**Sericulture - A Potential Agro Based Enterprise**

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**ABSTRACT**

Sericulture is an ancient and important rural agro-based industry per excellence with agriculture base and industrial super structure. India’s economy is largely depends on the success of agriculture and associated farm activities, as more than 70 percent of the people’s livelihood is depending on this sector. Sericulture industry with its rural based on-farm and off-farm activities and enormous employment generation potential has been recognized as one of the most appropriate avenues for socio-economic development. The industry covers different on-farm and non-farm activities involving various groups of people. This sector offers gainful employment for the rural masses as well as for the educated youth in semi-urban and urban areas. Sericulture growth will certainly improve rural economy, by creating income generating entrepreneurial opportunities. In view of the significance of sericulture industry for the economy of the country, the paper enlightened the entrepreneurial opportunities in agriculturally based activities of sericulture.

**Keywords:** Agro-based, Enterprise, Sericulture, women participation, Employment, silkworm rearing

**Introduction**

The word “Sericulture” has been derived from the word “Su” (Si) which means silk. Sericulture is the art and science of growing silkworm, food plants, rearing silkworms, and production of silk. Sericulture is a labour intensive agro based cottage industry that contributes significantly to employment in rural areas in some of the states where it is predominant. Sericulture, a recognized practice in India, is defined as a practice of combining mulberry cultivation, silkworm rearing and silk reeling. There are four varieties or types of silk worms generally reared in India viz. Mulberry silk worm/domestic silk moth (*Bombyx mori*), Eri silk worm (*Philosamia ricini*), Tassar silk worm (Antheraea mylitta) and Muga silk worm (*Antheraea assamensis*). Mulberry is taken up in several parts of the country such as Karnataka, West Bengal and Jammu and Kashmir; muga silk production is mainly confined to Assam; and tassar silk production is mainly taken up in Bihar, West Bengal, Madhya Pradesh and Orissa and is identified as an activity mostly associated with tribal communities. Besides, eri silk production is restricted to Assam and Orissa states. In West Bengal, mulberry sericulture is a traditional activity predominant in several districts such as Malda, Murshidabad, Bankura, Purulia, Darjeeling, Uttar Dinajpur, Cooch Behar, North and South 24-Parganas, Jalpaiguri, Midnapur, Dakshin Dinajpur, Burdwan, Birbhum and Nadia. While considering tassar silk, the activity is predominant in Purulia, Bankura, Midnapur and Birbhum. The major crop under expansion programme in West Bengal is mulberry. India occupies the second position in the world, next to China in terms of silk production where it plays a vital role in development of socio-economic conditions and generation of employment opportunities to the rural poor. The total area under mulberry cultivation is approximately 188 thousand ha in the country. In India more than 98% of mulberry silk is produced from five traditional states like Karnataka, Andhra Pradesh, West Bengal, Tamil Nadu, and Jammu and Kashmir. The climatic situations in our country are very much favourable for luxuriant growth of mulberry and rearing silkworms throughout the year. The temperature in Karnataka, the major silk producing state in India, ranges from 21.2 to 300C whereas the climate in Kashmir is more advantageous to silk worm from the months of May to October. Cultivation of mulberry plants is termed as **Moriculture**. There are about 20 species of mulberry, among which four species like *Morus alba, M. indica, M. serrata and M. latifolia* are usually cultivated. The crop can yield well for 12 years, after that they are pulled out and fresh planting is done. Yield of mulberry leaves is approximately 30-40 t/ha/year.

**Definition and concept of Sericulture**

Silk and Silk worm Sericulture or silk farming is an agro-based industry that involves all the processes/steps starting from mulberry cultivation to silk dying and weaving of sericulture activities. Shortly. Sericulture is an art of rearing silkworms for silk production. Its main product is the natural silk fiber. Silk is at functional term used to describe protein fibers that are secreted by insects (from phylum Arthropods) is known as Silk Moth. Silk is a natural protein fiber and is very soft, lustrous, smooth, strong, and durable than any natural or artificial fiber (Silk-fiber is a protein produced from the silk-glands of silkworms. Silkworm (*Bombyx mori* L.) is a small Lepidopteron insect that is economically very important at the national and international level. On the other hand, silkworm is the common name for the silk-producing larva of any of several species of moths, which acquire salivary gland known as "Silk gland" that modified for the productions of cocoons. There are two types of silk worms practiced in Ethiopia namely Mulberry silkworm and non-Mulberry silkworm (e.g., Eri silkworm). The silkworm moth oil can be used to obtain textile dyes and superior soaps; Besides, it has pharmaceutical purposes.

**Major Benefits of Sericulture**

India is the only country in world which produces all varieties of silk namely mulberry, tassar, muga and eri. Silk reeling is an activity where people with little education and technical knowledge can also learn reeling skills while being employed in the reeling units.

1. High employment generation: About 60-100 lakh people especially in forest areas like tribal are engaged in various on-farm and off-farm activities and sericulture can generate employment @ 11-man days per kg of raw silk production throughout the year leading to rural economy upliftment.

2. Provides vibrancy to village economies: About 57% of the gross value of silk fabrics flows back to the cocoon growers with share of income to different groups.

3. Low gestation but high returns: Mulberry takes 6 months to grow and once planted can support silkworm rearing for 15-20 years depending on inputs and management provided.

4. Five crops can be taken in one year under tropical conditions.

5. Women friendly occupation: Women constitute over 60% of total employed in down-stream activities in India; mulberry garden management, leaf harvesting and silkworm rearing are effectively carried out by the women folk and silk reeling industry including weaving is 100% supported by them.

**Salient Features of Sericulture**

Sericulture is not restricted to the agricultural activities of mulberry cultivation, silkworm rearing and seed production, but opens up into the post-cocoon sectors of silk reeling. twisting, weaving, dyeing, printing and garment manufacture. While, the farmers in the rural areas practice sericulture for producing cocoons, silk reeling/ spinning and weaving activities are concentrated in semi- urban area, towns and cities. Reeling forms, a vital link in converting the agricultural produce viz., Cocoon into an industrial product -the yarn. Reeling involves a series of intricate process converting the cocoons into raw silk. The reeling sector in India is highly decentralized, employing a variety of reeling devices viz., Charka, Cottage basin, domestic basin, multi-end reeling machinery and Automatic reeling machine.

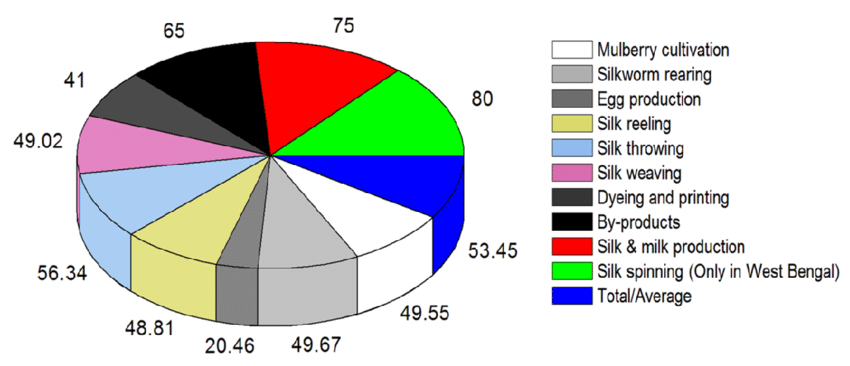
**Versatile enterprise:** Mulberry, the food crop for silkworm, is a hardy and perennial crop. It can be cultivated in a wide range of soil and agro-climatic conditions both in rainfed and. irrigated areas. Sericulture can also be integrated with certain other agricultural crops. livestock, vegetables and plantation in the integrated farming system for optimum use of the available resources to maximize the productivity and thereby net farm income on a sustainable basis.

**Eco-friendliness:** Sericulture an environment-friendly farm occupation. Since mulberry is a perennial crop, it does not require frequent opening of land, which exposes soil to natural vagaries such as wind and water erosions. Eco-friendly technologies such as bio-fertilizers, recycling of sericulture wastes into nutrient rich organic manure, bio- control measures for pests and diseases of mulberry and silkworm, and use of safe chemicals for disinfection of rearing houses and appliances are encouraged in sericulture for preserving and promoting the natural eco- system.

**Suitable for weaker section of society:**As sericulture is highly suitable to small and marginal farmers. because of its higher income generating nature with comparatively less investment, sericulture is one of the solutions for tackling the concerns of shrinking land holding sizes of farmers. (Doubling Farmers Income).

**Sericulture can easily integrate with other farming practices:** Silk production can be integrated with other farming activities like fish farming (aquaculture), beekeeping (apiculture), vegetable production and poultry farming. For instances; after reeling, silkworm pupae from cut cocoons are found to be useful to feed poultry and fish and the waste of silkworm larvae will be used as farmyard manure. In addition to feeding silkworms, mulberry leaves can serve as animal feed and provide fruit. Farmer also integrate silkworm production with poultry production in that, they feed dead and over produced worms (rich in protein) for poultry. Mulberry leaf is also found along road shoulders and fences as well as intercropped with other crops. The seed of castor is used for bio fuel production, and further expansion of sericulture is integrated with this technology and is better sustainable. The pupae and silk waste are being used as poultry or fish feed. Waste silkworm pupae are considered as an important dietary protein source for poultry after proper processing at a reasonable cost. Silkworm pupae were used as food in piggery, poultry, and pisciculture and as dog feed due to their richness in protein and fatty acids. The deoiled feed of pupae made rabbits to gain better weight and growth of fur.

**Involvement of women in Sericulture:** Basic feature of this farm based economic enterprise is the involvement of women as their contribution in sericulture industry is to the tune of 60%, mostly in silkworm rearing and reeling. Sericulture provides scope for the direct involvement of women in the process of production and decision making for improving their economic conditions and enables them to gain greater recognition and status in the family and society. It is started in China as early as 2600 BC, Lei-su, wife of the emperor Huang-di, is supposed to have taught people as to how to rear the silkworms, reel silk and to make garments. Further in the year 2640 B.C. according to the legend, the usefulness of silk was discovered by a Chinese Empress Salien-chi. Thus, the origin and development of sericulture is linked to women. The sericulture industry fits into the guidelines and principles of the International Council of Women. In general, women in the house while attending to the household activities also look after silkworm rearing activities like leaf chopping, bed cleaning, feeding the silkworm, maintenance of hygiene, picking the ripe worms and placing them on mountages and so on. Their participatory role as workers is highly significant, and their rate of participation in silk cocoon production is much higher than that of male counterparts.



**Process of Sericulture**

Sericulture is the process of obtaining the natural silk fiber through silkworm rearing, which can be practiced in varying agro-climatic conditions, and is suited to different production systems. The process of sericulture involves major activities such as; cultivation of mulberry leaves or castor oil plant to feed silkworms which spin silk cocoons, rearing of silkworm (for the production of raw silk), silkworm egg production, production of raw silk, rearing equipment, cocoon drying, reeling the cocoons for unwinding the silk filament for value added benefits such as processing and weaving. Silkworm rearing is an extensive month-long exercise starting from egg stage and terminating in adults laying eggs and dying their natural death. During this path, they pass through five larval instars (1st, 2nd, 3rd, 4th, and 5th instars) intervened by four moults, cocoon and pupal stage. In Ethiopia, silkworm rearing includes life cycle spans through 46-56 days with 10-13 days of egg stage, 21-30 days of larval stage, 2-3 days cocoon spinning, 10-15 days as pupal duration and 3-5 days in adult stage. Each female lays 300 to 500 eggs and eggs hatch in about 12 days. The larvae of mulberry silkworm are caterpillars that are about 40 cm long. For raw silk production, the pupae are killed, a process called stifling. First cocoons are cooked in water to remove the gum, which holds it together, and then unwinding the filaments (reeling) takes place, hence, process of the removal of silk yarn from the cocoons is called reeling. Before adults emerge, otherwise the emergence of the moths makes the fibers into pieces. Before weaving, the raw silk is boiled in water to remove remaining gum, dyed and bleached, and then woven into the garment.

**Mulberry Silk Production: People and Process-**

The commercial production of silk is a long and complex process involving a variety of skilled people at different stages of its production. About 60 lakh people in India are engaged in various sericulture activities throughout the year. Here is an outline of the different steps involved in the production of mulberry silk and the people employed at each step.

**1. Silk rearers**: The process starts with rearing the silkworm, Bombyx mori, in a controlled environment. The female silkworm lays eggs in a box which are incubated for a few days until the eggs hatch into larvae. They are now ready to be fed mulberry leaves.

**2. Silk farmers:** Mulberry saplings are planted in nurseries and take about 6 months to grow. The leaves of the mulberry trees are then harvested to be fed to the silk larvae.

**3. Silk rearers:** The larvae are fed huge quantities of chopped mulberry leaves for about 6 weeks. During this time, they shed their skin 4 times and grow to about 4 inches long. Once it stops eating, the silkworm is now ready to spin silk. The worm is attached to a frame, where it rotates its body continuously, secreting saliva. The saliva hardens in contact with air, forming a pair of silk filaments. It also secretes a gummy fluid, sericin, which binds the filaments together for protection. Over the next 4 days, the silkworm spins about 1 km of filament, constructing a cocoon and encloses itself completely within it, growing into a pupa. From every batch of cocoons, a small portion of the male and female pupae are kept aside until they grow into moths and are mated for producing the next generation of silkworms. The remaining cocoons are sent for processing into silk.

**4. Silk reelers:** The cocoons are boiled in water, killing the pupae and softening the sericin. The silk filaments are unbound from the cocoon and carefully wound onto a reel. Filaments from several cocoons are wound together to create a single thread of raw silk. About 2500 silkworms are required to produce a pound of raw silk.

**5. Silk twisters:** The raw silk still contains the sericin gum. It is removed by washing it with soap and boiling water. The resulting silk is soft, light and lustrous, and is twisted to produce the strands of silk yarn. Different methods of twisting are used to get the various types of silk yarn: crepe, organzine, singles, etc. The yarn is dyed at this stage in baths of dye colours.

**6. Silk weavers:** In the final step, silk fabric is woven from the silk yarns using looms (handlooms and power looms). A variety of looms employ different ways of holding the warp and weft yarns in them and apply various weaving techniques to produce the diverse range of silk fabrics that we can find today.

**Major Constraints in Sericulture**

Followings are the major hindrances in case of sericulture:

**1. Constrains in mulberry cultivation**:

a. Labour scarcity due to diversified employment opportunities.

b. Even though they are available, they have to be paid with higher wages (high labour cost).

c. Harvesting of mulberry leaves is a labour-intensive operation.

d. Harvesting requires frequent and a greater number of harvests.

e. Inadequate water supply during summer as water level would go down thereby limiting the availability of water for irrigation purpose.

f. Therefore, the farmers can not undertake cultivation of mulberry in larger area.

g. Pest and disease attack; leaf eating caterpillars and stem borers are the major pest causing huge reduction of yield.

h. non-availability of farm yard manure due to the fact that most of the farmers are not rearing cattle now-a-days.

i. Lack of awareness about application of bio-fertilizers due to lack of visual impact.

j. Lack of awareness about suitable varieties.

**2. Constraints in silkworm rearing:**

a. non-availability of skilled laborer

b. Lack of awareness on maintenance and regulation of the room temperature, aeration and sunlight

c. Lack of knowledge about disinfectants

d. Rearing of silkworms requires skill in various steps like cutting of mulberry leaves, feeding, changing of beds, maintenance of temperature and aeration and maintenance of hygienic environment.

e. All these operations can be carried out properly only when the labourers are skilled and trained.

f. The labourers can learn skills only after some years of their experience and training.

g. Maintenance of optimum temperature, aeration and sunlight is very important for producing quality cocoons.

h. Majority of the farmers don’t have adequate knowledge about identification of disinfectants thereby leading to more infection.

**3. Constraints in marketing of cocoons:**

a. Fluctuation in market price as the market price for cocoons is decided mainly based on the quality of cocoons.

b. The poor-quality cocoons may be produced due to various reasons such as improper feeding schedules, disinfectant larvae, maintenance of irregular room temperature etc.

c. Only lower prices will be paid for poor quality cocoons and hence there may be fluctuation in market prices.

d. Distant location of market

e. More expenditure on transport.

i. As market centres is located in distant places, they face the constraint of transport.

ii. Few respondents have the mode of own transport.

iii. Many of them depend on hiring vehicles like van, tempos and buses, for that they have to spend more money.

f. Delayed payments from buyers: As the marketing is mainly undertaken by government, sometimes there may be a delayed repayment from buyer.

**Key Interventions of Sericulture Department-**

In order to achieve a better production level after mitigating the challenges, the department of sericulture has proposed some key interventions:

1. Introduction of high yielding varieties of mulberry.

2. Supply planting materials at subsidized rates.

3. Supply of rearing inputs/appliances to the beneficiaries.

4. Maintenance and multiplication of basic silkworm seeds.

5. Promotion of post cocoon sector through development of reeling/twisting infrastructure.

6. Training and capacity building of stakeholders viz., officials, farmers, reelers and private seed producers.

7. Marketing support to the producers.

**By-products of mulberry silkworm**

1. Garlands can be prepared from the shells of the pupae that can be stored after out the silk filament.

2. In the soap manufacturing industries, the oil is extracted from the dead pupae.

3. The exuviae that is remained after oil extraction is used in poultry feed which are rich source of vitamin E and K.

4. The excreta of silkworm are rich in organic matter and can be used to feed fish.

5. Mulberry wine is also extremely popular among the wine lovers.

6. Few sports items and toys can also be prepared using the woody stems of mulberry plants.

**CONCLUSION-**

The sericulture industry is unique for more than one reason. It is based on agricultural output viz., cocoons and cottage-based labour intensive in nature. Identification of a market opportunity, research and development, community empowerment and learning from failure are the key factors for the success. Sericulture clearly provides remunerative ‗employment ‘for family members and economic benefit to farming households. In India, Sericulture is not only a tradition but also a living culture. It is a farm based, labour intensive and commercially attractive economic activity falling under the cottage and small-scale sector. It particularly suits rural based farmers, entrepreneurs and artisans, as it requires small investment, but with potential for relatively higher returns. It provides income and employment to the rural people especially farmers with small landholdings and the marginalized and weaker sections of the society. Sericulture occupies a place of pride in the rural economy by being only cash crop that guarantees attractive returns in a short period of time. Moreover, the women in the society particularly the rural women are actively involved in almost all the activities in their family works and in assisting the male member of family to uplift the economy. Women participate in the activities of sericulture, thus provide ample scopes for their development through awareness, capacity building through imparting training demonstration of technologies, processes, techniques etc., & guiding for empowerment so that the society will be socioeconomically uplifted and the country as well. Sericulture has emerged as the most important cash crop with minimum investment, low gestation period, high employment potential and highly remunerative return. Suitable for every section of society, a big farmer or a landless farmer, aged person or a youth, man or a woman. This Sericulture sector is not only important for generating rural employment and preventing rural migration but also for protection and preservation of ecology, sustainable development, socio-economic change.

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