board, mulberry sericulture production has expanded to many other states, including Madhya Pradesh, Assam, Punjab, Maharashtra and Manipur. All these states are referred to as the non-traditional states for mulberry sericulture. Despite being a non-traditional state, Madhya Pradesh has shown remarkable growth in terms of outreach and the total production of cocoon and silk fibre in the last five years.

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Although sericulture as a sector encompasses non-farm activities such as yarn and fabric production and the dyeing of fabric, the next sections of the article will focus on the farm-based part of the sector, which is mulberry plantation and cocoon production.

SCOPE FOR SMALL FARMERS

In Betul district, for small farmers with an average of 2.5 acres of land, of which one acre is irrigated, mulberry sericulture offers far greater possibilities to realize a stable and higher income as compared to traditional crops such as wheat, maize, soya bean and paddy. A representative tribal household, with this much land, earns around Rs 60,000–70,000 a year from all sources. Forest produce accounts for 20 per cent of the total household income. The low productivity of cereals is one of the key reasons behind such a low income level. Besides, in the last three years, crop loss due to hail storms and rain during crop maturity stage has impacted returns negatively. Sudden changes in climatic conditions also impacted the production of forest produce such as mahua.

In this scenario, mulberry sericulture demonstrates better resilience against uncertain changes in precipitation, temperature and prolonged dry spells. If 75 decimals of irrigated land (upland) were to be brought under mulberry plantation, one can produce

cocoons worth Rs 50,000 to 75,000 in a year. Our experience says that it has the potential to go up to Rs 100,000, provided one has year-round irrigation support. The following Table explains the advantage of incorporating land mulberry sericulture in farm-based activities, over only growing agriculture or horticulture crops.

A representative tribal family, with two adult family members, can easily manage the rearing activities; the added advantage is that it does not compete with other crops for labour.

Unlike other agricultural activities, mulberry sericulture is far more capital intensive and requires an investment in infrastructure development. For a small land-holder, without grant assistance, it is nearly impossible to grow a plantation and produce cocoons. From Table 3 one can get a broad sense of the magnitude of investment required to erect a plantation, construct a rearing shed and carry out cocoon production activity.

At present, particularly in Madhya Pradesh, various projects of the Central Silk Board,

Table 2: A Comparative Depiction of Land Use and Return

Land Use without Mulberry Sericulture (for 2.5 Acres Land of which 1–1.25 Acre is Irrigated)		
Crop	**Production (in Quintals)**	**Gross Returns (Rs)**
Maize in 0.5 acre in monsoon	5	6,500
Paddy in 1 acre	8	12,000
Soya bean in 1 acre	5	15,000
Pulse in 0.5 acre	1	4,000
Gram in 1 acre	2	7,000
Wheat in 1 acre	7	10,500
Vegetables in 10–15 decimals		6,000
Total (A)		**61,000**
Land Use Including Mulberry Sericulture (in 75–80 Decimals of Irrigated Land)		
Maize in 0.5 acre in monsoon	5	6,500
Mulberry plantation in 75 decimals	2.5 q cocoon	62,000
Soya bean in 0.5 acre	5	15,000
Pulse in 0.25 acre	0.5	2,000
Gram in 1 acre	2	7,000
Wheat in 0.5 acre	3.5	6,000
Vegetables in 10–15 decimals		6,000
Total (B)		**1,04,500**
Increase in income (B - A)		**43,500**

Government of India, and DoS, Government of Madhya Pradesh are pro-actively supporting willing farmers to create the necessary infrastructure. The Catalytic Development Project (CDP) has proved to be an effective scheme that encourages small farmers to take up the activity. With the recent re-modelling of the revenue sharing system between the Government of India and the state government, CDP does not exist anymore. However, the Government of Madhya Pradesh has already decided to continue with the same model and the unit cost, as was proposed in CDP. Table 3 also explains the government assistance available for various kinds of infrastructure-creation, to carry out mulberry silk-worm rearing.

With the increase in the net returns from the activity at this point, it seems possible to develop a loan-based model of mulberry sericulture for small-holders.

PROCESSES OF MULBERRY COCOON PRODUCTION

Life-cycle of the mulberry moth (Bombyx mori)

The life-cycle of a silk worm, Bombyx mori, begins with the eggs and is complete in 50 days with the emergence of the moth from the cocoon. The stages of the life-cycle of silk-worms are: i) eggs ii) larvae iii) pupae iv) adult moths.

Table 3: CRC Establishment Cost

No.	Activity or Infrastructure	Unit Cost (Rs)	Government Assistance (Rs)	Farmer's Contribution (Rs)	Remarks
1	Establishing a sericulture garden	24,550	11,000	13,550	Up to the first rearing, including garden management for 4–6 months
2	Rearing house construction	2,00,000	1,37,500	62,500	Farmer usually takes the initial 2–3 rearings in temporary sheds and, from the profit earned in two cycles, she invests in the construction of a permanent shed.
3	Equipment for rearing	37,500	37,500	0	
4	Working capital	15,000	6,200 for one time as a revolving fund	9,000	
5	Developing irrigation source	18,750	18,750	0	

Figure 2: Different Stages of the Life Cycle of Bombyx mori

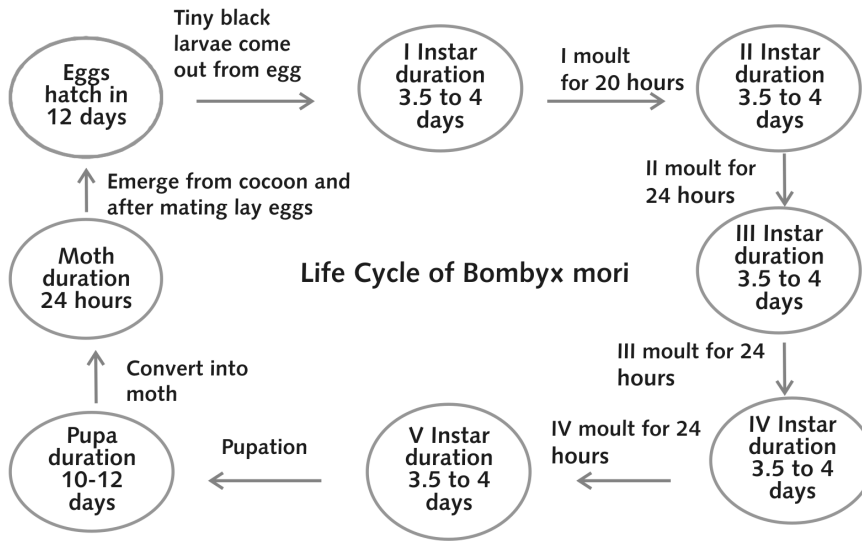


Figure 2 explains the different stages of the life-cycle of Bombyx mori.

For commercial purposes, different races of Bombyx mori have been developed by Central Sericultural Research and Training Institute (CSTRI), Mysore, and other government-sponsored research institutes. Each of the races has a specific agro-climatic suitability and each one produces specific types of cocoons. The accompanying Table illustrates the races suitable for specific agro–climates and their commercial importance.

Mulberry cocoon

Mulberry cocoon (pupal stage) is the raw material for the silk industry. There are several types of cocoons and each one has a specific utility in the silk industry. Based on the race of the silk-worm, the cocoons are categorized in two broad categories. Table 4 captures the specific features of the different categories of cocoons.

Cocoon yield depends on the following factors.

- Quality of the Disease Free Laying (DFL) and the selection of the appropriate race:

Table 4: Various Races of the Bombyx mori and their Agro-ecological Suitability

No.	Race	Description	Climatic Suitability	Commercial Importance
1	PM X CSR2	Multi-voltine race	Throughout the year	Length of the filament is less than that of the bi-voltine cocoon
2	PM X FC1	Multi-voltine race	Throughout the year	
3	CSR2 X CSR4	Bi-voltine race	Winter, beginning of monsoon and autumn	Length of the filament is more than that of the multi-voltine race
4	FC1 X FC2	Bi-voltine race	Winter, beginning of monsoon and autumn	

Table 5: Features of Various Types of Cocoons

Parameters	Bi-voltine Cocoons	Multi-voltine Cocoons
Colour	White	Yellow
Filament length and quality	1,000–1,200 m/cocoon and finer filament	800–900 m
Cocoon weight	1.8–2 gm	1.25–1.5 gm
Silk percentage	Average 22	Average 19
Price (Rs/kg)	350	270
Suitability for reeling	Good for multi-end reeling machine	High percentage of 'un-reelable' cocoon; the filament breaks quite often

Disease-free eggs laid by one adult female moth of the Bombyx mori are called Disease-free Layings (DFLs). One DFL comprises 450 to 500 eggs. Based on the weather conditions, the races of the silk-worm are selected.

- Hatchability of DFLs: Proper incubation of DFLs and timely exposure to light are two critical factors that lead to a high hatchability of eggs. About 85–90 per cent hatchability is ideal for any race, in any season.
- Sufficient feeding for the silk worm: Larvae emerge from one DFL of any bi-voltine race and, on an average, consume 12.5 kg of leaves before producing cocoons; it is 10.5 kg for multi-voltine races.
- Sanitation and hygiene of rearing houses and the Chawki Rearing Centre.

Mulberry plant and raising plantation

A plantation of mulberry (Morus alba) is the primary step of mulberry sericulture. Mulberry thrives under various climatic conditions, ranging from temperate to tropical regions. The ideal range of temperature is from 24 to 28°C. Mulberry grows well in places with an annual rainfall ranging from 600 to 2500 mm. In areas with low rainfall, the growth is limited.

Table 6 – Plant Varieties and Leaf-yield

No.	Variety	Suitability	Production in tonnes/ ha/yr
1	S 36	Irrigated	45
2	V 1	Irrigated	60
3	M 5	Irrigated	50
4	S 13	Rain-fed	18
5	S 34	Rain-fed	17

Mulberry flourishes well in soils that are pH neutral, deep, fertile, well-drained, loamy to clayey, and porous with a good moisture-holding capacity.

The leaf-yield is an important parameter for any mulberry species because silk-worms mainly feed on leaves. A good cocoon yield depends on the volume of leaves produced per plant. The leaf-yield, in turn, depends on the spacing of the plantation. Paired row system (5 x 3 x 2) is ideal for the growth of mulberry plants and the production of quality leaves. In the paired row system, the rows are alternate to one another at 5 ft and 3 ft distance and the plants are evenly planted at a distance of 2 ft in the rows. In this plantation system, 5,550 plants can be planted in one acre of land. The V1 variety of mulberry is a highly

leaf producing variety and produces 60 tonnes of leaves from one hectare annually. Table 6 depicts the leaf-yield of the various mulberry species.

The year-round availability of irrigation is crucial for raising a successful plantation and to obtain the desired leaf-yield. The rearing of 100 silk worms DFL, requires roughly 1.3–1.4 tonnes of leaves. In 75 decimals of land, with a paired row system, one can raise at least 4,000 plants. This will mean that each plant must produce 500 gm of leaves to feed 100 DFLs. In the climatic condition of Satpura, one can take up four rearing cycles in a year. In order to obtain 2 kg of leaves in a year, it requires adequate irrigation. Table 7 gives a rough idea of the irrigation requirements for 75 decimals of land in normal monsoon conditions (1000 mm annual rain fall, 80 per cent of which occurs between July and September).

Table 7: Irrigation Requirements for 75 Decimals of land

No.	Season	Irrigation Interval	Duration of Each Irrigation (3 HP Motor Run on Electricity)
1	July–September	NA	NA
2	October–January	At 15-day intervals	Irrigating one acre takes 3–4 hours.
3	February –March	At 10-day intervals	
4	April–June	Weekly	

Key activities of mulberry cocoon production

- **Raising mulberry plantation**

Usually, mulberry plantation takes place in the monsoon. The ideal time for plantation is between July and August. However, if irrigation facilities are available, the period can be extended up to October. After 4–5 months of plantation, cocoon production can be taken up, but that depends on the leaf-yield.

- **Construction of rearing house**

For each individual producer, constructing a concrete rearing house (RH) of 40 x 20 ft dimension within 6 to twelve months of plantation is essential for rearing silk worms. An RH of this size can accommodate up to 200 DFLs in one rearing cycle. The RH should be constructed in the east-west direction with sufficient aeration.

- **Chawki rearing activity**

The rearing of silk-worms is completed in two phases. The first seven days after hatching, which includes two instars and two moultings, is very critical for a good harvest. CRCs provide a controlled environment for the silk-worm larvae to grow uniformly in the first seven days of its life-cycle. Any deviation from standard practices in CRC can lead to 100 per cent mortality of the silk-worms in the later stage of growth. Two main activities take place in CRC.

i) Black boxing: At a temperature of 28–29^{0}C and 80–85 per cent relative humidity, black boxing is a process of controlled exposure of the eggs of the silk-worm moths to light. It ensures uniform hatching.

Table 8: Infrastructure Requirement for CRC

CRC capacity 8,000 DFL at one time and 32,000 DFL in a year		
No.	**Description**	**Value**
1	Plantation area	0.5 acre
2	1 chawki rearing house	30 x 30 ft
3	Leaf chopping machine	1
4	Cooler	1
5	Exhaust fan	2
6	Room heater @ 1500 wt	4
7	Humidifier	2
8	De-humidifier	1
9	Electricity supply	24 hr
Total cost of infrastructure (approx)		Rs 4.5–5 lakhs

ii) Brushing: The emergence of larvae from the eggs and subsequently separating out the larvae from the empty egg shells with a feather is called 'brushing'. After brushing, the larvae start feeding on the finely chopped mulberry leaves.

A CRC with 8,000 DFL rearing capacity can support up to 50 producers in a contiguous patch, in one cycle.

- **Latage rearing**

The farmers receive worms from the CRC after seven days. The silk-worm larva completes its life-cycle up to the pupal stage in the rearing houses of individual cocoon producers. Here, the core task of a farmer is to ensure timely feeding of the worms, taking proper disinfecting measures inside and outside the shade, and maintaining appropriate temperature and humidity in the rearing house. Depending on the seasons, the worms take 24–26 days to enter the pupal stage.

Table 9: Conditions for Instar Growth

No.	Stage	Temperature	Humidity
1	Instar 3rd	24–26	70–75
2	Instar 4th	22–24	65–70

- **Spinning and cocoon production**

After the last moulting, the worms feed voraciously for 6–8 days until they turn a pale yellowish colour and, thereafter, begin emitting silk from their mouth and the scaffolding around its body forms the cocoon. The worms take 3–3.5 days to make a cocoon and the cocoons mature in three days. Thereafter, cocoon harvesting takes place.

- **Marketing**

After the harvesting of the cocoons, the farmers either sell the cocoons to government-regulated markets. In different states, state governments have their own procurement system.

Table 10: Key Production and Quality Parameters

Parameters	National Standard
Leaf-yield/ha in a mulberry garden	45–60t/ha
DFL reared/ha/year	2,000
DFL to cocoon conversion ratio	50%
Silk ratio of cocoon	23%
Good cocoon percentage (Reelable cocoon/Total cocoon produced x 100)	90-95%

EXPERIENCE OF PROMOTING MULBERRY SILK-WORM REARING IN BETUL DISTRICT OF MADHYA PRADESH

Journey So far

PRADAN started promoting mulberry sericulture way back in 2002 in a few villages of Kesla block, Hoshangabad district. The early days of promoting the activity were more about exploring the feasibility of the activity in the area and its potential, in terms of raising household incomes. In the last 12 years, the team has experienced several ups and downs; on the one extreme, it had to close down the activity in the oldest villages and, on the other, it had an overwhelming number of families adopting the activity in relatively new pockets and the people earned more than Rs 1,00,000. Beyond these successes and failures, what was gained is experience and learning. The current state of the activity in 50 villages of the Betul district, with approximately 724 women farmers, can be seen as the cumulative learning of the last one decade, converging to fine-tuning and strengthening the activity. Table 11 portrays a comprehensive picture of the long journey.

Table 11: Glance at the Comprehensive Journey of Mulbery Sericulture in PRADAN

No.	Period	Milestone	Challenges
1	2002–07	◆ Initiation of mulberry sericulture in the Kesla block, Hoshangabad district ◆ Activity expanded to nearby Shahpur block of Betul ◆ Total 180 farmers adopted the activity ◆ A separate technical team was placed and an accounting system and book-keeping was put into place.	◆ Less grip on technical aspect of rearing and, therefore, leaf-yield and conversion of DFLs to cocoon was very poor ◆ Average income per household was as low as Rs 3000/year ◆ Farmers' focus was more on availing subsidy ◆ Error in farmer selection
2	2007–09	◆ The idea of building a producers' collective was conceived and the Simant Krishak Shahtut Krimi Palan Sangh (SKSKS) was born. ◆ A separate office space was created for SKSKS. ◆ Activity started expanding to newer pockets of Shahpur block.	◆ Drop-out rate of old farmers was very high. ◆ Average income/farmer/year was low. ◆ Struggle for stabilizing productivity continued. ◆ SKSKS was established but it was hardly serving any purpose. ◆ For DFL and sapling activity, complete dependence on Department of Sericulture.

No.	Period	Milestone	Challenges
3	2009–11	◆ Studied and identified drop-out and weak performer regions. ◆ Set up a criteria and plan for expansion. It was more about setting exclusion criteria to reach out to genuinely interested farmers. ◆ Closed down the activity in Sukhtawa, and operations handed over to DoS. ◆ Concentrating on newer pockets of Shahpur and Ghoradingri blocks. ◆ Cash transaction with farmers stopped completely. Each woman opened a bank account.	◆ Irregularity in production ◆ Mortality of plants increased due to weak supply of saplings. ◆ Convergence of cocoon from DFLs was not as good as per the potential of the activity.
4	2011–13	◆ With the support of an external expert, a medium term business plan was developed for SKSKS. ◆ Village-level Producer Groups (PGs) meetings were regularized. ◆ Sapling production started in the local area. ◆ Chawki rearing, earlier assumed to be a technical and sophisticated activity, tried for the first time in the villages with experienced farmers. ◆ Productivity stabilized at nearly 50%. ◆ For the first time, SKSKS organized and celebrated a *kisan mela* and the members shared their achievements and motivated others.	◆ Smaller rearing cycles, spread throughout the year, imposed heavy load on the systems of supervision and field support. ◆ Volume of production was low. ◆ Frequent and smaller rearing cycles led to complexity in managing operations in CRCs. ◆ Operational cost of SKSKS was largely met by PRADAN.

No.	Period	Milestone	Challenges
5	2013–present	◆ Producer-wise production plan and DFL consumption plan preparation initiated at Mahila Resham Samiti (MRS). ◆ MRS was entrusted with the responsibility to review the plan and help each other achieve planned production. ◆ Producers' base increased six-fold as compared to 2011. ◆ Total production increased eight-fold, as compared to the production in 2011. ◆ Batch rearing initiated. It reduced the batch size from 11/year to 5/year. ◆ Average income of the producers: Rs 40, 000 and more/year. ◆ SKSKS started generating revenue to sustain its operations. ◆ Gross business volume of SKSKS crossed Rs 20,000,000. ◆ Accounting software developed for SKSKS. ◆ Six new CRCs established and SKSKS became self-reliant in terms of DFL requirement. ◆ Betul became the second-highest producer of mulberry cocoon after Hoshangabad. The farmers of SKSKS accounted for more than 80% of the total production of Betul district.	◆ Other than the department, no other buyers of cocoon existed in the market. ◆ For timely supply of eggs, SKSKS is still dependent on the DoS. ◆ Infrastructure for storage and post-production operations such as stifling were inadequate in the face of the growth in production. ◆ Reduction in cocoon price because of the removal of excise duty on Chinese yarn.

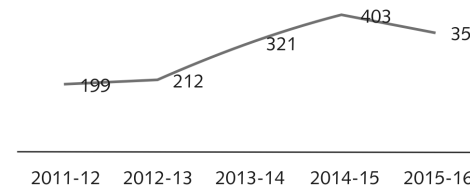
Trend and Current State of the Activity

PRADAN's involvement in mulberry sericulture covers only a small part of the entire value chain. It starts with the brushing of DFLs in CRC and ends with the sale of the cocoons to the Madhya Pradesh Seri Federation, promoted by the DoS, Government of Madhya Pradesh. At present, 724 women from 50 villages of the Betul district are involved in the mulberry sericulture activity. SKSKS, an informal producers' collective, is integrating the operations. Table 12 explains the current state of the activity in terms of production and yield.

From the Table, it can be inferred that there has been a substantial and consistent growth in the production since 2012–13. The key strategic interventions made in the last four years are as below:

- **Increase in DFL consumption/farmer/cycle:** Low DFL use has been one of the key reasons for the farmers realizing a low income. From 2013 onwards, the focus of the activity has been to ensure a high leaf-yield so that the farmers rear at least 80 DFLs in one rearing cycle. Figure 3 shows the trend of DFL use/farmer/year. In 2015–16, the average DFL use is expected to reach 480. In order to encourage farmers to use more DFL/rearing, the price of DFL was incentivized. The more the number of DFLs, the less the price. At present, if one farmer uses 150 or more DFLs in one cycle of DFL, the price goes down to Rs 5.5/DFL, whereas for 80 or less numbers of the DFL/cycle, the price is Rs 10/DFL.

Figure 3: Average DFLs Reared by Old Farmers



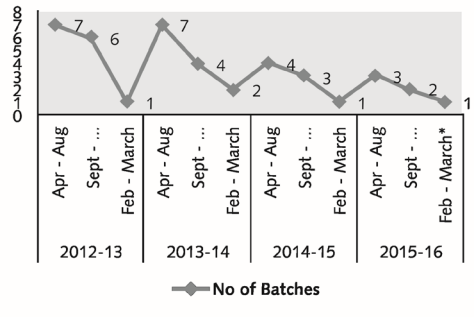
- **Batch rearing:** Before 2013, there used be 10–11 smaller rearing cycles, spread across the year. In order to bring efficiency in management and supervision, batch-rearing was initiated. Operationally, it means that all the farmers in a village will start rearing at the same time. It consequently systematized the entire operation, starting from garden management to DFL supply

Table 12: The Current State of the Activity (Production and Yield)

No.	F.Y.	Number of Farmers	DFLs Reared	Production in Kg	Productivity %age	Gross value of cocoons sold (Rs)
1	2009–10	222	12,662	6,087.9	48.08	7,06,063.0
2	2010–11	161	19,632	8,997.0	45.82	1,101,089.0
3	2011–12	218	25,228	12,636.7	50.08	2,051,251.0
4	2012–13	185	28,395	13,079.0	46.06	2,141,323.0
5	2013–14	227	56,785	26,903.9	47.37	6,415,936.0
6	2014–15	347	90,511	45,911.3	50.72	15,277,134.0
7	2015–16*	724	13,5019	74,273.0	55.00	21,459,351.0

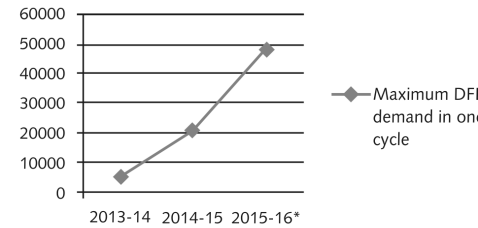
to cocoon procurement. This helped farmers take up rearing in the best season. Figure 4 indicates the trend of 'the number of batches' in a year.

Figure 4: Trend of Number of Batches in a Year



- **Planning for each producer:** Synchronizing production cycles for all the farmers required an intensive planning exercise at each individual producer's level. In 2014–15, the team initiated a planning process in MRS. Each farmer was asked to set an income target for the year, leading to farmer-wise DFL demand for each rearing season. For the first time, we could freeze the rearing seasons: a) before sowing of maize in the monsoon b) before 'Ganesh Chaturthi' c) before Deepawali d) before Holi. In 2014–15, 80 per cent of the farmers reached 70–80 per cent of their planned income targets and were able to translate the same into the DFL use plan. In 2015–16, the producers were intelligent enough to set the DFL consumption plan instead of setting the income target. For 2015–16, the total DFL use plan was set to be 200,000 and we expect the farmers will achieve more than what they have planned.

Figure 5: Maximum DFL Demand in One Cycle



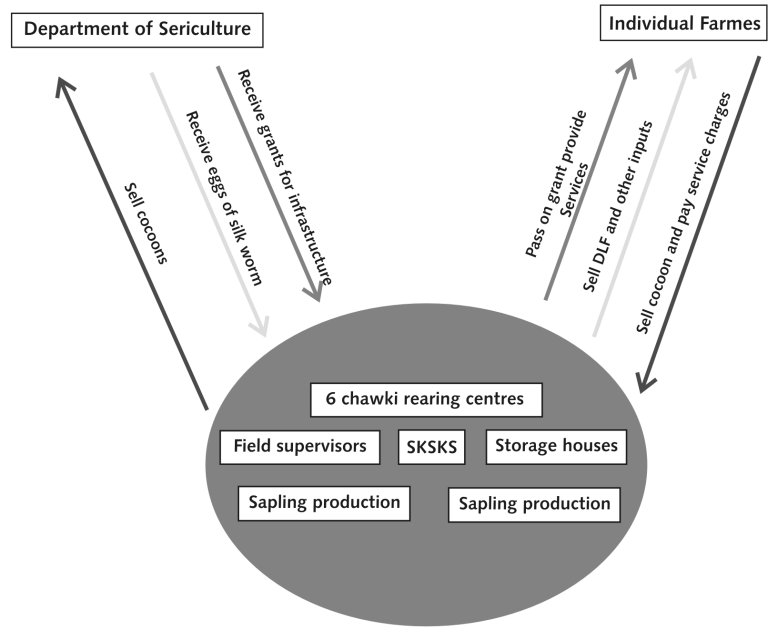
- **Complete control over CRC operation:** With the increase in the producer base and DFL demand, bringing Chawki Rearing under total control of SKSKS was one of the most significant strategies. Before 2014–15, there were only two CRCs run by SKSKS. In 2015–16, five new CRCs were established. At present, with seven CRCs, SKSKS has a total Chawki Rearing capacity of 70,000 DFLs at a time.

Table 13: Number of Farmers in Plantation

FY	New	No. of Farmers Who Took Up Rearing in Plantation Year	No. of New Farmers Who Earned More than 15,000 in Plantation Year
2011–12	54	31	0
2012–13	62	27	0
2013–14	51	43	4
2014–15	152	134	18
2015–16*	360	224	21

- **Minimizing the gestation period:** Four years back, it took a new farmer almost a year before she could realize production. At present, around 80 per cent of the farmers are achieving this in the very first year of plantation.
- **Entrusting MRS with greater responsibilities:** In 2013–14, a huge effort was made to revive all MRSs. The team understood that unless the producers' collective shares the responsibility to support each other and hold each other accountable, efficiency in production cannot be achieved. Earlier, all activities from DFL distribution to settling household-level issues to regular monitoring of rearing activity to cocoon procurement were the supervisor's responsibility. From 2013–14 onwards, MRS started taking a stake in setting the annual plan for individuals, in activity monitoring, particularly for new farmers, and also in confronting each other in MRS meetings, for non-achievement of production plans.
- **Strengthening the functioning of SKSKS:** Established in 2009, SKSKS was to integrate operations at the Production Cluster Level (conceived more or less like an FPO). From 2013 onwards, concerted efforts were made to make it functional. Earlier, SKSKS was merely a 'grant passing' body for the DoS. Instead of giving infrastructure grants directly to farmers, DoS used to give them to SKSKS and, in turn, SKSKS would distribute the funds to the individual producers. For the supply of chawki (DFL) and procurement of cocoons, DoS was in direct touch with individual farmers. The producers used to pay Rs 3 per kg of cocoon to SKSKS as service charge. A few key decisions were taken to strengthen the functioning and identity of SKSKS.

Figure 6 : Schematic Representation of Transaction of Produce, Subsidies and Raw Material



- Direct transaction between DoS and the farmers was stopped. SKSKS was placed between the farmers and DoS for each and every transaction.
- SKSKS established six new CRCs, to ensure timely supply of quality DFLs to member producers.
- SKSKS also started producing saplings required for new producers to raise plantations.
- A membership fee was levied on new farmers joining the activity.
- The grants for raw material were withdrawn. SKSKS now receives a few raw materials such as disinfectants from DoS free of cost, but for the farmers, nothing is free of cost.
- Service charge for the cocoon produced increased from Rs 3 to 15 per kg, to generate the funds for the operating costs of the organization.
- The cost of DFLs also increased and incentivized the farmers to take bigger learning cycles.
- A small fund was created to support the farmers, whose rearing had been affected by extreme climatic conditions.
- The Governing Board of SKSKS was trained on specific business indicators so that they could keep track of the movement and decisions. All these were discussed and approved by them.
- Initiatives were taken by SKSKS to support students in pursuing higher education.

IMPACT ON INCOME

At the individual producer's level, there has been spectacular growth in the gross returns from mulberry silk-worm rearing, particularly in Betul district. Figure 6 shows that in 2013–14, 30 per cent of the producers earned above Rs 40,000 from cocoon production, which went up to 60 per cent in 2014–15. In 2015–16, till December, 51 per cent of the producers have crossed the level of Rs 40,000. We expect around 70 per cent of the farmers will earn Rs 40,000 or more from the activity by the end of 2015–16.

Figure 7: Income Trend among farmers

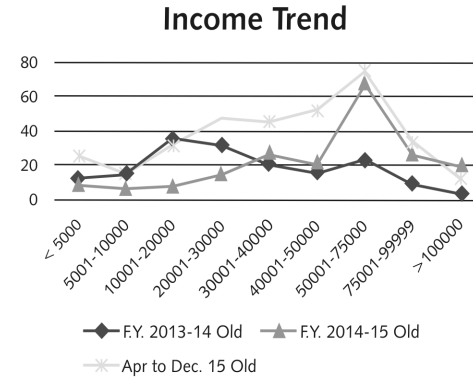


Table 14: Comparision of Production in Traditional States with Betul

Parameters	Standards of Traditional States	Status in Betul
Leaf-yield/ha in a mulberry garden	45–60t/ha	30–35t/ha
DFL reared/ha/year (average)	2,000	1,200
DFL to cocoon conversion ratio	67.13 (Karnataka 2013–14)	51% (average of last three years)
Silk ratio of cocoon	23%	22–24%
Good cocoon % (Reelable cocoon/ Total cocoon produced x 100)	90–95%	90%

STANDARDS OF PRODUCTION

Table 14 shows that Madhya Pradesh, despite being a non-traditional state for mulberry sericulture, is catching up with the farmers of the traditional states, on certain production parameters because of the farmers of Betul district. There is huge scope to increase DFL consumption/ha/year, provided appropriate management and leaf-yield are ensured. Because of the climatic conditions, realizing productivity beyond 60 per cent, throughout the season, seems a little difficult.

CHALLENGES AHEAD

- To increase total production, there is a need for urgent attention to establish infrastructure for post-production operations such as storage and stifling. At present, SKSKS does not have independent stifling and storage units. Therefore, expansion and deepening of the activity, to a great extent, depends on the government system.
- A few months back, the Silk Federation of Madhya Pradesh announced a 30 per cent decrease in cocoon price. In Madhya Pradesh, there is no other marketing channel and, therefore, farmers were compelled to sell their produce to the Madhya Pradesh Silk Federation. Increase in production necessitates exploring the possibilities of direct marketing of cocoons.
- For supply of DFLs, SKSKS is still dependent on DoS. For autonomous functioning, it needs an independent channel for procuring quality DFLs and infrastructure for the incubation of eggs.
- The demand for chawki will rise two-fold by 2016–17, and to cater to the need, at least four more CRCs will be required. The current grant assistance for CRC is falling far short of what is required.
- Over the last 3–5 years, the monsoon has been quite unpredictable. Crop loss due to hail storms or excess rain or sudden rise in humidity has been frequent in the last couple of years. In this situation, putting in place, a suitable insurance programme is the need of the hour.

CASE STUDIES

Shivkali Bai from Chhuri Village

Shivkali Bai is just like any other woman but has acquired a distinct image, today, among all the women of Chhuri village in Betul. Eleven years ago, she got married to Suraj. Their financial condition was very unstable. She started working as a house-maid to a well-off upper caste family of the village. Then she worked as a labourer on others' fields and sometimes for *panchayat* works. Meanwhile, her family grew as she had a son and two daughters. Financial burdens, clubbed with the issue of food security, pushed the family into a very difficult situation.

Some women of village informed her about SHGs and how they may be of help for her credit needs. She joined the Devi Mahila Samiti in February 2007 and started saving ten rupees every week. Meanwhile, she also started cultivating paddy and maize on a small piece of land, which was not sufficient to cater to the food and cash needs of her family. She started mulberry silk-worm rearing in 2012 and reared her first trial crop in late 2012, which fetched her Rs 140. Her new endeavour was not an easy one like other crops. It required technical knowledge, continuous care of silk-worms and a responsibility about bringing success to the activity. She says *"Bhaia, agar sab kuch sahi nai hota to sab kehte ke kaam theek nahi hai* (If it had been a failure, people would have said that I have not worked properly)."

In the next season, some of the older farmers like Kamla *bai*, Jaiwanti *bai* and Rampyari *bai* supported her to learn the technical aspects of silk-worm rearing and monitored each of the critical practices. In 2013–14, she successfully completed one rearing cycle with 50 DFLs and earned Rs 12,000. The next cycle fetched her Rs 17,000.

As she said, this was first time that she had a lot of money in her bank account, and the first thing she did was to purchase a cycle for her son so that he could attend school regularly. Even after getting some success in silk-worm rearing, it took a significant amount of time for her to get out of her self-view of a silent wage labour.

Sangeeta *Bai* from Dhappa

Sangeeta Evne, of Dhappa village, is no different from the other women of the Gond community in this area. Her family has 5 acres of land but the undulating terrain and the lack of irrigation support made her husband migrate to nearby cities in search of employment. In 2011–12, she was the first person of her village to agree to start mulberry sericulture in one acre of land. In 2013–14, she earned Rs 1,50,000 from cocoon production and sapling production. In 2014–15, her earning further increased to Rs 2,00,000. In 2015–16, she expects to earn above Rs 3,00,000.

Her success has inspired many others in Dhappa and, today, there are 43 women producers who have adopted mulberry with great confidence. She has also served as a Governing Board Member of SKSKS for three consecutive years.

The references for this article are available on request from newsreach@pradan.net