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**CHAPTER - II**

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**CONCEPTUAL FRAMEWORK OF SERICULTURE**

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## CHAPTER- I

### CONCEPTUAL FRAMEWORK OF SERICULTURE

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## CHAPTER - II

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### CONCEPTUAL FRAME WORK OF SERICULTURE

Sericulture is a family occupation. It provides good subsidiary income to the rural population belonging to very low income groups.

Sericulture is a cottage industry, with an agricultural base and industrial superstructure. Being labour intensive in nature, it offers vast scope for productive employment around the year, especially to the people who are normally disadvantaged in the labour market, women, the old and physically handicapped, providing them, small source of continuous income. One of the important features of this industry is that, it can be practiced, under wide range of conditions, given reasonably good soil, satisfactory rainfall and not extreme variation in temperature and humidity.

India has been and continuous to be predominantly, a rural economy. According to the census 1981, nearly about 70% of Indias population of 680 million, live in villages. There are every 5,75,000 villages, while there are not more than 3,000 cities and towns. Besides, the accidence of poverty in India, is much more severe in the villages than towns. Therefore, promoting the socio-economic life of people, living

in rural areas should become a priority item even on purely practical, statistical background.

Current development efforts in the third world countries are very much concentrated on evolving new ways and means of finding employment opportunities, to absorb the growing surplus labour of poorer families in rural areas. It is a challenging task for the programme designers and administrators, to identify and encourage the talents in the rural constrains. There is a need for analysing and discussing carefully the experiences of the sericulture programme.

#### 2.1 MEANING OF SERICULTURE :

In a strict sense 'sericulture' would refer to the process involved in the production of natural filament created by the silk worm. Therefore, sericulture means "The raising or rearing silkworms for the purpose of production of silk." As the activity gets commercialised and develops on a large scale with specialised activities, related activities concerned with the rearing of silkworms become important and also come under sericulture.<sup>13</sup>

Hence sericulture would refer to the activities of raising the food plants of silkworms, production of silkworm eggs or layings and silkworm rearing and ending with the disposal of cocoons.

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13. Mohan et.al. 1990 : Sericulture for Rural Development  
Khadi Gramodyog (Jan) P.168.

## 2.2 CONCEPTS USED IN SERICULTURE :

Sericulture includes, growing of mulberry plants, rearing of silkworms, production of cocoons and reeling of raw silk. The concepts used here are :-

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|----|--------------------------|---|
| 1. | Cultivation of Mulberry  | } Agriculture in nature.  |
| 2. | Rearing of silkworms and |   |
| 3. | Reeling of cocoons       | : Carried on either in cottage establishment or in large scale factories called filature. <sup>14</sup> |

### 2.2.1 Mulberry Cultivation :

Mulberry cultivation is a major factor, determining productivity and hence the profitability. In sericulture, the yield of mulberry crop, i.e. maximisation of mulberry leaf yield per unit area, which will lead to the realisation of two most important objectives namely increased cocoon production per hectare and reduced cost of production. Therefore, it should be primary aim of every sericulturists to ensure that to get maximum leaf yield from his mulberry crop. It should also be realised that, all measures taken to maximise leaf yield, simultaneously help to improve the quality of leaves which automatically secures an insurance against cocoon crop losses and the latestage silkworm rearing.<sup>15</sup>

Mulberry is a deep rooted hardy plant which can

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14. Gazetteer of India : 1982 Op.Cit. P. 905.

15. Krishnaswami 1986 : Mulberry cultivation in South India central silk Board P.1.

withstand draught and its water requirements, being 26" to 45" rainfall per annum.<sup>16</sup>

Mulberry is a perennial crop and once it properly established during the first year, it can come to full yielding capacity during the second year and last for 15 years without any significant deterioration in leaf yield. It is therefore, very important that the initial planting establishment of the crop is carried out according to scientific methods for obtaining best results in the subsequent years.

The cultivation of mulberry consists of the following factors.

1. Selection of land,
2. Preparation of land,
3. Preparation of pits,
4. Preparation of cuttings,
5. Spacing and planting,
6. Inter cultivation,
7. Irrigation,
8. Manuring,
9. Pruning and,
10. Harvesting of leaves

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16 Gazetteer of India 1982:Op.Cit. P. 905.

1. SELECTION OF LAND :

Mulberry is a hardy plant. It could be grown on any type of land and soil but a flat or slightly slopy land with red sandy loam is ideal. The pH of the soil should be around 6.5. If the soil is acidic or alkaline, it should be corrected by addition of lime or gypsum respectively. Since mulberry is a deep rooted plant, it should be sufficiently deep.

2. PREPARATION OF LAND :

New plantation can be taken up at any time under assured irrigation, except severe winter period in December—January. Usually pre-monsoon showers in April May are considered advantageous to start operation. The land should be given a deep digging to a depth of 30 to 35 cm in order to loosen the soil and it should be ploughed once or twice to give a fine tilth. A basal dose of organic manure like compost or cattle manure should be applied at the rate of atleast 10 tonnes per hectare for rainfed mulberry and 20 tonnes per hectare for irrigated mulberry.

3. PREPARATION OF PITS :

Pits of 35 X 35 cm size are made at a spacing of 90 X 90 cm. ( 3' X 3' ). A mixture of soil and farm yard manure is filled in the pit.

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#### 4. PREPARATION OF CUTTINGS :

Mulberry is propagated vegetative through cuttings. Improved variety (Kanva-2) should be used for advantages on leaf yield and quality. The branches which are 6 to 8 months old and 10-12 mm, in diameter were selected for cuttings. These are cut into bits of 18 to 20 cm. length with a minimum of 3 to 4 healthy buds. The cut should be clean and should not damage the bark. The greenish tender portion of the branch should be rejected.

#### 5. SPACING AND PLANTING :

There are two systems of planting under irrigated condition, viz. the row system and the pit system. In the row system the rows are made 60 cm. apart and the cuttings/saplings are planted in the row at a distance of 22 cm. In the pit system, the rows are made 60 cm. apart and the cuttings/saplings are planted at a distance of 60 cm in the row.

#### 6. INTER CULTIVATION :

Two months after planting, a light hoeing and weeding should be done. A second weeding is done after another 2 to 3 months. Thereafter, inter cultivation should be done after every pruning or harvest. The weeding operation should be thorough and weeds along with roots. This also results in loosening of the soil and stimulation to the plants to grow vigorously.



**7      IRRIGATION :**

The plantation taken up during the monsoon period have the advantage of receiving fairly distributed rains from June to November. If the rain is not adequate or falls, for over 10 to 12 days it should be supplemented with the required irrigation. During the dry period from December to May, systematic irrigation should be given regularly at an interval of 8 to 14 days depending on the type of soil. About 1 1/2 to 2 acres inches of water fills the channels completely and percolates deep and does not get depteted from root zone easily due to evaporation.

**8      MANURING :**

Under assured irrigation, the mulberry will grow vigorously and the first dose of fertilizer should be given after two and half months of planting at the rate of 40 Kg.N. per hectare. After six months the plants would be ready for first harvest of leaves. Thereafter the normal fertiliser application programme could be resorted to following each harvest, at the rate 300 : 120 : 120 Kg.N : P : K per hectare, per year in split doses.

**9      PRUNNING :**

After 5-6 months of planting, mulberry attains a hight of 2 meters and will be ready for first harvest of leaves. In row system, the plants are pruned 2.5 to 7.5 cm above the

ground level. Subsequent harvest are done at above 10 weeks interval.

#### 10 PRESERVATION OF LEAVES :

Fresh mulberry leaves are more palatable and nutritious to the silkworms. The leaves for feeding young worms must be kept in baskets, lined with clean wet cloth and also covered with wet cloth. When the leaves are to be stored in bulk quantities for feeding the grown up larvae, they are stored in wooden frames or leaf chambers measuring about 1.5 m X 10 M X 8 M which are lined with wet gunny cloth. The leaves should be heaped loosely and should be periodically turned to provide aeration and also to prevent rise in temperature inside the heap of leaves.<sup>17</sup>

#### 2.2.2 REARING OF SILKWORMS :

Rearing of silkworm is another important process besides mulberry cultivation silkworm rearing is a quite complicated process, calling for a great management skill, with due understanding of the various technical aspects involved. The silkworm which has been domesticated and evolved over many thousands of generations, to produce substantial quantities of silk, in a very short period, is needed very delicate and requires careful handling during the process of rearing. Highly

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17. Dr. Manjeet Jolly 1987 : Economics of Sericulture under Rainfed conditions. Central Silk Board P 1-4.





**FIG.1**  
**MULBERRY PLANTATION**



**FIG.2**  
**REARING OF YOUNG AGE WORMS**  
**(CHA'KI REARING)**



productive races are still more delicate and demanding in their ecological requirements. Therefore, the job of raising productive silkworms, in topical areas as in South India is very tough.

Rearing of mulberry silkworms involves the laborious work of feeding the silk worms, the leaves at regular interval and providing them with conditions necessary for their full growth and development of spinning good cocoons. Apart from suitable temperature and feeding, silkworm, rearing requires suitable sanitation and cleanliness, vigilance. Silkworms rearing is more profitable mainly when it is carried on by the members of the family.<sup>18</sup>

#### DIFFERENT SPECIES OF SILKWORMS :

Various insects like Lepidoptera in their larval stage and wasps in their adult stages, produce silk as a secretion, from salivary glands, Embioptera from malpighian tubules and spiders and certain mites as a secretion from annular glands for making webs. Among insects caterpillar of Bombycidae and saturniidae family, are the important silk producers. However, silk is commercially produced, employing mulberry silkworm and eri silkworm, tasar and muga silkworms are lesser importance, as they are reared under confined conditions. Thus the silkworms are of mainly two types, which are stated below.<sup>19</sup>

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18. Gazetteer of India 1982; Op.Cit. PP. 906 -907.

19. Hand Book of Agriculture. Op.Cit. PP.1228-1233.

A. MULBERRY SILKWORMS, and,

B. NON-MULBERRY SILKWORMS.

A. MULBERRY SILKWORMS :

These belong to the family Bombycidae. This is totally domesticated insect and is never found in a wild state. It is the most important of all the silkworms and is extensively reared in many countries including ours. In India it is cultivated on mulberry, in Kashmir, Karnataka, Punjab, West Bengal and Tamil Nadu.

Depending upon number of generations per year, these silkworms are classified as Univoltine, Bivoltine and poly or multivoltine races. The Univoltine race has a single generation. This is found in Europe, Kashmir, and Punjab and silk produced is of superior quality. The bivoltine and multivoltine race are found in South India. Assam and Bengal producing inferior quality of silk.

B. NON-MULBERRY SILKWORMS :

Non-mulberry silkworms are of three types.

- i) Eri silkworm : Pholosanta ricino B.
- ii) Tassar Silkworm : Antheraea Paphia B.
- iii) Muga Silkworm : Antheraea Assamia

i) THE ERI SILKWORM :

This belongs to family 'Saturnidae' ! The adult moth

is stout and dark and wings are darkish brown and white. It lays 120-200 eggs in clusters, which hatch 7-10 days. The caterpillar has a green body with a brown head and the body, the small tubercles bearing short hairs. The full grown caterpillars feed on castor leaves and is completely domesticated. It can pupate any where. The cocoon is not compact, but loosely spun. Silk is white to brick red in colour and not glossy as the mulberry silk. It is not in one single strand and therefore, it is not reliable and has to be one, the moths can be allowed to emerge from the cocoons and after the emergence, the cocoons are reversed, to remove the pupal cases. The cocoons are then soaked, in cold water for 16 hours and in warm water for 45 minutes, washed in washing soda solutions, dried and spun into silk. Twenty eight grams of eggs will give about, 1600 larvae, which can be yield 4 Kg. of silk after consuming leaves from about half hectare of castor crops.

These silkworms are commonly reared in Assam and West Bengal, but, now it has spread to Bihar, Orissa, Madras and Uttar Pradesh. It can be successful in all places, with good rainfall and warm climate, like Kerala and where castor is grown. They can not withstand <sup>in</sup> severe summer.

ii) TASSAR SILKWORM : ANTHRAEA PAPHIA B :

This is also saturnidae moth, usually found in forest areas feeding on leaves of Dalbergia Sal (Shorea robusta)

Asan (*Terminalia Tosa*), Arjun (*Terminalia arjuna*), Ber (*Zizyphus Mauritiana*). The eggs are laid on tender leaves for 8 to 10 days. The caterpillars are stout green with red spiracles and the larval period is, 37 to 40 days. The cocoons are oval and as long as hens' eggs with a hard case, hung from the terminal branches by a stiff attachment about 5 cm long and pupal period is 25 to 50 days. The moth is stout with yellowish or brown wings, with an eyespot on each wing. The moth do not mate in the captivity and so the caterpillar can not be domesticated, as such, the cocoons have to be collected from the host trees, in the jungle. The silk is reelable unlike of eri silkworm and therefore, the pupae have to be killed before emergence of moths, to prevent cuttings of the silk thread into pieces.

In Uttar Pradesh, Tassar cocoons are raised by aboriginal tribes in the forest of Mirzapur. The silkworm is one or two brooded. Mirzapur tassar cocoons are smaller than those found in Bihar.

iii) MUGA SILK-WORMS : *Antheraea Assania*

It resembles tassar silkworm and is found in Assam. The cocoons are reeled and are of brilliant yellow colour, from which silk of golden yellow colour is obtained. It is much priced for its golden colour.

**BIOLOGY :**

Adult moth is cream in colour, about 2.5 cm long sluggish. It lies for three days only. Nothing takes place, immediately after seed, like eggs in masses. Hatching, takes place, in 8 to 12 days. The caterpillar on hatching are about 3 mm long and dark in colour, they moult four times. The full grown caterpillar is elongate, about 5 cm. long, cylindrical, yellowish white in colour, with a small annal horn. Larvel period extended, from 28 to 30 days. It produces a long continuous strand of silk, to form an oval cocoon and pupation takes about one to two days for constructing the same. Pupation takes place, inside the cocoon and adult emerges in 10 to 12 days. Life cycle is completed in six to eight weeks.

**REQUISITES NEEDED FOR REARING :**

Silkworm should be reared in a room set apart, for this purpose. Such room should be open on all sides and well ventilated. The surroundings should not be water logged. Following requisites are needed for silkworm rearing.

**1. STAND OR RACKS :**

They are prepared from wood. Four strong vertical wooden poles are fixed in the ground, to form the four corners of a rectangle. These are tied with horizontal wooden rollers, nine to ten inches apart.



2. TRAYS :

The worms are kept in trays of bamboo or wooden. The lighter the tray, the easier it is to handle. It may be circular or rectangular in shape.

3. NETS :

Nets are used, for removing the litter consisting of the remains of leaves and excreta of worm, from the bed of silkworms. The silkworms are better, not to handle with bare hands, but with the help of nets. A rearer should have nets of different sizes.

4. CHOPPING KNIVES :

These are used for chopping the leaves. Finally chopped leaves are fed to the first age worms.

5. CHOPPING BOARD :

This is a clean wooden board, over which the leaves are to be chopped.

6. GUNNY CLOTH :

Requires for, keeping the mulberry leaves in instead of the floor, before feeding, which keep the leaves in fresh condition.

7. PARAFFIN PAPER :

This paper is used for keeping the silkworm beds,

covered during rearing, so as to prevent withering of leaf and also to maintain, the required humidity, in the rearing beds.

8 FOAM RUBBER STRIPS :

This, again is a requisite of modern methods of rearing. Long foam rubber strips, 2.5 cm X 2.5 cm thick, dipped in water are kept all around the silkworm rearing beds, during the first two instars, for maintaining optimum humidity, in the rearing beds. As a suitable, newspaper folded into convenient strips, and dipped in water, could also be used.

9 CHOP STICKS :

These are used for picking the youngage larve. This ensures, hygenic handling of delicate worms and also prevents damage to them.

10 FEATHERS :

A feather, preferable white one, is a most essential auxillary in the rearing room. It is required for brushing newly hatched worms and also while changing beds, in the earlier stages. It saves worms, from the injurious contacts of hands.

11. ANTS- WELL :

Ants are the serious menance to silkworms. As such it is necessary to rest the rearing stands on ants wells.

The simplest and well is, an enamelled plate 20 cm. wide and 4 to 5 cm deep.

12. CHANDRIKE :

This is rectangular board, made up of bamboo. Full grown larvae are reared on chandrike, for spinning the cocoons.

13 HYGRO METER :

To ascertain temperature and humidity is also necessary. Temperature and humidity, are of supreme importance in rearing of silkworms.<sup>20</sup>

These are the requisites needed, in rearing of silk works.

Compared to the average cocoons crop in the sericulturally advanced countries, like Japan the average Indian yields are very low. As against 60 to 70 Kg. obtained for about 100 dfls. in Japan, of a cocoon quality of 5 to 6 rendita. Indian yields are only of order of 20 to 25 Kg per 100 dfls. in multivoltine areas, the quality of Indian cocoons is also poor. The yield and quality of cocoons much depends upon the following factors.

1) ARRANGEMENT FOR REARING :

Besides the use of less productive breeds one important cause of obtaining comparatively lesser yield of cocoons, in India

20. Hand book of practical sericulture Op.Cit. P 80- 86.

is the low standard of rearing and some of the aspects are is below.

1. PLANNING :

Planning is crucial, in the execution of any work, is well accepted. Thus before starting the rearing itself, a complete plan should be drawn, with regards to the requirements of mulberry, space to be required, implements required personnel etc. Based on this only quantity of eggs to be reared should be fixed. One should never rear diseased or unexamined seeds.

2. REARING ROOM :

A rearing room should be South facing with arrangement for cross verification, along with both North South and East West directions.

3. DISINFECTION OF REARING ROOM AND EQUIPMENTS :

Immediately after rearing and again before the start of the rearing, the room and the rearing implements should be properly washed and disinfected.

4. INCUBATION :

Presently not much of strength being given on incubation of the eggs. Normally they are kept spread in the

rearing room without any efforts, to control the temperature or humidity. By incubating the multivoltine eggs at higher and lower temperature, combined with lower and higher humidity, during incubation resulted, not only the better hatching but also better quantity and quality of cocoons.

6. QUALITY OF LEAF :

Growth of silkworms, very much depends upon the quality of leaves fed to the worms. The leaves best realised and utilised by the worms are those containing more moisture protein, sugar and carbohydrates and less ash and fibre.

7 LEAF PRESERVATION :

The leaves should be immediately preserved loose, under wet cloth, which should be kept soaking wet at all the time by sprinkling water on it repeatedly, at convenient intervals. Leaves presented as above, infact, absorb more moisture and remain fresh, for a longer time.

8 ENVIRONMENT REQUIREMENTS :

The atmospheric temperature and humidity, have a great bearing on the growth and health of silkworms. While the silk worms can thrive, under conditions of high temperature and low humidity. They are highly susceptible to high temperature and high humidity particularly the late age worms.

9      SPACING OF WORMS :

This is another important aspect to which great care and attention should be given. At present, there is a tendency to rear the worms, very much crowded and this does not permit, a force and complete growth of worms. According to the practice currently followed, the worms from 100 dfls, when fully matured in about 10 to 12 bamboo circular trays of H diameter and this spacing is too inadequate.

10      NUMBER OF FEEDS AND QUANTITY OF LEAVES :

If the suggested modification mentioned above ~~are~~ followed, it would not be necessary to give more than 4 to 5 feedings where as at present, sericulturists give anything, from 4 to 8 feedings a day. As regards the quantity of leaf, to be fed to the worms, from 100 dfls, with 400 to 500 Kg. This quantity is too inadequate and does not permit of maximum growth of worms and increased quantity of leaves, will also have to be fed to the worms.

11)      REARING OF YOUNG AGE WORMS :

Early age larve can be best reared in trays measuring 2' X 3" in hight. About 10 to 15 dfls can be brushed in a tray of his measurement, from hatching, till to the second moult. The leaf to be fed to newly hatched larve should be sufficiently big, measuring about 0.5 to 1.0 cm. As the worms grow, the leaf size to be chopped can also be increased.

The first age worms, settle for moult within 3 to 4 days and in another 20 hours, they will enter the second age. Second age also is similarly reared. Second age is passing within 2 1/2 days and after 20 hours of moulting, they will enter the third age.

The third age worms, coming out of the second moult, are removed to round trays of size 4' diameter. The third age will take, four days to settle for third moult, and in one day comes out of the moult, to enter the fourth age. Thus, the total period taken for young rearing, lasts from 11 to 12 days, the number of feeds to be given during the young age is, 3 to 4 between 6.00 am to 10.00 p.m. Bed cleaning will have to be done in first age stage, prior to setting for moulting twice, during second age and three times, in case of third age worms.<sup>21</sup>

iii) REARING OF LATE AGE WORMS :

The late age worms of fourth and fifth instars read comparatively less humid, rearing conditions. Further, in fourth age onwards, entire leaf may be supplied and even small shoot or chopped shoots may be supplied. The worms in fourth and fifth age need only 4 feedings a day. It would be advisable to give a fairly large feed at night the bed cleaning would be necessary, to be given once in the morning every day. The consumption of leaves, by caterpillar, increases from about

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21. Ibid P. 1231.





**FIG.3**  
**REARING OF LATE AGE WORMS**



**FIG.4**  
**DRY COCOONS READY FOR HARVESTING**



0.1 g.m. per day during first stage. The total consumption during the entire life of the caterpillar, is about 90 gm. The full grown caterpillars are, spread in a regular order about 8 cm. apart in 'chandrika' allowed to pupate.

iv) PREPARATION OF SILK :

The cocoon is constructed, of a single reelable thread of silk. If the moths are allowed to emerge, from cocoons the silk thread is cut into pieces during the process. Therefore, the pupae are killed to three days before the emergence of moths by exposing them to sun, for 2 to 3 days or by passing steam or hot air over them or by fumigating the chemicals. The stifled cocoons are dried and the loose outer floss is removed by brushing. They are, then soaked in warm water, to soften the gum, that binds the silk thread. The threads from 4 to 5 cocoons are put in a spool of reeling machine and made, a single thread out of the sufficient thickness, to form a raw silk. About 50% to 60% of the silk of the cocoons is reelable and it forms raw silk and rest is formed in to waste silk. Raw silk boiled, steamed, stretched, purified by acid and washed twice or thrice, to remove the gum and to bring out the characteristics and much characterized lustre.

A dry cocoon weight about one gram and is about 2/3 weight of green cocoon. The chrysalids form 60% and the silk

matter 40% of the weight of cocoon. It has been estimated that about 60,000 cocoons yield a kilogram of raw silk and they require, about a ton of mulberry leaves. About 28 gm silk seed yield nearly 18 to 23 kg. green cocoons or a 9 to 14 Kg of dry cocoons.

The above are the various factors, on which the quality and quantity of raw silk depends upon. So due care must be taken in arrangement of rearing, rearing of silkworms of different ages and preparation of silk. Then only it will be possible to attain the quality and quantity of cocoon production equal to the quality and quantity of cocoons produced, in the countries, like Japan, China and So on.

### 2.2.3 REELING OF COCOONS :

Reeling of cocoons to produce the raw silk, is the ultimate industrial density of products. Silkworm spins the cocoons, by splitting out the silk fluid, hardens to form, a fine silk filament ( bare) on coming into contact, with the air. This bare comprises of, two distinct filaments or brins composed of fibroin and struck together and coverage by silk gum or sericin. The bare is continuous, filament of lengths from 350 to 500 mts. in multivoltines, to around 1500 mtrs, in univoltine and in Bivoltine.

When the cocoons are treated with hot water, the gum

(sericin) being readily soluble in hot water readily facilitates, unwinding process. This operation of unwinding of the bave from the cocoons, called "Reeling"<sup>22</sup>

THE MAIN PROCESS OF REELING COCOONS :

The main process of reeling of cocoons are described in Brief as under.

1. Cocoon drying stifling.
2. Cocoon Boiling.
3. Brushing.
4. Reeling proper
5. Re-reeling.
- 6 Finishing and,
- 7 Testing.

1. COCOON DRYING STIFLING :

The object here is, to kill the pupae, before they matamerphose, into moths and emerge, cutting the cocoons in the process and rendering them unreelable.

In India, steam stifling of cocoon is very commonly in vague. Hot air shifling is also resorted to, especially in Jammu and Kashmir, while aun drying is also very much.

2. COCOON BOILING : This is done to make the cocoon,

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22. Gazetteer of India : 1982 Op.Cit. P. 910.

thread, reelable by swelling, softening and a little dissolution of sericin or gum.

3. BRUSHING :

This is the process of seeking, the end of the filament, in the cocoon mechanically, operated brushes, are the vogue, at present for this purpose.

4. REELING PROPER :

This is the actual process of unwinding the bave from the cocoons, combining the required number of the desired size and gathering the same on standard reels.

5. RE-REELING :

If raw silk is reeled directly, on the large reels, it leads to insufficient drying of the threads and consequently, to hard gum spots. This lowers the quality of silk. This difect can be avoided, when, raw silk is first reeled on to small reels, and re-reeled into large reels after appropriate drying. Re-reeling is therefore, an essential fact of quality silk production.

6 FINISHING :

The object of finishing is to remove the visible defects like, oversize knots, loose ends etc. and thus,

improve the marketability of raw silk. This involves end fixing and skeins of silk are generally 1.5 m in circumference and about 70 gm in weight. Later the skeins are made into books of standard weights and also in to 600 kg bales. A silk bale in India weights 50 Kg. While international bale of silk is 60 Kg or 132.316.

7. TESTING :

Raw silk is subjected to a series of standard tests to precisely assess its size cultivation, winding quality, evenness as to cleanliness, neatness, tenacity, cohesion etc. and to determine its grade. We have both International and Indian standards which facilitate marketing of raw silk on the basis of its quality. This is the last step of reeling of cocoons.<sup>23</sup>

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23 Hand book of Practical Sericulture Op.Cit. PP 165-166.