STUDY OF THE USE OF BAMBOO IN THE SERICULTURE SECTOR IN SOUTH INDIA

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BEIJING, CHINA

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Foreword

Sericulture in India is more than 2000 years old. The leaves of mulberry form the largest source of food for the worms of the moth – Bombax morii,. from whose glands, silk is spun in the form of a cocoon for entry from the stage of adult larva to pupa. Equipment made of bamboos have been in use in rearing of the worms and spinning of silk thread for ages. The source of supply of bamboos, socio-economics, thousands of weaver families involved in manufacture and supply of such equipment, the importance of the such manufacture in their life, and the problems of artisans etc., had not been properly studied and documented.

The credit for initiating such a study to arrive at quantities of bamboo used in sericulture and the socio-economic importance to thousands of rural families goes to the International Network of Bamboo and Rattan (INBAR). Realising the role of bamboo in the high profile silk industry, INBAR entrusted the work of systematic sample study of the whole chain from resource of bamboos to the intensive use of equipment in sericulture, to Bamboo Society of India.

The report prepared by the society is the combined effort of many scientific officers engaged in gathering field data on the basis of structured proformae devised by the economist Dr. Ranganath Shastry. The hardwork put in by the scientific staff and the cooperation received from the Central Silk Board, Bangalore, Directorates of Sericulture in the Southern states and the officials of the forest department deserve grateful acknowledgement and thanks. The encouragement given by the governing body of the society and the effort put in by Ms. Sushma Veerappa in preparing a video film of the role of Bamboo in Sericulture deserve to be mentioned with thanks. If the results of the study are used in solving the problems of the artisans to streamline the supply, manufacture, sale and use of the equipment, it will be a tribute to INBAR for initiating the study.

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EXECUTIVE SUMMARY

Use of silk originated in China over 2200 years B.C. and came to India via Tibet around 140 B.C. Leaves of mulberry form ideal food for the silkworm larvae. They spin the cocoon through glands and this forms silk.

Out of about 17,000 tonne of mulberry, silk produced annually in India, about 87% are produced in the three South Indian states of Karnataka, Andhra Pradesh and Tamilnadu. Over 3,30,000 farm families cultivate about 28,000 ha of mulberry to make a living by selling cocoons reared by them.

Traditionally, bamboo equipment have been used in sericulture. Baskets for gathering mulberry leaves, trays for feeding leaving to larvae, mountages for production of cocoons, trays for cocoon storage, stifling baskets for steaming of cocoons and some woven mats are the main uses of bamboo in sericulture. There are other minor uses in production of silk. Average requirement of these items per ha of mulberry is summarized in the table below.

Bamboo available in the natural forests of Karnataka and Andhra Pradesh are the main sources of supply. Shortages are made up by purchase from private sources in Maharashtra, Goa and Assam. Substitute equipment are also used to overcome shortages of bamboo, but are not very popular. Manufacture of bamboo equipment required for sericulture engages hundreds of thousands of traditional weaver families and provides means of livelihood to them. The present study is targeted to find out quantities of bamboo used, their sources, employment generation, economics and problems in the whole chain from bamboo resource to use of equipment in silk production. A large number of artisans, farmers and reelers were sampled to find out the source of bamboo supply, economics of manufacture of equipment, sale or hire of such equipment to silkworm rearing farmers and silk reelers. The results of the study are summarised. The total requirement of bamboos for the states under the study per annum are given below:

1	Weight of bamboos used	2,00,000 tonnes
2	Employment for extraction	1.2 million mandays
3	Employment for loading unloading and storage	0.2 million mandays
4	Wages earned by extraction and handling	Rs. 105 million
5	Employment in sericulture	Rs. 19.9 million
6	Value of bamboo products in sericulture	Rs.2987.0 million
7	Wage earned in manufacture of bamboo equipment for sericulture	Rs. 933.916 million

Note: Rs.46.70 = 1 US$

Although all aspects of silk production and marketing are properly studied, documented and have been subjected to research due to the importance of silk in the economics of the country, the importance of bamboo in silk production and the problems of artisans engaged in weaving and fabrication of equipment have not been properly documented, studied or remedied. The present study is aimed at identification of importance of bamboo supply to sustain sericulture as an industry and the necessity to overcome problems in quality, quantity and sustenance of smooth

supply of raw material for manufacture of equipment to the silk industry and find out ways and means to overcome problems of artisans, silk farmers and the reelers. It is seen that scientific management of bamboo forests, improvement in tools for harvests, reduction of time and wastages during transit and storage, improvement in quality and quantity of production, creation of agencies to coordinate between supplies and markets etc. are needed in this industry of great economic importance, so as to improve the socio-economic conditions of large number of rural families.

History of Silk

Use of silk is known from over 2200 years BC in China as per earliest authentic reference in the chronicles of Chou-King in which silk figured prominently as a symbol of homage to emperors in public ceremonies. Silk industry has originated in the province of Chang-Tong in China over 3000 years ago. Due to commercial relations between China and Persia, silk goods traveled to markets in Southern Europe in the first century BC. Korea was the first country to take up sericulture due to transfer of knowledge through Chinese immigrants to that country. Japan got knowledge of sericulture in the third century BC when Semiramus, a general in the army of empress Singu-Congo of Japan invaded Korea. A Chinese princess who got married to the King of Khotan in Tibet is said to have taken eggs of silkworm and seeds of mulberry with her. Mulberry cultivation came to India from Tibet around 140 BC and started spreading along the banks of Brahmaputra and the Ganges in India[1]. There is mention of use of silk got from wild natural cocoons in old Sanskrit literature. Popularity of silk in India got enhanced, when the East India Company started trading in silk. Arab traders took silkworm eggs and mulberry seeds from India in the early part of Christian era. Though sericulture spread to other parts of India, its use for cottage industry was widely adopted in the princely state of Mysore in South India and by the weavers in Kashmir. In the 4th and 6th century AD, raw silk from India and Central Asia got exported to Persia and on to Rome and Athens. It spread from here to other European countries. In the 19th century, a destructive disease spread as an epidemic of pebrine in France and gradually wiped out sericulture in Southern Europe. Discovery by Louis Pasteur in 1870 that the disease could be diagnosed and cured, helped in its partial revival. Fabulous silks were traded from China and India through a 6000 miles silk route in the west.

Production in India

Major silk production in India is through mulberry cultivation and feeding the leaves to the worms. There are other natural kinds of silks of which Tassar, Moga and Eeri have some commercial significance. During the last three decades, there have been efforts made by the state governments to develop sericulture as an industry due to its role in generating rural employment and poverty alleviation. The climate and soil suited to economic mulberry cultivation play a

major role in its popularity in the states of India. Statistics of silk production are available at the Central Silk Board, according to which the major states producing mulberry silk are Karnataka, Andhra Pradesh & Tamilnadu in South India. In North India, the states of West Bengal & Manipur, in East India Himachal Pradesh and Kashmir are the major silk producers. Statistics of silk production in the last five years are given in Ann.A1 & A2. It is seen that production of mulberry silk averages to 17,746 tonne p.a. in India, whereas production of non-mulberry silk is an average of 120 tonne p.a. i.e., less than 1%. Ann.B. gives data on production of non-mulberry silk. Karnataka state accounts for 62.96% of Indian silk production, followed by 22.16% in Andhra Pradesh and 5.27% in Tamilnadu. Silk production from these three states is 90.39% of the production in India and hence the present study undertaken for use of bamboos in sericulture in South India, becomes significant for India as a whole. Other types of silk are not produced in South India, except about 2.5 tonne of Tassar in Andhra Pradesh. Assam leads with over 100 tonne of Moga and Eeri silk. Manipur and Meghalaya produce about 20 tonne each p.a. of Eeri silk. South India dominates in mulberry silk production in India.

Popularity of silk industry

Silk is a very popular natural fabric of the world. It has importance in religious activity, in fashion and in all-important functions in India and abroad. Silk is used both in pure form and in blends with cotton, wool, viscose, gold, silver and artificial fibers in all kinds of apparel. Many states have an independent ministry for sericulture and a full fledged department with branches spread to nook and corners of the state. Union Govt. has created the Central Silk Board with head quarters at Bangalore and branch offices in most states. There are silk marketing agencies, silk cooperative societies at all stages of silk production, processing and marketing. Similarly, research institutes have been exhibited to take care of continuous development in mulberry production, production of disease free eggs, to fashion designing of silk produced in India. Statistics of farmers and extents of land engaged in production of mulberry, number of villages, families and people engaged in rearing of worms, production of cocoons, processing and marketing of silk at all stages are being annually gathered both by the state departments of sericulture and the Central Silkboard. Credit needs of the industry at all steps of production and marketing are reviewed from time to time and financial institutions take care of the credits, recoveries etc., with refinancing by the National Bank for Agriculture and Rural Development

(NABARD). The status of silk industry in India at a glance is given in Ann.C. Importance of sericulture in rural employment, poverty alleviation, sociology, economics and necessity of all inputs from irrigation, fertilization, plant protection, harvest, transport, storage, processing and marketing have been recognized in all important silk producing states and have been documented. But, the importance of bamboo in sericulture industry and its sustained supply to artisans who produce and supply the bamboo equipment needed in harvest of mulberry leaves, transport, storage of leaves, rearing of worms, production transport of cocoons, in filatures, reeling, looms etc., is not much studied or documented properly. Due credit has to be given to the International Network of Bamboo and Rattan (INBAR) for recognizing the socio-economic aspects of role of Bamboo in Silk industry in India and initiating a comprehensive field study through systematic sampling to highlight the importance of bamboo in sustaining the silk industry in India.

Bamboo materials used in Sericulture

Bamboos form the backbone of agriculture through agricultural implements, tool handles, fencing, transport, storage and processing equipment of all agricultural produce in tropical India. Similarly, bamboo has its multifarious uses from baskets for collection of mulberry leaves, harvesting, storage, rearing of silkworms, production, transport, storage and processing of cocoons, filatures, reeling and weaving of silk. The different uses of bamboo in sericulture are listed below.

a) Leaf collection basket: - The basket is specially designed for collection of plucked mulberry leaves. It has a small mouth on top and a wide middle, sloping again towards the bottom to take the shape of a compressed sphere. It is about one kg in weight and can hold 12 kg of leaves for easy carriage. It is woven from a combination of 1 to 2 cm wide slivers between 0.4 cm thick strips and strengthened at the mouth by similar strips. It is valued at Rs.40/- each. It has an average life of one year.

b) Rearing trays: - Circular, with diameters of 0.9 mt to 1.3 mts and depth of 5-6 cms, it is used for rearing worms. It is priced at Rs.40/- to Rs.60/- each depending on diameter and season and it weighs 2.5 to 4 kg and is used 5-6 times each year

and has average life of three years. Bamboo trays are preferred as they absorb the excretions of the worm and are easy to clean.

c) Mountage: - Called as “Chandrike”, it is used for rearing cocoons between woven 5-6 cms strips fixed at 3-5 cms apart in a circular fashion from centre to the periphery of a bamboo mat of size 1.8x1.2 mt, by means of coir rope. It gives anchorage to the silk thread as the larvae weave the nest around them for the pupal stage. The mat is strengthened on the hind side with 3 cm bamboo strips or rounds on all four edges and criss-cross by coir rope. The mountage weighs 10 to 15 kg and costs Rs.150/- to Rs.250/- each depending on quality and season. It is available on hire during the season at Rs.5/- per day and is needed for 3-4 days at a time, till the cocoons are removed after completion of the spinning that takes around two days. It is used repeatedly and has an average life of three years. Maximum use of bamboos is on account of use of mountages. It is explained that bamboo provides the best absorbant surface for quick driage of secreted silk to become a strand.

d) Mats: - Bamboo mats of 1.8x1.2 mtrs are used for chopping mulberry leaves meant for feeding the worms without soiling them. Mats are also used to hold basketful steamed cocoons after they are stifled on steam in woven baskets.

e) Stiffling baskets: - The basket with wide top and narrowing bottom is used to gather cocoons and stifle them on steam baths so as to loosen the strands for separation of the silken threads from the pupae. The basket is about 75 cms tall, 55 to 60 cms dia at the top and 35-40 cms at the bottom. Each basket weighs about one kg. Each basket can hold 12 kgs of cocoons. Each basket has a life of 18 to 24 months.

f) Cocoon storage trays: - Made of woven bamboo to diameter of about 75 to 100 cms and 6-7 cms deep. Each tray weighs about 2.5 kg. Each tray can hold 2.5 kg of cocoons. Rectangular trays of size 1.2x60 cms are also in use. These trays are filled with steamed cocoons and mounted on stands vertically for purpose of airdrying of cocoons.

g) Sticks in rearing stand: - Where rearing stands are used, round bamboos of about 3 mtr length are used to support the rearing trays. The stands are made of wood whereas partitions are created by round bamboo sticks, so as to hold 10 trays vertically in the stand.

h) Chawki sticks: - 1 mt long 3 cms thick bamboo split or small rounds cost Rs.2/- each. Five sticks are used per ha of mulberry cultivation.

i) Reeling sticks: - 0.5 mt long splits of bamboo are used in reeling silk thread around them for later use in twisting into yarn or in weaving. Six such sticks are needed per ha per annum for which the cost will be Rs.6/- per ha.

j) Chop sticks: - 20 cms long in the size of a chopstick, these are used to pick up the delicate worms for shifting or transfer as they are not handled by fingers, due to fear of infection. However, their use is too little and not of significance.

A table containing the different bamboo components used in sericulture, their average price, life etc. is given in Annexure D.

From among the different uses of bamboo in sericulture mentioned above, the maximum quantity used is in chandrikes, trays, baskets and mats.

Advantages of Bamboo use in Sericulture

Bamboo is a renewable natural ligno-cellolosic resource with the advantage of annual production and growth. The rhizome i.e., the underground stem of bamboos spread in the soil and annually produce culms or poles from the axillary bud of the rhizome. Emergence of culms takes place in the early part of monsoon in South India, which is June to August. The food material stored by the woody grass in its rhizome, is utilized to activate the axillary bud during early rains, when the climatic and soil moisture conditions are the best for the growth. Emerging from the soil as a conical shoot covered by whorls of leafsheath, the elongation of the shoot is rapid. The maximum height and girth of the shoot is attained within a short period of 8 to 12 weeks. The number of culms thrown out annually depends on age of the rhizome, from the time it has developed from either seed or propagule, the soil moisture and fertility conditions. Similarly, the height and diameter of a culm for a given species or provenance, depends on the age of rhizome, food stored by it during the previous year's growth and the conditions of climate and soil. It is

the annual productivity of culms which can provide sustained supply of bamboos to end uses. The culms or poles can be split easily by knives. The split bamboo can be cut into slivers of required thickness to facilitate weaving. Since the slivers can easily bend without breaking, it is possible to use them in weaving into flat mats duly strengthened by splits or into baskets of different shapes and sizes. After evaporation of excess moisture, the airdry bamboos or splits or slivers do absorb some atmospheric moisture depending on the relative humidity. But this doesnot cause any major changes in the products like mats, baskets, trays etc. either in shape or size. Air dry bamboo splits and slivers are absorbant because of which the secretion from silk glands dries quickly and provides a good surface and support for the strands of silk. Being locally available from natural forests and from farms in South India, bamboos become the ideal material for the various needs of equipment for silkworm rearing to silk production. Bamboo is light compared to metals and is a cheap source for use in silk industry. Since the equipment in worm-rearing and silk production requires to be handled by human labour, the advantage of volume to weight ratio makes it popular in use in South India. Besides, bamboo has very good insulation property and is not much affected by heat and cold. It is a bad conductor of electricity.

Species in use

Naturally grown species of bamboo mostly used in South India consist of a) Medri – *Dendrocalamus strictus* which is common in the deciduous forest zone which is dominant in the state b) Dowga – *Bambusa bambos* growing in moister zone of peninsular India and c) Marihal or Shame – *Pseudoxytenanthera stocksii* which is common in farms and homesteads in Konkan region. Two other species commercially available are i) reed bamboo – *Ochlandra travancorica* in Kerala state and ii) reed bamboo – *Ochlandra talbotti* available in the moist pockets in western ghats. These two species are also used in weaving, but have little application in sericulture industry. In addition to these local species, some mats are brought from North-East India for use in Chandrike. These mats are woven from *Dendrocalamus hamiltonii* and *Melocanna baccifera*.

Bulk uses

Medri forms the bulk species in use in silk industry, followed by Dowga and Marihal. Medri is used in the round, split and sliver forms for various applications in the industry. Due to bulk

availability and presence of traditional weavers in the wet zones, Dowga is mainly used in weaving mats and baskets, much less as splits and not in the round form, except in frames constructed to support rows of trays stacked vertically. Shortages of the above two species are made up by using Marihal, both in weaving and as sticks. Annually, some bamboo mats are brought from N.E. India, mainly from Assam. These mats come in size of 2 mt x 1.2 mtrs suited to construction of Chandrikes. These mats are superior to the locally woven mats in quality, both due to the species of bamboo used and superior skill of weavers there. An average of 100 M.tonne of such mats are transported by lorries over a distance of nearly 2500 kms for use in Karnataka. Each lorry brings 3500 to 4000 mats which are sent in bundles of 35 each in the size of 2 m x 1.2 mt.

Composition of species

Karnataka has higher area under *D.strictus* than *B. bambos*. However, the volume or weight of the growing stock can be equal between the two species, as each culm of *B.bambos* is nearly three times in weight. In Tamilnadu and Kerala the proportion of *B.bambos* is higher. But in Kerala, reed bamboos are not much used in the equipment for sericulture. In Andhra Pradesh, *D. strictus* is over 90% of the growing stock. Due to higher availability in Karnataka and Andhra Pradesh. *D.strictus* has higher use in sericulture and is estimated at 70% by volume.

Management

Bamboos are extracted on selection basis in a felling cycle of 3 or 4 years. Bamboo forests are divided into felling series and each felling series is divided into 3 or 4 equiproductive coupes for felling. Generally, all culms which are 3 year old and above and a part of second year old culms are extracted during the year of felling. The clumps get rest for 2-3 years for recuperation. But the method of extraction has been unscientific, due to which there has been deterioration in extent and quality of growing stock of bamboos.

Agency for felling

Upto 1990, the removal of bamboos was given on contract by the department. Pulp mills engaged their own extraction contractors on tender basis. Some cooperative societies of Buruds* were engaging their own felling contractors. Since the extraction rates were decided on lowest

tender basis either on stacked volume i.e. cum or on rates per 100 bamboos extracted, the bidders were looking to extraction from less congested clumps and easily accessible areas. This system resulted in unscientific removals, congestion of clumps and affected recruitment and regeneration. Hence, the forest department switched over to departmental extraction. But the results of such working in the bamboo forests of all the states donot show any improvement in the growing stock. Grazing and fire are common in bamboo forests. Both these factors damage regeneration, affect recruitment and cause congestion of the standing clumps. No serious effort has been made by the department to either arrange for scientific extraction or proper care of the clumps to improve their condition, which is the key to higher recruitment and better shape and size of culms available for extraction. The State Governments issue orders annually or biennially for fixation of rates for supply of bamboos both to the industries and the artisans. Rates for supply to artisans involve some concession. Extracts of the government order for fixation of rates for extraction is given in Ann.E. Rates fixed for standing bamboo now are available in Ann.E.

Apathy of Government agencies

It is over ten years since the forest department has done away with contract system of extraction of forest produce. Forest Development Corporations have been established in all major states and they are also taking up extraction of bamboos. Yet, neither the forest department nor the forest development corporation has established scientific bamboo management, preservative treatment or organized rational utilization which is necessary for conservation of this important resource. The artisans and users including the pulp industries are constantly suffering due to the disorganized supply and continuous shortages of both quality and quantity for proper enduses. It is an irony that even studies are not initiated to quantify the needs of various end users of bamboo or sources from where such supplies are coming. This is the main reason because of which, accurate data on utilisation of bamboos in silk industry is not available. Even the department of sericulture has not made efforts for organized supply of bamboos their products to the sericulture farmers. Substitutes to bamboo equipment have been attempted with no tangible success. Substitutes are neither practical, bio-degradable nor energy efficient.

* Community engaged in the profession of bamboo weaving is named Buruds or Medars.

Storage

Immediately after extraction, the bamboos are stacked in the forest on motorable roadsides for a few days, before inspection, accounting and transport is arranged. This system applies to bulk removals either to designated forest depots or to the end users like pulpmills and artisans' cooperatives. Local villagers and artisans manage to get licences for head load or cart load removal by getting prepaid permits either from the forest department or by the village forest committees. In all the states, the artisans have formed cooperative societies. These societies are allotted bamboos at concession rates at quotas fixed per family. Generally, 50 bamboos per family are allotted per month. The rates for supply are different to the cooperatives, market users and industries. Industries either purchase bamboos stacked in the depots or are permitted removal of dead bamboos on payment of a rate fixed per tonne. The tonnage is decided either on weight recorded at the weighbridge or average volume (cum) fixed for metric tonne. Sometimes, bamboo extracted departmentally and stacked in depots remains without disposal for months. No arrangement is made either by the forest department or by the forest corporation or the endusers including the pulp industries, to provide preservative treatment during storage. Fungus and insects cause damage to extracted bamboos and loss thereof is neither cared for nor remedied.

Marketing

Like timber and fuelwood, there are bamboo merchants in most cities and towns of southern states. Large cities have traditional marketing centres, called "Bamboo Bazaars". Both the bamboo merchants and the leaders of artisans cooperatives get permits from the forest department for transportation of extracted bamboo, grade them according to species, lengths and sizes before storage, and sell them in retail sale to users. The sale price at the market end is 3 to 4 times the standing value of bamboos. As most artisans are not rich enough to buy bamboos in bulk and store them for use, they are at the mercy of bamboo depot owners and merchants for their daily or weekly requirement of bamboos for making products for sale. Though there is an effort by sericulture department to establish service centers for supply of bamboo equipment, these centers are also dependent on traditional bamboo merchants for supply.

Bamboo resources

Forest area containing bamboos in India is 8.96[2] million ha, which is 11.71% of the recorded forest area. The growing stock is estimated as 80.5 million tonne. Seven states of N.E. India contain 66% of the growing stock. Madhya Pradesh accounts for 12% of the growing stock. The states in South India have less stocks. According to available information, the areas and growing stock of bamboos in southern states is as follows

State	*Extent/Sq.kms*	*G.S Mill. Tonne*	*Plantation (ha)*
Karnataka	4,920	3.5	14,400 until 31-3-2000
Andhra Pradesh	8,625	5.0	55,000 until 31-3-2000
Tamilnadu	3,100	2.0	NA
Kerala	517	4.0	2,606
Goa	249	2.0	Mostly planted
Pondicherry	Nil	-	-

Bulk of bamboo is available in the government lands and mainly in the moist deciduous forests. Dowga is prevalent in the moist vallies of deciduous forests. Marihal bamboo is grown in private lands including homesteads in the Konkan belt from Ratnagiri district in Maharashtra, through Goa upto South Kanara district in Karnataka. These three species constitute entire resources for uses in sericulture. In Kerala state both the major species of bamboo are grown in homesteads. According to one report made for forest resources of Kerala, the annual output of bamboos from homesteads is 10,000 tonne p.a. The average annual output of bamboos from the recorded extraction as maintained by the forest department is given below.

Karnataka	70,000 MT

Andhra Pradesh	2,70,000 MT
Tamilnadu	10,000 MT
Kerala	88,000 MT
Goa	10,000 MT

Recent studies (2000) made by the author have revealed that about 15,000[3] tonne of bamboo mostly of Marihal variety are brought into markets in Belgaum district by the farmers of Konkan in Goa and Maharashtra and sold annually to weavers in Karnataka and neighbouring districts of Andhra Pradesh and Tamilnadu. Apart from weaving into baskets, this bamboo is used in making equipment used in sericulture. Small quantities of medri bamboo comes in from Andhra Pradesh into southern districts of Karnataka either as poles or in the woven form for use in trays and Chandrikes. The quantity so brought in is about 1000 MT p.a. and is less significant in comparison with production in Karnataka and supply from private lands in Konkan.

Bamboo utilization

Bamboo is used as common household material in agriculture, horticulture, sericulture, housing, packaging, transport, storage etc. Industrial uses of bamboo consist of pulping, matboards and as core-sticks in Agarbathis (scented sticks). Generally, green and straight bamboos are used in the domestic sector and in weaving. Slightly defective, bent and dry bamboos are used for pulping. Weaving and core sticks of agarbathis are possible from green bamboos or after soaking dry bamboos. Dry bamboos are used for strengthening the back of mats in Chandrikes and splits are used for similar purpose in baskets, mats, trays and Chandrikes. Dry bamboos are used to construct frames to support a series of trays in silkworm rearing. The average estimated uses of bamboos p.a. from recorded sources in the domestic and industrial sectors in South India are given below: -[4]

	Pulping MT	*Other Uses MT*
Karnataka	40,000	30,000

Andhra Pradesh	2,10,000	60,000
Tamilnadu	10,000	NA
Kerala	60,000	25,000
Goa	-	10,000
Pondicherry	-	-

Bamboo weaving is a traditional centuries old cottage industry. A large section of weavers belong to a defined community in South India and are termed as Buruds'. Karnataka alone has a population of 50,300 Burud families[3] and AP has 2,900 families. In addition to Buruds, weaving of bamboos is a domestic profession among several families in the low income group of rural communities. Since villagers situated in the vicinity of natural bamboo forests enjoy the privilege of bringing headloads of bamboos for their weaving profession, there is no exact record of quantities removed on headloads. Woven bamboo is used in several sectors of which sericulture is quite important and compares with use in agricultural sector in South India. Silk industry in South India is a large user of bamboo next only to the pulping sector. Since weaving is an art learnt by rural poor communities through generations, the employment generation in this type of use is much higher than bamboo use as raw material for pulp and paper industry.

The study

Early attempt for assessing the quantities of bamboos for different uses in Karnataka was made and results published in an article in the National Seminar on Bamboos held in Bangalore during Dec.1990[3]. The quantity of bamboos used in Silk industry was given as 5,50,000 tonne for production of 7052 tonne of silk. Based on average silk production in Karnataka over the previous three years, an assessment of Bamboo requirement each year for the main three items viz., leaf baskets, trays and mountages used in Karnataka was given as 40,000 tonne[4]. Earlier figures of 1990 were considered too high. In addition to the quantity of bamboos used, the publication (4) in 1998 also gave employment potential and economic benefits of this important bamboo use in Karnataka. INBAR took the initiative to take up a detailed field study in India on the quantitites and source of bamboo supply, the chain of stakeholders involved in manufacture,

sale and production of silk and its contribution to national economy. The field study work for South India was entrusted to Bamboo Society of India, Bangalore. The terms of reference budget and the expected output of the study are available in Ann.F.

Approach

The society constituted a core team for initiating the study. Apart from the office bearers of the society consisting of the Chairman, Executive Director and the Treasurer, all of whom are experienced foresters, an economist who had previous exposure to practical sericulture was taken into the team for advising on statistical and economic approach to the field study for gathering data through a set of designed questionnaires. These data forms were then handed over to a number of field officers to visit selected samples of mulberry farms, silkworm rearing farmers, bamboo equipment manufacturers, intensive worm rearing villages, cocoon markets, silk filatures and reeling centres etc. Baseline data for sampling was gathered through the Department of Sericulture in the States of Karnataka, Andhra Pradesh and Tamilnadu. However, the sericulture data in Kerala state had to be obtained from the Office of Sericulture Federation (SERIFED) based in Trivandrum. Statewise silk production data during the last five years was readily available from the Office of Central Silk Board in Bangalore. Data on extent of mulberry cultivation, egg producing centers, quantity of disease free layings (DFL) used raw silk, produced etc. was also available from the board. Districtwise data on extent of silk production and mulberry cultivation was obtained from Directorate of Sericulture in the three states and from SERIFED in Kerala. Data on bamboo resources, harvest and sale were obtained both from the forest department statistics, from bamboo cooperatives, traders etc. List of manufacturers of bulk equipment using bamboos so procured was obtained from the district officers in the department of sericulture, district offices of the forest department and from traders. Using the baseline data so obtained, it was possible to draw stratified samples of mulberry farmers, bamboo harvesters, purchasers and the groups of artisans engaged in the manufacture of bamboo articles for sale to users. The mulberry farmers, officials of the sericulture department, manufacturers, owners of silk filatures etc. were then visited for interaction to gather information on the whole chain of production and supply of bamboo articles, costs, extent of use of each product, its average life, cost of replacements, sources from which the materials are either hired or purchased etc. The data so gathered was collated to arrive at averages for requirements of products, their

life, costs, socio-economics of production of bamboo articles and cocoons etc. The long list of cooperatives, traders and manufacturers of equipment in the three states is given in Ann.G.

Major production area

It was found that the few districts of Karnataka, Andhra Pradesh and Tamilnadu situated in the South Central part of the deccan plateau form the nucleus of silk production. These districts are in the tropical zone with advantage of annual rainfall of about 750 mm spreadover 7-8 months in the year and have tropical red loam as the main soil type. This zone has the advantage of both South West and North East monsoons bringing pre-monsoon showers in April-May and precipitation between June and November. The area enjoys light rains, long sunshine and mild temperature ranging between 15^0C in Dec-Jan and touching 34^0C in midsummer of May-June. Mulberry farming is sustained by light irrigation to supplement the number of rainy days ranging between 100 to 125 between March and November of each year. Ground water gets recharged repeatedly due to prolonged rainy season, though the intensity of rain is low. The red loam assists in percolation and moisture retention to sustain good mulberry crop for 8 to 10 months in the year, which permits leaf harvests of atleast six cycles at average interval of six weeks. Districts of Kolar, Tumkur, Bangalore, Mysore and Mandya in Karnataka form the core of mulberry farmers with all the neighbouring districts in Karnataka, Andhra Pradesh and Tamilnadu supplementing mulberry and cocoon production. Naturally, filatures, reeling and weaving are situated around the centers of large scale cocoon markets. A map showing the sericulture zone of South India is given in Ann.H.

Organising fieldwork

The field officers engaged for data collection in the forms prepared by the core team gathered statewide data. The heads of sericulture deptts. in Karnataka and Andhra Pradesh are based in Bangalore and Hyderabad respectively. However, the Directorate of Sericulture in Tamilnadu is based in Salem, which is hardly 200 kms away from Bangalore and it is not based in the State Capital at Chennai (Madras). This in itself is a proof of the zone touching Karnataka being intensive producer of cocoons. Similarly districts of Andhra Pradesh bordering Kolar district in Karnataka are intensive mulberry farming centres. Silk production in Kerala is too little and hence it is administered by the State Sericulture Federation. Since major part of Kerala state is

under the strong influence of South West Monsoon which brings heavy precipitation between June and September, mulberry farming is too little in the state except Palakkad district, which borders Coimbatore district of Tamilnadu. The field officers were then sent to silk farmers, bamboo cooperative societies, district service centres meant to service small scale industries, bamboo market centres, equipment manufacturers, cocoon markets etc. from where data was gathered in the structured proformae.

Concession to artisans

Available government orders and data on supply of bamboos to the burud cooperative and individuals were obtained from the offices of the forest department in the respective states. Extracts are given in Ann.E. Quantities of bamboo supplied to buruds in Andhra Pradesh during the last five years is given in Ann.E-1. It is seen that an average of 400 societies have gathered 3.8 to 7.7 million bamboos. The same annexure gives the number of bamboos supplied to the market. It is likely that part of market supply has also gone into making sericulture equipment, just as part of artisan supply is used for the purpose.

Forms for data collection

Exhaustive forms for gathering data through the field officers were prepared so as to gather information to cover on i) Bamboo sale centres or outlets both in Government and outside government ii) manufacturers of bamboo equipment for sericulture either in societies or individuals iii) units providing equipment on hire basis iv) cocoon rearing profession etc. The forms so designed are given in Ann.I-1 to I-6. The field officers were given copies of the forms to use in field survey so as to gather all physical and socioeconomic data on use of bamboos in sericulture.

Field experience

Experience has shown that (a) the production and control of bamboo is with the state forest departments, (b) bulk of the trade is with erstwhile bamboo extraction contractors and traders who have now joined hands with the buruds, S.C and S.T groups to participate in one or more cooperative venture (c) these contractors or traders control the production and sale of equipment meant for sericulture, including enlisting themselves with the concerned government

departments (refer to Ann.G) (d) these traders have established production centres where they engage skilled and unskilled workers for production of equipment e) they form bulk suppliers both to i) service centres created by government ii) farmers, cocoon producers, reelers etc. f) they have experience and information on the bamboo extraction policies and programmes of the departments, artisans and groups who can supply components of bamboo to fabricate the equipment like trays, Chandrikes g) they have knowledge and access to bamboo market, mat suppliers etc. from all over India, which they use to keep up their trade and thus, they form the core group controlling production, supply, hire and prices of bamboo equipment. Since there are many such traders, it is safe to assume that a) the prices of equipment are competitive enough and vary according to market forces of demand and supply b) minor variations in the unit cost are controlled by the seasonal variations in the cost of labour c) quality of the product also reflects in the sale price and d) the policy and efficiency of the forest department is a major factor governing supplies of raw material and prices. It was found out that the intervention through the orders of the Hon'ble Supreme Court in 1997-98 and the constraints of forest management due to restraints by the provisions of the Forest Conservation Act, did upset smooth extraction and supply of bamboos mainly in Karnataka. Yet the traders managed to establish contacts with private suppliers in Maharashtra and Goa, mat manufacturers in N.E.India and thus were able to keep up production and supply to the sericulture farmers. There are some schemes of the Government in the forest department, sericulture department, tribal welfare etc. in which there is provision to provide equipment to the rural poor free of cost. The production of cocoons gets subsidies and governmental assistance at different stages from supply of disease free layings, mulberry farming, supply of equipment to fillip for marketing of cocoons. The establishment of service centres under the Ministry of Small Scale Industries has not changed the mode of production and supply of bamboo equipment to sericulture industry. These district service centres have again listed the bamboo traders/societies to whom they pass on orders of supply of equipment at negotiated prices and keep 2% of the cost of supply as their service charges.

Mulberry farming

Mulberry farming is an essential part of sericulture. There are not many large farmers cultivating over 4 ha of mulberry. Over 96% of mulberry farming is with small farmers. Most farmers in the

traditional silk production zone like to set aside 0.25 to 0.5 ha out of their average holding of 1 to 4 ha for mulberry cultivation. In over 90% of such farmers, the work of harvesting leaves and rearing of silkworms is done through the family members, because it engages most of their idle hours. Since the work of harvesting leaves, chopping them, feeding to larvae, transfer of larvae from trays to trays or finally to Chandrike, is done by family members, without distinction between age, sex, physical or mental skills etc. The cocoons gathered from Chandrikes are carried on headload, cartload, buses or stage carriers for sale in the government supported cocoon market or even private traders. The business of handling cocoons and separating silk thread and waste after steaming the cocoons is a sticky and smelly one. This is done in filatures which are a domestic or tiny scale industry, traditionally run mostly by muslims. Here again the whole family and some casual local labour is involved.

Extent and number

The department of sericulture has maintained annual statistics of area under mulberry cultivation, number of families and villages involved in mulberry cultivation, the quantities of disease free layings (DFL) supplied for rearing of worms, quality and quantity of cocoon production and production of silk and silk waste in the states under study. Extract of such data obtained from Central Silk Board is summarised in the following table as averages for five years from 1995-96 to 1999-2000 (31-3-2000) for the four states studied. Pondicherry and Goa in South India donot have records of sericulture.

Sl. No	State	Area under Mulberry – ha	DFL Nos 00,000	Reeling Cocoons tonne	Raw silk tonne	Silk waste
1.	Karnataka	1,57,108	2017.11	73,572	8578.4	2586.8
2.	Andhra Pradesh	38,744	576.58	26,686	3018.6	782.0
3.	Tamilnadu	11,578	184.03	6,805.4	777.6	215.4
4.	Kerala	1,359	1.12	33.65	3.09	0.68

	Total	2,08,789	2778.84	1,07,097	12377.69	3584.88

It is found out that the districts having large mulberry cultivation are:

a) Bangalore, Kolar, Mysore & Mandya districts which account for 77.3% in Karnataka

b) Anantpur, Chittoor, Kurnool and Cuddapah which account for 85% in A.P.

c) Dharmapuri, Salem, Erode and Vaniyambadi districts in T.N. – 70% in Tamilnadu

d) Cannonore, Idukki and Palakkad districts in Kerala – 70% in Kerala.

The average number of families holding sericulture farms in these states is summarised below:

	Total Families	*Av. Holding Ha.*
Karnataka	3,33,823	0.47
Andhra Pradesh	51,724	0.75
Tamilnadu	37,450	0.31
Kerala	19,651 (0.69)	0.07
Total	4,42,647	0.471 ha

The abstract of data gathered from farmers in form IV is given in Annex.K.

Bamboo uses in Sericulture

Bamboo thorns and splits are used for fencing in farms. But this practice is limited to natural bamboo zones, which are away from sericulture farms. No assessment is made for bamboo thorns use as it is common practice only in high rainfall where paddy & sugarcane are cultivated.

Baskets

Two kinds of baskets are used in mulberry farming. One basket is for manuring the crop. The second basket is for gathering leaves. The manuring basket is about 0.6 mt diameter and about 25 cms deep, circular in shape. The leaf collection basket has 55 cms middle diameter tapering to

about 20 cms at the bottom and 20 cms mouth at the top. See Photo 1. Average weight of both the kinds of baskets is 1.5 kg each and have average life of three years. Average market price is Rs.30/- each. The number of baskets needed is worked out by field studies at 10 per ha for application of manure and six per ha for leaf collection. About 80% of farms use bamboo baskets. The manure basket can hold 8 to 10 kgs of manure and leaf basket can hold 12 kg of fresh mulberry leaves. The baskets are woven with 2 to 3 cms wide bamboo slivers strengthened by bamboo strips of 2 to 3 cms thickness. About 80% of farms use bamboo baskets. Leaf harvest is done upto nine times each year. Quantity of leaves harvested is nearly 35 tonne p.ha p.a. for irrigated mulberry and half this quantity for rainfed crop. Based on the above averages, the requirement of bamboo of these baskets is worked out for the 4 states and given in the table below:

1	Area under mulberry in the southern states	2,08,789 ha
2	At 80% of farmers using baskets	1,67,030 ha
3	Baskets at 10 per ha for manuring	1.67 million
4	Number of baskets divided by average life of 3 years	0.55676 "
5	Weight of 1.5 kg each – tonne	8.35
6	No. of leaf collection baskets at 6/ha – million	1.002
7	No. divided by 3 years life – million	0.334060
8	Weight of baskets at 1.5 kg each	501 tonne
9	Weight of bamboo required at 10% wastage 835+501	1469 tonne
10	Manpower generation at 5 baskets per day	0.385
11	Wage earning at Rs.50/- per day	Rs.19.25 million
12	Market value of the baskets at Rs.30/- each	Rs.26.72 million

Note: - Rs.46.70 = 1 US$

Mats

Bamboo mats are regularly woven by the traditional weavers for various end uses. The most common uses are for partitions, fencing for cash crops like betel-leaves, dunnage in stores, for spreading in sun drying of sugar, grains etc. In addition, the mats are used for chopping mulberry leaves, storing steamed cocoons before drying them in cocoon storage trays kept on stands, one above the other. Normal size of woven mat is 1.8 mt x 1.2 mtrs. Average airdry weight of a mat is 1.5 kg. The weaver sells such mats at Rs.22/- to Rs.25/- each. The market price is Rs.35/- each. Mats are rolled into bundles of ten and sold in the market in South India. Such mats from Assam come in bundles of 35 in each roll. About 3500 mats are transported over the long distance of over 2000 kms to consumption centers in South India. Assam mats are superior. They are sold in retail market at Rs.45/- each and are mainly used for fabricating mountages. Average life of a mat is two years. Farmers' family uses 5 mats per annum. On these considerations, the requirement of mats, quantity of bamboos and their market value are worked out and given in the section *Mats in use*. In addition to use of mats by sericulture farmers, they are used by silk filatures.

Mats in filature

After steaming the cocoons in the stifling basket, the hot soft cocoons are unloaded on a bamboo mat. Average number of mats used in equal to the number of stifling baskets in use. The mat has average life of two years due to contact with heat and rough usage. At 10 kgs of cocoons per basket as capacity of holding and at 80% filatures using baskets, the requirement of mats and baskets is calculated. Production of reeling cocoons in the four states under study is 108,380 tonne per annum. At one mat for 10 kg of cocoons, the requirement of mats is 0.86704 million at 80% of farmers using such mats. Mats in filature are used for average life of 200 times. Each mat is 1.5 kg in weight and market value is Rs.25/- each. Based on these calculations, the requirement of bamboo, the value of mats, manpower generated etc. are worked out and given below.

Mats in use

In sericulture families

No, of families	4,42,647
at 5 mats per family p.a.	2.213 million
at 70% farmers using mats	1.5492 million
at av. life of 2 years	No.p.a. = 0.77463 million

In filatures

Quantity of cocoons in 4 states p.a	1,08,380 tonne
No. of mats required at 10 kg per batch	0.86704 million
Av. life of 200 uses per mat	0.00433 million

Overall

Total number of mats required p.a. (sum of above)	0.77896 million
Dry weight of mats at 1.5 kg per mat	1168 tonne
Allowance for wastage of 10%	1284 tonne
Market value of mats at Rs.25/- each	Rs.19.47 million
Manpower for weaving at 5 mats per day	0.1558 million
Wages earned at Rs.50/- per day	Rs.7.79 million

Rearing trays

Woven bamboo trays, generally in round form are used for feeding of worms. The trays are generally in size of 1 mt and 1.2 mt diameter with a rim of 6-7 cms height (see P-2). The requirement of such trays increases as the worms grow in size after every moult. The bamboo trays called "Tatte" are vertically placed one above the other on frames which are made of wood or bamboos. Generally, the outer frame is that of wood and the partitions are either wooden reepers or round bamboos. Each frame is generally 2 mtrs in height and can hold 20 trays in two rows (see fig.c). This is meant to save rearing space in the village homes. Either a part of dwelling house is used for accomodating such frames or rearing houses protected from ants are specially constructed for such use in zones where cocoon production is a repeating annual feature. Each tray has weight from 2.0 to 3.5 kg, with an average dry weight of 3.0 kg. Trays are woven from 1.5 to 2 cm wide slivers of both Medri and Dowga bamboos and strengthened by splits of 1.5 to 3 cms. The rim of trays require special strengthening by thick splits. Bamboo trays are not used in case of branch feeding which is resorted to by some large farmers to save on cost of labour required in leaf harvest, chopping and feeding. Branch feeding is done on large frames of size 3.5x1.5 mt made of wood or bamboo frames, on which coir ropes or plastic ropes are tied to hold the branches (see fig.c). From field studies, it is estimated that 82% of farmers use bamboo trays. Number of leaf crop of mulberry harvested varies from 5 to 9 p.a. depending on moisture and conditions of growth. Average number of crops is 8 in the traditional zones under irrigated cultivation and five under rainfed cultivation. The trays are used repeatedly and have an average life of 3 years. The trays are smeared with mud-cowdung mixture and are kept disinfected by spraying insecticides.

Requirement of number of trays has been assessed by contacting in any samples of farmers. There have been research studies conducted by scientists and university students for writing their doctorate thesis. The data collected from the field officers is used for finding out the average requirement of bamboo trays and mountages needed by farmers, as these two items constitute the largest use of bamboos in sericulture. Districtwise averages of such uses by sampling has been worked out and given in Ann.J. There have been accurate research studies on use of number of trays, number of times used annually and average life of trays. These studies have produced data on number required for 100 dfl aswelas per acre, per ha etc. Such data compare favourably with the data generated from our field studies. The requirement of bamboos on the basis of average

number needed per ha of cultivation is given in the following para. The number of trays p.a. will be one third of the total number as the average life is 3 years.

Number of rearing trays required per annum and related data is given below:

Area under mulberry in the southern states	2,08,789 ha
Requirement of trays at 200 per ha	41.7578 million
Number at average life of 3 years	13.9192 million
No. reduced to 82% usage	11.1354 million
Weight of trays p.a. at 3 kg per tray	33406 tonne
Weight of bamboos required at 10% wastage	36746 tonne
Value of trays at Rs.50/- each	556.77
Employment generation at 4 trays/day/pair	5.567
Wage earnings at Rs.100/- per pair per day	278.38

Sources of supply

There are some manufacturers and traders in traditional mulberry zone who are major suppliers of trays. The manufacture of trays is done by artisan families for which bamboos are procured mainly from government sources and supplemented by private purchases. One big bamboo (Dowga) can give 2 trays. Conversely, two thin medar bamboos may be needed per tray. The circular portion in the form of mats is sometimes made in one place (e.g. Nandyal in A.P., Shimoga in Karnataka) and the trays are fabricated near the farm centres like Chintamani in Kolar dist., Vijayapura and Kanakapura in Bangalore rural district, Maddur and Malavalli in Mandya district, Sira in Tumkur district etc. Average of four trays are made per day for which the total value is Rs.200/- and the wages earned by a pair of workers is Rs.100/- to Rs.120/- per day. The market price varies from Rs.40/- to Rs.60/- each depending on size, quality and season. On the basis of Rs.50/- per tray as average price, the average manpower for the manufacture of trays, the employment generation and value of production of trays every year, is given in the previous para.

Mountage (Chandrike)

This equipment is of great importance in cocoon production. Mature larvae which are about 23 days old are transferred to the mountages in the circular thin frames between which cocoons are spun. The spinning process takes 48 to 60 hours after which the cocoons are removed for sale. The remnant waste silk is removed, the mountages cleaned and disinfected before reuse. A mountage is made of 1.8 mt x 1.2 mt mat strengthened with solid bamboo at the back by tying with coir rope. On the front side of the mat, 45 to 50 mtr long woven bamboo ribs of 5-6 cms high are fixed concentrically by coir rope (see fig.d). These are called "flowers" (Hoovu in Kannada) and are either locally prepared or brought from bamboo production centres like Shimoga and Nandyal. The mats are also locally woven or bought in bundles from Shimoga and Gauhati in Karnataka and Assam respectively. Though Thrissur and Trivandrum in Kerala manufacture large quantities of mats of reed bamboo, these are not used in sericulture, though the prices are competitive. Kerala State Bamboo Corporation is the main manufacturer of mats through many cooperative societies in Kerala by supply of reed bamboo given free of royalty to the corporation by Kerala Govt. A mountage weighs from 10 to 20 kg depending on the weight of bambos used. Average weight of mountage is 13 kg of which 12.5 kg is the weight of bamboo and the balance is that of coir rope.

Field studies have assessed requirement of mountages per ha, per crop and for every 100 dfl. 80% of farmers use bamboo mountages, which are priced at Rs.160 to Rs.250/- each depending on quality and season. They are also kept repaired if slightly damaged. Mountages are bought by large farmers and are often hired during peak production for 3 days of pupation. Hire charges are Rs.5/- to Rs.6/- each per use. It is revealed that 40% farmers in Andhra Pradesh own mountages and 60% hire them. Average life of a mountage is three years even after some repairs. Research studies have also been conducted on requirement of mountages per 100 dfl or per ha of mulberry cultivation which is Rs.250 per ha. On the basis of average numbers needed, average weight per mountage, average life etc., the requirement of bamboos is worked out and given in para 21.4.3.

Labour and value: - Two mountages are made per day if the whole manufacture inlcuding splitting, slivering, weaving and fabrication are done at the place of manufacture. But mats and flowers are bought in bulk and fabricated at the manufacturing place in which case 5-6 mountages are got ready per day by one pair of workers. Average wage earning comes to Rs.40/-

per day for ladies and Rs.60/- per day for gents respectively. Cost of bamboos comes to an average of Rs.6/- per mtr length. On the basis of these averages, the employment generation and value of production are given in the para below:

Mountages used: - See Photos 4-7

Area under mulberry in the 4 states	2,08,789 ha
At 80% farms using mountages	1,67,031 ha
Mountages required at 250 per ha	41.7578 million
Divided by average life of 4 years – p.a.	10.439 million
At average wt. of 11 kg per mountage	1,14,830 tonne
At average price of Rs.200/- each market value	2087.8 million
Bamboo used at wastage of 5%	1,20,571 tonne
Employment at 3 mountages per day per pair of weavers	6.9593
wages earned at Rs.50/- per weaver per day	347.965

Cocoon storage trays

These are like rearing trays woven from slivers and splits of bamboo. The trays are one meter in diamater and 5 cms in depth. Average number of trays used for storing cocoons produced from 100 dfl is 15. The trays are priced in the market at Rs.40/- each. Average weight of the tray is 2.5 kg and it can hold 12.5 kgs of cocoons. The average life of these trays is five years. The requirement of cocoon storage trays is worked out on average Dfl. Used each year in the states under study and calculated for only 80% of cocoon production, as wooden trays are also used. One pair of weavers can prepare five trays per day. Two medri bamboos are needed per tray. The weight of bamboo use p.a. in such trays, the market value of trays, employment etc. are given in the following para:

Storage trays used

Dfl used in four states each year	277.884 million
at 80% using bamboo trays – Dfl	222.307 million
at 15 trays per 100 Dfl	33.346 million
Average longevity is 2 years, hence no. p.a	16.673 million
Market value of trays at Rs.15/- each	250.1 million
Weight of bamboo at 2 kg per tray	33,346 tonne
Considering 5% wastage, wt. of bamboo	36,686 tonne
Mandays generated at 10 trays per pair per day	6.668 million
Wages earned at Rs.80/- per pair per day	Rs.266.72 million

Steam stifling baskets

Most of conversion of cocoons to silk is carried out in the filatures on a cottage industry scale. The filatures are around the cocoon markets. A filature processes about 300 kg cocoons per day and works for about 250 days in a year.

As shown earlier, average production of cocoons in the four states is 108,380 tonnes p.a. 10 kgs of cocoon are stifled in steam per batch in a basket. The requirement of baskets p.a. comes to 43,352 p.a. on the basis of 200 times usage for each basket. Since the average weight per basket is one kg, the total weight of baskets is 43.352 tonne or roughly 45 tonne of airdry bamboo. At six baskets woven per day per weaver, the man power used is 7,225 mandays per annum. The value of baskets at Rs.20/- each comes to Rs.0.867 million p.a. The wages earned at Rs.50/- per day comes to Rs.0.722 million p.a.

Requirement of stifling baskets: - See Photo 1.

Quantity of cocoon production p.a. in southern states	1,08,380 tonne
No. of baskets at 10 kg capacity at 80% usage	0.86704 million
No. of baskets p.a. at average of 200 uses	0.0043352 million
Wt. of baskets at 1 kg each	43.35 tonne
With allowance for wastage bamboo need	45.00 tonne
Market value of baskets at Rs.15/- each	Rs.0.650 million
Manpower requirement at 8 baskets per day	5420 mandays
Wages earned at Rs.50/- per day	Rs.0.361 million

Bamboo sticks in rearing stand

The trays are placed one above the other in rearing stands. Ten trays in two rows are placed on such stands in the village houses to save space. It is seen that the frames are made of jungle-wood, but bamboo sticks are used as partition in 80% of such stands (see Photo 9). The sticks are of round bamboo of length of 1.5 mts each. Each stand needs 20 sticks, which can be obtained from 5 bamboos. The average life of sticks is three years. As 200 rearing trays are used per ha p.a., the number of stands per ha is 10. The requirement of bamboo for construction of stands is worked out and given below:

Bamboo sticks in rearing stands

Area under mulberry in 4 states	2,08,789 ha
At 10 stands per ha No. of stands	2.879 million
Considering 80% usage, No. of stands	2.3032 million
No. of sticks at 20 per stand	46.064 million
At four years average life	11.1353 million
No. of bamboos at 5 sticks per bamboo	2.227 million
Weight of 200 per tonne bamboos	11,135 tonne
Value of bamboos at Rs.20/- each	Rs.44.54 million
Manpower at 200 sticks per day	0.0557 million
Wages at Rs.40/- per day	Rs.222.7 million

21.8 Chawki sticks

The requirement of chawki sticks is small. Only 5 sticks are used per ha. The sticks have average life of 3 years. Since each stick is about 1 mt long and 3 to 4 cms in diameter, the number of bamboos at 5 sticks per bamboo works out to bamboo numbers equal to the area of mulberry per annum divided by 3 years of average life. The bamboo requirement is given below:

Area ha	**No. of bamboo needed**	**Wt. In tonne at 200 bamboos/tonne**	**Rs. Million**
2,08,789	69,600	348	1.392

22. Related bamboo uses

Besides the direct uses in sericulture, there are many other uses connected with harvesters and weavers. The bamboo felling labour has to stay in temporary sheds constructed from use of bamboos, mats and leaves. The bamboo felling operation in South India takes place between December of each year upto end of May of the next year. Fellings are suspended during the rainy season between June and November. Since the bamboos are extracted for various end-uses, including for pulp mills, the use of bamboos for temporary dwellings cannot be accurately assessed for sericulture end use. Residues of fellings are available as fuelwood for such labour in the forest.

Sheds for weavers

Most large-scale manufacturers create bamboo-made workshops for storage of bamboos, shelter to workmen, storage of articles manufactured etc. A photograph of one such bamboo workshop is given in Photos 11 and 12. Such sheds are used for weaving of other bamboo products like vegetable baskets, agricultural needs like grain storage bins, winnows etc. Hence it is not possible to assess bamboo requirement exclusively connected to silk industry.

Employment for bamboo extraction

Extraction of bamboos in the forest from thorny intertwined branches in the clumps is both difficult and time consuming. Even the approach to the base of clumps requires clearing of basal thorny branches. Evenafter cutting the base with a long handled axe or bill-hook, the culms have their branches intertwined with others at the middle and top of clumps.

The current requirement of labour for bamboo extraction is worked out on averages now used. The felling contract is given on the basis of 100 bamboos in case of better culms used in weaving and tonnage or volume in case of industrial uses. In addition, labour is used for loading, unloading, storage etc. The present average requirement for felling and extraction of bamboos from forests consists of six mandays per tonne Loading, unloading and stacking require one manday per tonne. Average wage rate now is Rs.75/- day. Labour requirement as apportioned to the bamboo use in sericulture for harvesting and handling, is given in the table below, together with wages earned per annum.

Sl. No.	Bamboo reqd. tonnage for Sericulture	Labour/tonne No.	Emplmnt. Million Mandays	Av. wage at Rs./tonne	Expenditure on Bamboo extrn. p.a. Rs.million
	2,00,000	a) extraction 6 b) handling & storage 1 Total 7	1.2 0.2 1.4	a) Rs.450/- b) Rs.75/-	90 15 105

Economic importance of silk beyond silk production

After the silk threads or silk waste is produced, there are several stages upto the use of silk which has great significance in the gross national product and employment generation. Spinning, colouring, blending, weaving of silk into fabric or sarees and manufacture of apparel are all the downstream activities. Bulk of weaving is in the rural sector through handlooms or powerlooms. Though some components in such weaving can be of bamboos, no further study for such uses is deemed necessary since wood, plastics and metals have been progressively used in place of bamboo. The ultimate value of silk in the national perspective is reflected in Ann.C.

Competition to bamboos in sericulture equipment

Cardboard trays, plastic trays and mountages have been devised and introduced in silkworm rearing. But the traditional cocoon rearing farmers in South India prefer bamboo trays and mountages in preference to other equipment. During the field sampling, almost all farmers have been unanimous in their opinion that bamboo equipment is still the best and have suggested removal of bottlenecks in the supply of bamboos, easy movement, standardisation of products and costs, rather than find substitutes.

Problems in supply

Almost the entire supply of bamboos as raw-material for manufacture of equipment comes from Govt. forests. Bamboos are defined as “forest products”, “whether brought in from the forests or not” under the forest act. Therefore, transportation of bamboos has to be covered by a permit duly issued by an authorised forest officer. Procurement of such transit permit involves delay in movement of harvested bamboo, resulting in losses due to driage, pilferage and decay due to attack by fungi, insects etc. During the last 10 years, harvesting of bamboo has been taken over by the forest department. This has introduced more red-tape, delays and some corruption too, in addition to higher costs of extraction, which has to be borne by users. Weavers of mats, trays and manufacturers of mountages have to put up with these problems. Billhooks tied to long bamboo poles used to cut the obstructive branches higher up. The culm is then dragged by holding the buttend either by a set of labourers, by hand or by tying a rope around the buttend. The felling operation has become cumbersome because of unscientific harvests, resulting in congestion of clumps and intertwining of culms through the clump while attaining heights. Heavy grazing compacts the forest soil, which is also responsible for congestion of clumps. These factors can be remedied, if the bamboo forests are scientifically managed.

The weavers, traders and other artisans have to accept the quality, quantity, age of culms etc. as handed over to them, without selection. Certain percentage of material sold to them cannot be used by them. Weavers would like green and soft bamboos for ease of weaving, quality of product and least wastage through residues. Since users have no control on selection, harvest and transportation of bamboos, they suffer both in quality and cost of the products. There are instances when the supply of bamboo is made long after their felling, resulting in driage, decay and total loss of the produce for use in sericulture. The situation is no better for extraction by the forest development corporations.

It is an irony that there is neither improvement in quality or quantity of bamboo production in all the states, even after introduction of departmental harvest. There has been no attempt at introduction of silvicultural management of clumps or scientific harvest. No modernization in

tools and methods of harvest, transport, storage, grading and no preservative treatment is resorted to. The policy of governments at concessional supplies to artisans and their societies has been misused for an unhealthy nexus between politicians, officials and traders. Traders backed by the politicians control the societies.

Even the ministry of textiles, sericulture and the departments of sericulture aswelas Central Silk Board, have been trying to find substitutes to traditional bamboo equipment and not given adequate thought to improving quality of bamboos or smooth and adequate supply of bamboos, which traditional farmers would like to use in preference to substitutes. Only in cases of non-availability and unreasonable high prices, the farmers use the substitutes like cardboard and plastics. Branch feeding is resorted to by large farmers to save on cost of labour and not for better results. The agencies promoting mulberry cultivation and sericulture have not looked into improvement in supply of much needed bamboo equipment. A suggestion made to introduce useful bamboo species as border-crop around mulberry farms, has also no takers.

Bamboo management

Extraction of bamboos from forests was prescribed as an overlapping working circle on a 3 to 4 years cycle in the working plans drawn for forests. Rigid conservation policies, reservation of bamboo areas as wildlife preserves, stoppage of green fellings due to lobbying by ill-informed environmental activists, diversion of attention of forest staff to social forestry resulting in neglect of normal forestry operations, interventions of the Hon'ble Courts resulting in lengthening of the red-tape in approval of management schemes etc. have all resulted in irregularity of extraction and supplies. Periodic flowering and death of clumps worsens the situation. It can be said that the famine of bamboos in the market and related miseries to artisans and users, can be attributed to lack or neglect of forest management and more so in the last five years. Even the bamboo plantations raised under different plan schemes have remained neglected, resulting in very poor yields and no improvement in yields. The table below shows data of extractions of bamboo in Karnataka to illustrate fall in yields. The same trend is seen in Andhra Pradesh and Tamilnadu.

Years	State	Period 1976-80	1980-1985	1985-90	1990-1995	1995-2000
Av.Qty.	Karnataka	1,01,507	1,17,192	48,948	25,169	21,882
Tonne	A.P.	NA	13,29,255	2,36,090	NA	1,70,000
p.a.	T.N.	--	17,461	6,635	4,010	1,500

Due to neglect of management, apathy of Govt. departments to the needs of the artisans, legal and administrative hurdles in extraction and supply, the artisans and manufacturers of equipment suffer from uncertainty, irregularity of supplies, fluctuation in prices etc., which in turn cause problems to workers, sellers and users.

Private sources of supply

The fall in yields from forest extraction and obstacles in easy availability have resulted in homesteads in Kerala and Goa grow bamboos due to ease of cultivation and ready market. Konkan districts of Maharashtra along the border of Karnataka have also taken up cultivation of bamboos. Species grown in Kerala is *Bambusa bambos*. In Goa and Maharashtra, it is *Pseudoxytenanthera stocksii* in bulk and medri in smaller numbers. An estimated annual production of 10,000 tonne is recorded from private sources in Kerala and about 30,000 tonne between Goa and Maharashtra. Tanjore district in Tamilnadu has taken up bamboo cultivation in private lands, but the produce is locally used as props for banana cultivation. The artisan groups dealing in equipment for sericulture buy private bamboos in bulk at markets in Sankeshwar and Belgaum and transport them to destinations of drier districts in Southern Karnataka, neighbouring Andhra Pradesh and Tamilnadu for their use. They have managed to solve problems of permits, checkposts and transport obstacles on their own at some additional cost, which is a fraction of the cost of purchase and transport. It was revealed to our field staff that the average cost of purchase of one lorry load of about 2500 small bamboos at Sankeshwar is Rs.25,000/-, transportation cost to Denkanikota and Dharmapuri in Tamilnadu is Rs.30,000/- and additional costs on overcoming obstacles of different departments involved is an average of Rs.5,000/- per lorry load. The landed cost of such bamboo comes to Rs.20/- to Rs.25/- each or Rs.4,000/- to Rs.5,000/- per tonne.

Manufacturing at site

Except for the wholesale contractors who number 3 to 15 in different towns in Karnataka and bordering A.P. and Tamilnadu, hundreds of artisans live in hutments. There are lanes in the towns where the buruds are concentrated. Each household either buys a headload of bamboos numbering 20 to 30 depending on the size at Rs.30/- and the family members do the splitting and weaving. There are many instances, where the wholesaler supplies the raw material and pays wages fixed for the products made to order. Some villagers situated near bamboo forests collect bamboo on headloads with or without permit and sell products to wholesalers. Individual families are always needy due to irregular availability of raw material because of which, they have idle hours and days or due to time required to get back the value of bamboos and their maintenance costs, which comes after sale of the produce. This is one reason for which they either depend on advance amount obtained from traders for which they commit quantity and rate for supply or depend on the traders for supply of raw material. The larger manufacturers or traders have been in this business for 15 to 30 years and know the tricks of the trade. They also have knowledge on alternative sources of supply of raw material or semi finished products used in fabrication of trays and mountages at different centres in Karnataka, Andhra Pradesh and even Assam for supply of mats. They purchase bamboos, mats, flowers (used inside Chandrike), coir-ropes etc. in bulk and supply the same to individual families for manufacture or hire artisans on wage per unit of manufacture. In the latter case, they construct large shed or pandal mostly out of bamboos, mats and plastic sheets. These sheds and pandals are used for storage of raw-material upto one or two lorry loads and storage of finished products till they are sold. Weaving and fabrication is done either outside or inside these pandals. At fig.d. it is seen that these traders purchase mats at Tarikere and around Shimoga in Karnataka or from Nandyal and Rajamundry in A.P. and shortages are got from Assam. The cost of purchase of mats of size 1.8 x 1.2 mts varies from Rs.25/- to Rs.35/- in wholesale and Rs.40-45 in retail. Bamboos are bought from forest department sources, bamboo cooperative societies, forest development corporations or bamboo merchants in Belgaum district, Shimoga, Rajamundry, Kurnool, etc. Flowers of about 45 m length are bought at Rs.65 to Rs.80/- each and its length is tailored to fabrication of one mountage. Coir rope bundles come from Kerala or Coastal Karnataka. It is seen from field study

that the experienced traders succeed because of their skills to overcome problems in procurement of raw material and their ability to make investments upto about Rs.2,00,000 during peak season to sustain their trade. In cases where there is lack of ready demand for mountages for sale, they hire them to small farmers at Rs.5 to Rs.6/- for a 3 days requirement and keep recycling them. In Karnataka about 40% of rearing farmers own the mountages and 60% hire them. Those depending on hired mountages number 75% in Andhra Pradesh and Tamilnadu. The annual production of larger bamboo traders varies from 3000 to 10,000 trays and 2000 to 6000 mountages per annum. Trays are generally bought and not hired. But many small farmers take both mountages and trays on loan from neighbours or on barter to avoid purchase.

Improvement in resources

The department of sericulture should promote bamboo plantations along with mulberry in the zones where artisans need supply of fresh bamboos. Such bamboo planting can be in homesteads, boundaries of mulberry fields or even block planting in common property resources. Service societies should be encouraged to motivate farmers to grow bamboos on assurance of purchase at support price, easy credit facilities, supply of quality planting stock, technical and extension services. Such societies should help in bamboo planting, harvest, contact with agencies having technical competence in bamboo planting, harvest, preservative treatment and market information. User groups should be attracted by the forest department and the forest development corporations in joint forest management of extended bamboo plantations for mutual benefit. Information technology should be harnessed for dissemination of market information between producers, traders, processors and users for proper linkages. Forest and sericulture research institutes should undertake applied research in continuous improvement of equipment in usage to reduce on cost of purchase, maintenance and replacement. Manufacture and supply of improved tools for splitting, slivering, thicknessing and joinery by service societies can help in reducing labour costs, wastages and improve quality of the product. Storage of bamboo equipment during idle period has not been given attention and deserves educating the users on the same. Promotion of a multiplicity of products and their ready sales for reasonable returns to the artisans, will help in reduction of wastages of bamboo, avoidance of idle time and improved wages to the poor families of artisans. The department of small scale industries and the handicrafts development board should have special cells at the district level to study, identify and remove bottlenecks in

the chain of activity from resource to the marketing of the products. Help and advise from voluntary agencies engaged in bamboo development should be continuously taken by the producers of bamboo like forest department, forest corporations, joint forest management committees etc. on the one hand and the service centres and wings of development departments on the other, for improving coordination.

Socio-economic conditions of Buroods: -

Caste

The growing of mulberry and production of cocoons are the activities taken up by farming community belonging to all the castes, mostly Vokkaligas and Lingayats. Manufacture of bamboo components for use in mulberry growing and rearing of silk worms for cocoon production is invariably taken up by families belonging to MEDAR and KORAMA castes which belong to scheduled category. This is a traditional occupation of these communities. There is little occupational mobility in these groups.

Family size

The general impression is that the poorer sections of the society are characterized by bigger family size. This notion is endorsed by the families engaged in manufacture of components for sericulture. Based on case studies the findings are as follows:

Average family size		: 6.2
Number of adults	Male	: 2.2
	Female	: 1.1
Number of children	Male	: 1.7
	Female	: 1.2

Housing

The families are poorly housed. Most often their houses are made of bamboo and thatch. Some portion of the house is made of mud plastered brick walls, mud flooring and tiled roofs. The dwelling house, working place, place for storing raw materials and manufactured components are

one and the same. The sanitary and other conditions are typically of weaker section. Even in a village they live in a colony or their own lane.

Education

Education receives least attention by elders and attracts least the children. All the children are enrolled in the schools but attendance is not regular. Among adults, the literacy is only 18% in the case of males and 6% in the case of females. The highest qualification acquired is S.S.L.C. (O level) i.e. 10^{th} standard (matriculation) in the case of males and 7^{th} standard in the case of females.

It is appropriate to mention here that the environment for children's education is not at all conducive. Starting from the age of 5, the children have to assist the elders in their work. Initially they do so before and after school hours. They start receiving tips for their assistance. This will make them familiar with handling money. By the time they are 10 to 12, they get habituated to handling money and start needing it most and by then, they would have acquired quite some skill in manufacturing the bamboo components. In a way, they become adults both in occupation and handling money. This distracts them from education. The parents will not be in a position to force the children to study and incur their displeasure because they will be asking children to assist them in work.

Health

Health conditions are not satisfactory because of the conditions of living and to a fair extent because of the habits. While children get attracted towards eating roadside foods and even smoking, the adults resort to drinking liquors. Conditions of aged persons are pathetic. The economic conditions force them to work. This is forced upon them since they stay where the work will going on. Drinking countrymade liquor of dubious source is their habit and this is one reason for their poverty.

Economic status

The families engaged in the manufacture of bamboo components eke out their living mainly by their labour. The average earning per adult is Rs.60/- day, for children between 5 and 10 Rs.30/-

day and for children between 11 and 15 it is Rs.45/-. This is after accounting for varying conditions in the supply of bamboo and demand for components. The supply of bamboo will not be regular in a year. The sale of bamboo components will be generally more during January to March because the farmers will have cash to purchase them. Their possessions are, apart from house, transistor, cycle, tools for their jobs and wrist watches, Savings are negligible.

Working hours

There are no regular working hours. The male adults start their work at about 7 A.M. and continue till 7 P.M. with breaks for food, brief rest etc. The female adults support male members after the domestic work. The children will work between 7 and 10 A.M. and 5 and 7 P.M, whenever possible and necessary. Except cinema, some religious functions and fairs, they do not have any other entertainment. Their main source of entertainment is transistors & radios.

Organisation support

There are societies formed for the manufacturers of bamboo components. These are formed mostly due to external (like government departments) pressure. In most of the cases these societies are defunct and most of the members are defaulters. The bamboo is supplied by a few individuals or sometimes a few manufacturers join together get bamboo by truck loads. Individually, they are dependent on the bamboo contractors and wholesale dealers of components.

Forest and sericulture research institutes should undertake applied research in continuous improvement of equipment in usage to reduce on cost of purchase, maintenance and replacement. Manufacture and supply of improved tools of splitting, slivering, thicknessing and joinery by service societies can help in reducing labour costs, wastages and improve quality of the product. Storage or bamboo equipment during idle period has not been given attention and deserves educating the users on the same. Promotion of a multiplicity of products an dtheir ready sales for reasonable returns to the artisans, will help in reduction of wastages of bamboo, avoidance of idle time and improved wages to the poor families of artisans. The department of small scale industries and the handicrafts development board should have special cells at the district level to study, identify and remove bottlenecks in the chain of activity from resource to the marketing of the products. Help and advise from voluntary agencies engaged in bamboo

development should be continuously taken by the producers of bamboo like forest department, forest corporations, joint forest management committees etc. on the one hand and the service centers and wings of development departments on the other, for improving coordination.

Policy interventions needed

Scientific management of forests by introducing all known silvicultural practices for improvement of yields and improved technologies and tools in harvesting, storage including prophylactic treatment have to be introduced. Guidelines for such management can be introduced immediately in consultation with scientific institutions, based on which the entire bamboo growing stock is regularly treated and available increments harvested. After the prophylactic treatment, bamboos should be graded to suit end uses. Such graded bamboo should be sold according to their grades, to artisans, farmers on priority and the balance sold to markets and industries without much delay in storage. Wet storage facilities should be created at chosen centres either by the forest department or the forest corporations for supply of green bamboos to rural artisans in retail sale. Transit of bamboos and products should be freely permitted on production of certificates of origin by prescribed authorities consisting of forest deptt., forest corporation offices, joint forest management committees, cooperative societies of growers, and harvesters etc., on the basis of maintenance of accounts and submission of periodical returns to a single central authority in each nearest range or forest division. Credit cooperatives to assist artisans with short-term cash credit have to be created near the villages having concentration of bamboo artisans. The service societies in each district with suitable number of branches should open depots for storage and sale of raw material like bamboos, ropes, purchase of equipment at predetermined unit prices and sale of such equipment to needy users. Service societies can also store equipment for hire and maintain them for improving their service life. These service societies should also ensure continuous supply of raw material, purchase of prepared goods, their quick disposal or ready hire and also wage disbursement to artisans without delay. A development fund created by such societies should take care of social, educational, health and other basic needs of the families of artisans.

SECTORAL STUDY ON USE OF BAMBOOS FOR SERICULTURE IN SOUTH INDIA

By N.S. Adkoli

Chairman, Bamboo Society of India

RECOMMENDATIONS

Bamboo supply

Considering the fact that artisan families are the real stakeholders in respect of bamboo forests, optimum extent of natural bamboo forests should be brought under participatory management under the present system of joint forest management (JFM). Micro-plans for intensive management of such JFM areas should be drawn in consultation with stakeholders on silvicultural principles, with a view to increase their yields to fulfill the increasing demands of quality raw material.

Extraction agencies

Since the current method of departmental extraction has become counterproductive because of unscientific harvest, delay and consequent deterioration of bamboo stocks, the extraction should be handled by service societies of users who should create wet storage and preservative treatment facilities for reducing losses in handling and storage.

Registered users

Data on users and their groups should be gathered by the service societies to ensure timely and equitable distribution of available bamboos and procurement of bamboos from large production centres to overcome hardships of artisans.

The department of sericulture should promote a project for planting of high yielding bamboos suitable for sericulture products on all mulberry farms under farm forestry.

Voluntary agency like Bamboo Society of India should be used by the Government departments as a bridge between the State and the stakeholders.

Marketing of products

To avoid dependence on middlemen and contractors for selling the products by artisans, the service societies should assist in purchase of such products at optimum prices, storage of the same at centres of consumption of cocoon rearing farmers and keep checks and balances on production, sale and use of such products. The Central Silk Board should provide grants and incentives to the service societies for bamboo development and trade activities.

Diversification

In the process of manufacture of bamboo equipment in use of sericulture, residues of bamboo like ofcuts are available as by products. The artisans should be provided training in manufacture of other products like chopsticks, spoons and craft items for use of residues and tie up of products to markets.

Training cum production centers

The department of small scale industries should fund and create training cum production centres in the heart of bamboo production areas to provide space, wet storage facilities, preservative treatment facilities, improved tools, large work and storage sheds in which training is provided to improve productivity and facilities are provided for centralised production from where the service societies can procure finished products for sale to farmers in cocoon production.

Socio-economics

In order to improve the socio-economic conditions of bamboo artisans, the service societies should create a development fund from which the families of such artisans get benefits of proper housing, health, education, old age pension etc. It is necessary for the forest and sericulture departments to join hands with the health department to start de-addiction and recreation centres to wean the traditional artists from their habit of drinking arrack. The service societies should

also function as credit cooperatives to provide short-term credit to artisans for purchase of raw material, tools and their urgent domestic needs.

Law and policy

The Indian Forest Act has included "Bamboo" alongwith "timber" to define it as "forest produce, whether found in and brought from forest or not". This provision discourages bamboo cultivation on private lands. This provision requires change to remove bamboos from farmlands under the definition of "forest produce".

Transit permit

Movement of bamboo from place to place has now to be covered by a transport permit issued by the forest department. Issue of transit permit can be authorised to village level institutions like the joint forest committees and service societies.

Taxes

Since bamboo products are means of subsistence livelihood to the rural poor, there should be no taxes like sales tax on products of primary manufacture by the artisans.

Annexure-A-1 – Statistics of Silk Production & Mulberry planting in India

Mulberry Production Statistics

#	State	1995-96 Production of			1996-97 Production of			1997-98 Production of			1998-99 Production of			1999-2000 Production of		
		Hecta--rage	Raw silk	Silk waste	Hecta-rage	Raw Silk	Silk waste	Hecta--rage	Raw silk	Silk waste	Hecta--rage	Raw silk	Silk waste	Hecta--rage	Raw silk	Silk waste
1	Andhra Pradesh	35546	2361	519	33128	2444	725	38084	2696	674	42314	3335	1034	44641	3757	958
2	Assam	2267	23	7	2545	18	5	2813	14.65	5	3074	16	5	3200	19.2	5.88
3	Arunachal Pradesh	26	1	NEG	27	1	--	97	1.38	--	224	2	NEG	219	0.27	--
4	Bihar	844	8	2	434	7	2	474	8.5	2	520	7	1	320	4.5	1
5	Gujarat	210	NEG	--	67	NEG	--	63	0.12	--	60	NEG	NEG	53	NEG	--
6	Himachal Pradesh	326	14	--	326	13	4	356	14.4	5	396	14	5	416	10.9	3.815
7	Haryana	123	NEG	--	60	NEG	--	20	NEG	--	20	NEG	NEG	20	--	--
8	J & K	3303	60	30	4150	85	30	4717	84	29	5243	86	31.4	5605	85	43
9	Karnataka	167422	8264	2727	166000	8327	2495	166000	9236	2771	166000	8944	2504	120119	8121	2436

10	Kerala	557	5	NEG	274	3	1	1164	3	1	2161	2	0.6	2637	2.48	0.808
11	Madhya Pradesh	4744	25	2	2252	15	5	2043	14.35	5	2043	7	5	2541	7.1	2.485
12	Maharashtra	741	14	4	605	12	9	706	16.12	6	853	19	7	1379	26.2	3.03
13	Manipur	25975	45	14	29975++	47	14	25975	49.1	17	4620	49	17	1833	57	19.95
14	Mizoram	488	1	NEG	547	1	--	550	1.38	--	650	1	NEG	750	2	--
15	Meghalaya	843	1	NEG	852	1	NEG	135	1.67	1	960	1	NEG	236	1	0.29
16	Nagaland	466	1	NEG	538	NEG	--	612	0.6	1	652	0.32	NEG	688	0.25	0.02
17	Orissa	2442	6	2	1966	7	4	487	5.6	1	807	5	NEG	1035	5	1.75
18	Punjab	125	3	--	128	3	1	620	3	1	628	2.6	NEG	628	0.18	--
19	Rajasthan	1139	1	NEG	1065	1	--	134	0.33	--	143	0.38	NEG	128	0.3	--
20	Sikkim	12	NEG	--	17	NEG	--	24	--	--	18	--	--	78	--	--
21	Tamilnadu	15188	925	278	12877	774	232	9491	601	180	9983	616	185	10953	672	202
22	Tripura	665	1	NEG	907	3	1	656	2.46	--	706	3.7	NEG	675	4	0.92
23	Uttar Pradesh	2270	33	--	4585	34	8	5665	40.5	14	6429	31	11	7378	17	13
24	West Bengal	20774	1092	437	21326	1158	464	21358	1254	502	21565	1118	444	21619	1152	461
	Total	**286496**	**12884**	**4022**	**280651**	**12594**	**4000**	**282244**	**14048.16**	**4215**	**270069**	**14260**	**4250**	**227151**	**13944**	**4153**

Source: SS

Annexure-A-2 – Statistics of Silk Production in South India

a. Raw Silk

b. Silk Waste

c. Total

						M.Tonne	Avg. of 5 Yrs	% to India
		95-96	96-97	97-98	98-99	99-2000		
Andhra Pradesh	a.	2361	2444	2696	3835	3757	3019	22.16
	b.	519	725	674	1034	958	782	18.94
	c.	2880	3169	3370	4869	4715	3801	21.41
Karnataka	a.	8264	8327	9326	8944	8121	8587	63.05
	b.	2727	2495	2771	2504	2436	2587	72.12
	c.	10991	10822	12007	11448	10557	11174	62.96
Kerala	a.	5	3	3	2.0	2.48	15.48	0.1
	b.	--	1	1	0.6	0.808	3.41	--
	c.	5	4	4	2.06	3.288	0.7	--

Tamilnadu	a.	925	774	601	616	672	718	5.27
	b.	278	232	180	185	202	215	5.10
	c.	1203	1006	781	801	874	933	5.25
Total of 4 States	a.	11555	11548	12536	13397	14988	12805	94.02
	b.	3524	3453	3626	3724	3597	3587	86.89
	c.	15079	15001	16162	17121	18586	16392	92.37
Total for India	a.	12884	12954	14048	14260	13944	13618	
	b.	4022	4000	4215	4250	4153	4128	
	c.	16906	16954	18263	18510	18097	17746	

Annexure-B – Non-Mulberry Silk Production in India (next page)

Raw Silk & Silk Waste: Tonnes

State	1995-96		1996-97		1997-98		1998-99		1999-2000	
	Raw silk	Silk waste	Raw silk	Silk waste	Raw silk	Silk waste	Raw silk	Silk waste	Raw silk	Silk waste
TASAR										
Andhra Pradesh	3	1	3	1	1.80	0.63	1.00	0.22	1.00	0.20
Assam	--	--	NEG	NEG	NEG	--	NEG	NEG	NEG	--
Arunachal Pradesh	NEG	--	NEG	--	NEG	NEG	NEG	NEG	--	--
Bihar	128	18	135	27	144.00	22.00	120.00	16.00	95.00	19.20
Himachal Pradesh	--	--	--	--	--	--	NEG	NEG	--	--
Madhya Pradesh	15	6	33	13	96.73	38.69	68.00	27.00	79.00	31.62
Jammu & Kashmir	--	-	--	--	--	--	--	--	--	--
Maharasthra	1	1	NEG	NEG	NEG	--	0.19	NEG	0.99	0.27
Mizoram	NEG	--	--	--	--	--	--	--	--	--
Manipur	2	NEG	1	NEG	2.00	0.30	0.68	0.02	1.00	NEG
Nagaland	NEG	--	NEG	NEG	0.05	--	0.12	NEG	0.13	--
Orissa	26	5	43	8	47.40	7.11	33.27	6.00	17.42	2.60
Uttar Pradesh	2	NEG	2	NEG	2.50	0.38	2.74	NEG	2.00	--
West Bengal	17	8	17	9	18.00	9.00	16.00	8.00	14.00	7.00

Total	194	39	235	58	312.48	78.11	242.00	57.24	211	61.19
ERI										
Assam	418	112	439	88	406.61	73.00	493.00	94.00	467.00	70.00
Arunachal Pradesh	10	--	10	2	12.08	2.48	12.00	2.50	5.00	1.00
Bihar	24	3	24	3	30.00	4.50	22.00	4.50	20.00	4.00
Manipur	140	19	169	19	170.00	19.00	178.00	8.50	179.00	7.75
Mizoram	NEG	--	1	--	3.69	0.55	NEG	NEG	--	--
Meghalaya	130	--	194	39	159.96	23.99	234.00	47.00	265.00	53.00
Nagaland	18	1	23	3	24.40	2.93	24.62	3.10	28.22	3.00
Orissa	1	--	1	NEG	3.00	0.45	0.50	NEG	1.00	NEG
West Bengal	4	NEG	3	NEG	4.00	--	6.00	1.00	9.00	7.00
Total	745	135	864	154	813.74	126.90	970.12	160.60	974	146
MUGA										
Assam	86	34	72	35	59.56	31.10	70.00	35.00	82.00	41.00
Arunachal Pradesh	NEG	--	NEG	NEG	0.16	NEG	0.17	NEG	NEG	--
Mizoram	NEG	--	NEG	NEG	--	--	NEG	NEG	NEG	NEG
Meghalaya	NEG	--	1	NEG	1.52	0.76	1.76	NEG	2.40	NEG
Nagaland	NEG	NEG	NEG	NEG	--	--	NEG	NEG	0.02	NEG

West Bengal	NEG	--	NEG	NEG	0.09	--	0.13	NEG	0.13	NEG
Manipur	NEG	--	NEG	NEG	0.20	--	NEG	NEG	0.18	NEG
Total	86	34	73	35	61.53	31.86	72.06	35.00	85	41.00

(-) Nil Source: SS

Annexure-C – Progress of Indian Sericulture/Silk Industry at a Glance

Sl.No.	Particulars	Unit	1999-2000
1.	***MULBERRY SECTOR***		
a)	Mulberry acreage	Hectares	227151
b)	Production of:		
i.	Silkworm egg/layings	Lakh Nos	3309.80
ii.	Reeling cocoons	Tonnes	124531
iii.	Raw silk	Tonnes	13944
iv.	Silk waste	Tonnes	4153
2.	***NON-MULBERRY SECTOR***		
i.	Production of:	Tonnes	211
ii.	Tassar raw silk	Tonnes	974
iii.	Eri raw silk	Tonnes	85
iv.	Muga raw silk	Tonnes	248
3.	Non-mulberry silk waste		
i.	**PRODUCTION OF**	Tonnes	505

ii.	Spun silk yarn	Tonnes	224
4.	Noil yarn	Tonnes	6936 (P)
	IMPORT OF RAW SILK		
	Quantity	Lakhs Rs.	41984.83
5.	Value		
	EXPORTS OF SILK GOODS & SILK WASTE		
	Certified silk goods	Lakh Sq.mt.	405.03
	Quantity	Lakhs Rs.	123952.85
	Value		
	Silk waste	Lakh Kgs	20.98
	Quantity	Lakh Rs.	3646.96
6.	Value	Lakh Rs.	150178
7.			
	FOREIGN EXCHANGE EARNINGS @	Numbers	25785
	SILK REELING CAPACITY		34794
8.	Filature/cottage basins		
	Charaka	Numbers	38728
	INSTALLED/LICENCED SPINNING		

	CAPACITY		3930
9.a.	**(Spindleage) +**	Numbers	227701
b.	Spun silk yarn	Numbers	29340
10.	Noil yarn	Lakh Nos	63.64$
	NUMBER OF HANDLOOMS*		
	NUMBER OF POWERLOOMS*		
	EMPLOYMENT		

@ includes DEPB, 100% EOU Exports (P) Provisional

* Refers to Handloom & Powerloom census 1987-88

$ Anticipated

+ = Data from 1997-98 onwards refers to existing mills only

######

Statistical section

Annexure-D: Annual requirement of Bamboos for Sericulture

Equipment in four Southern States

Sl. No.	Product	Bamboos tonne	Nos Million	Manpower milli.mandays	Total value of product Rs.million	Wages earned Rs.million	Remarks
1.	Baskets	1469	0.334060	0.385	26.72	19.25	
2.	Mats	1284	0.77896	0.1558	19.47	7.79	
3.	Rearing trays	36,746	11.1354	5.567	556.77	278.35	
4.	Mountages	1,20,571	10.439	6.959	2087.8	347.965	
5.	Cocoon storage tray	36,686	16.673	6.668	250.1	266.72	
6.	Sticks in rearing stand	11,135	11.1353	0.167	44.54	8.351	
7.	Steam stiffing baskets	45	0.004352	0.00542	0.65	0.271	
8.	Chawki sticks	348	1.043	0.01044	1.04	5.219	
	Total	2,08,224		19.912	2987.09	933.916	
		Or Say 2,00,000 tonne					

Note: Chopsticks used are negligeable quantity and hence ignored.

Annexure-E: Circlewise Allotments of targets for CSS NTFP

I – Bamboo, II – Cane

III-Mixed, IV-Mixed Medicines

Sl.No.	Name of Circle	Area ha															
		Year 1997-98				Year 1998-99				Year 1999-2000				Grand Total			
		I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
1.	Bangalore	--	--	60	-	--	--	20	20	--	--	--	20	--	--	80	40
2.	Belgaum	20	--	--	15	--	20	--	20	--	--	53	20	20	20	53	55
3.	Mysore	--	--	40	--	--	--	40	--	--	--	20	20	--	--	100	--
4.	Hassan	20	--	40	--	--	--	40	20	--	--	20	--	20	--	100	20
5.	Kodagu	--	80	40	--	--	40	40	20	--	--	40	20	--	120	120	40

6.	Canara	--	--	35	--	20	--	--	--	40	--	20	20	60	--	55	20
7.	Shimoga	--	--	20	20	20	--	33	--	--	--	--	--	20	--	53	20
8.	Gulbarga	--	--	20	--	--	--	20	--					--	--	40	--
9.	Bellary	--	--	60	20	--	--	40	--					--	--	100	20
10.	FUO	--	--	--	5	--	--	--	--	--	--	--	20	--	--	--	25
	Total	75	80	335	60	40	60	233	80	40	--	153	120	120	140	721	260

Annexure-F: Consolidated progress report for the State for physical and financial achievements

Area in ha
Amt. in Rs.Lakhs

A – advance work area
B – creation
C – Maintenance
D – Maint. of older areas
T – Target
A – Achievement

	Year	1997-98					1998-99					1999-2000		
		T	A	T	A		T	A	T	A	T	A		
	A	40	40	1.4	1.4	A	--	--	1.2	1.2	40	20	0.640	0.320
I	B	36	36			B	40	40			40	40	0.400	0.400
	C	--	--			C	36	36			36	36	0.360	0.360
	A	45	45			A	345	345			345	348	10.00	10.080
II	B	29	29	1.76	1.76	B	45	45	8.67	8.67	45	45	0.41	0.41
	C	--	--			C	29	29			29	29	0.27	0.27
	A	256	256	26.68	25.262	A	381	381	28.61	28.61	153	157.5	7.34	7.56

III	B	97	97			B	256	256			381	381.0	13.92	13.92
	C	500	500			C	--	--			256	256.0	2.37	2.37
	D	390	390			D	97	97			97	97.0	0.9	0.9
	A	20	20			A	20	20	0.56	0.56	120	105	9.0	7.74
IV	B	10	10	1.73	1.73	B	--	--			20	20	0.46	0.46
						C	10	10			20	20	0.18	0.18
											10	10	0.09	0.09
											1592	1564.5	46.34	45.060
		353	353	26.68	25.262	D	390	390	5.33	5.33				
		+890	890			D	1259	1259	39.04	39.04	1592			
V to XI			276	276	10.09	5.53		1640	1640	54.66	53.879		1592	1564.5	

Annexure-G List of Manufacturers, Cooperative Societies & Traders in Bamboo and their Products

Sl. No.	District	Place	Name of Firm & Address	No. of members
A.	**KARNATAKA STATE**			
1.	Shimoga	Handenalli	Sri Mylaralingaeswara Medar Sangha	158
2.	"	Gopala	Sri Guruketeswara Medar Sangha	109
3.	"	Shimoga	Bamboo & Cane Craft Society	238
4.	"	Shimoga	Medar Workers Selfhelp Society	85
5.	"	Sagara	Medar Girijananga Society	108
6.	"	Bhadravathi	Sri Kukkudeshwari Medar & Cane Workers Society	19
7.	"	Shimoga	Medar Shramajeevigala Sangha	85
8.	"	Kagadi	Sri Manjunatha Bidirudabbe Sangha	54
9.	"	Shimoga	Manjula Bamboo Industry H. Siddaiah Road, Shimoga.	N.A.
10.	"	"	Deepak Bamboo Industry	N.A.

			S.S. Baramappa Nagar, Shimoga.	
11.	“	“	Muneshwara Bamboo Industry Santosh Nilaya, Jail Road, Shimoga.	
12.	Bellary	Kottur	Kottureshwara Medar Sangha	218
13.	“	Bellary	M.P. Krishnappa	175
14.	“	“	Bamboo Workers Association	140
15.	Davanagere	Davanagere	Shivasarana Medar Kethane Society	306
16.	Chitradurga	Challakere	Chitradurga Koracha Community Sangha	96
17.	“	Chitradurga	Akhila Karnataka Medar Ketavara Sangha	99
18.	“	Chellakere	Bamboo & Cane Craft Society	76
19.	“	Hosadurga	Kulkkuvadeshwari Bamboo Workers Sangha	125
20.	Bangalore	Bangalore	B.R. Ambedkar Korama & Medar Society	115
21.	“	“	City Parvatipuram Medar Society	151
22.	“	“	Chowdeshwari Medar Workers Society	100
23.	“	“	Maruti Medar Bamboo Workers Sangha, Padarayanapura	100
24.	“	“	Renukamba Bamboo Workers Society	110
25.	“	“	Yuva Medar Workers Society	110
26.	“	“	Rajarajeshwari Korma and Medar Society	120

27.	“	“	Mahalakshmi Koracha Medara Sangha	850
28.	“	“	Sri Annapoorneshwari Medar Sangha	150
29.	“	“	Sri Malaswamy Sangha	100
30.	“	“	Karnataka State Meda Girijana Kshemabhivridhi Sangha, B’lore-2.	
31.	“	“	K. Murthy, S/o. K. Velam, C/o. V. Tanimalai, No.17, Motappapalya, Bangalore-38.	
32.	“	“	Soundar Raju – 438, 1st Main Road, 7th Cross, Prakashnagar, B’lore-21.	

Sl. No.	**District**	**Place**	**Name of Firm & Address**	**No. of members**
33.	“	“	R. Narayan, S/o. Raju – 432, 4th Cross, Ulsoor, Bangalore-8.	
34.	“	Channapatna	Medar & Bamboo Handicraft Society	230
35.	“	Ramanagaram	Sri Rama Medar Bidurina Sangha	207

36.	"	Vijayapura	Chowdeshwari Medar Bamboo Cane Handicraft Society	150
37.	"	Devanahalli	T.C.Gopal, Tatte – Chandrike Manufacturer Mandibele Road, Vijayapura – 562 135.	
38.	"	"	T.C. Nagaraj, Tatte – Chandrike Suppliers, No.5, Mandibele Road, Vijayapura.	
39.	"	"	T.C. Ashwath, Tatte – Chandrike Suppliers, Mandibele Road, Vijayapura – 562 135.	
40.	"	Kanakpura	Mantuswamy Bamboo & Cane Craftsmen Society, Lakshmipura, Kanakpura.	N.A.
41.	"	"	Sri Bhairaveshwara Bamboo Workers Welfare Association, Boodikeri Road, Kanakpura.	N.A.
42.	Mysore	Bannur	Siddeshwara Bamboo Cottage Industries Labour Society	100

43. "	Mysore	Manjunatheshwara Medar Sangha	120
44. Hassan	Hassan	Sri Ranganath Medar Society	70
45. Kolar	Kolar	Sri Shivaparvati Medar Welfare Sangha	250
46. "	Bangarpet	Sri Koracha & Korama Khadi Sangha	275
47. "	Kolar	Sri Lakshminarasimha Medar Sangha	186
48. Tumkur	Ediyuru	Sri Muneshwara Medar Bamboo Craft Kshemabhivridhi Sangha	200
49. "	Tumkur	T.C. Natarajan – Door No.9, Kotekolhapur Temple Road, Agrahara, Tumkur.	
50. "	"	G.R. Srinivas – Bamboo Chandrike Manufacturer, Maruti Extension, Tumkur.	
51. Bellary	Bellary	Ballari Koracha Rural Association	N.A.
52. "	"	Medar Bamboo Workers Association	N.A.
53. "	Darura	Darura Koracha Handicraft Association	N.A.
54. "	Bellary	Sri Gourishankar Medar Handicraft Workers Society	200
55. Bidar	Aurad	Bandarkunte Kottegala Selfhelp Group	N.A.
56. "	Bidar	Hokanna & Bidar Selfhelp Group	N.A.

57.	"	Humnabad	Humnabad Bamboo Basket Makers Society	N.A.

Note: - Many societies of the list above have been allotted from a minimum of 2000 bamboos to a maximum of 1,48,580 bamboos from the forest deptt. in Karnataka during 1998-99, with an average of 20,000 bamboos.

Sl. No.	District	Place	Name of Firm & Address	No. of members
			Basavanahalli	
58.	Kodagu	Somvarpet	Bamboo Workers Coop Society	40
59.	"	- Do – Individuals	B.Y. Krishna	5
60.	"	"	Pushpa	4
61.	"	"	R. Chinnaswamy	5
62.	"	"	Venkatappa	4
63.	"	"	B.D. Nagaraj	5
64.	"	"	Rajamma	3
65.	"	"	Dhanraj	2
66.	"	"	Kalamma	6
67.	"	"	N.R. Mani	4
68.	"	"	Tulasiraj	2
69.	"	"	Yashodamma	3

70.	“	“	B.D. Nataraj	3
71.	“	“	Munamma	1
72.	“	“	Chandrashekar	2
73.	“	“	Krishnappa	6
74.	“	“	Vasundhara	3
75.	“	“	Shivaram	2
76.	“	“	Lata	1
77.	“	“	Krishnaprasad	4
78.	Chikmagalur	Tarikere	V.V. Raju – Bamboo Merchant Kodi Camp, Tarikere.	
79.	“	“	P. Ganesh, 8th Cross, Lingadahalli Road, Kodi Camp, Tarikere.	
80.	“	“	C.S. Kumaraswamy – Chandrike Manufacturers, Maruti Extension, Tarikere.	

81.	Kolar	Siddlaghatta	N. Venkataramanappa, H.Cross, Chintamani Road, Siddlaghatta.	
82.	"	"	T. Sriramulu, H.Cross, Chintamani Road, Siddlaghatta Taluk.	
83.	Mandya	Maddur	Sri Govindaraju, Venkateshwara Bamboo Workers Society, Near Old Bus Stand, Maddur – 571 428.	
84.	"	"	Gafarbeg S/o. Hyderbeg Bamboo Chandrike Manfacturer, Maddur.	
85.	"	"	a) Giriyappa, Bamboo Tatte – Chandrike Suppliers, Shivapura, Maddur. b) Om Shivashakti Bamboo Work Unit, Shivapura.	

Sl. No.	**District**	**Place**	**Name of Firm & Address**	**No. of members**

86.	Mandya	Malavalli	a) S.C & S.T Development Society, Koonanppaddur, Malavalli.
87.	Kolar	Chikballapur	S.N. Manjunath, S/o. Narayanappa Tammanayakanahalli, P.O. Jatwar.
88.	"	"	S. Srinivas – Peresandra P.O. Chikkaballapura Taluk.
89.	"	"	S. Raghuram – Peresendra P.O. Chikkaballapura Taluk.
90.	Tumkur	Sira	S. Ramanna – Sri Manjunatha Bamboo Shop, N.H.4, Sira – 572 137.
91.	"	"	R. Narasimha Murthy, Sri Gajanana Bamboo Shop, N.H.4, Sira.

B. TAMILNADU

92.	Dharmapuri	Pennagaram	Pennagaram Bamboo Weavers' Coop Society, Pennagaram.	200 members
93.	"	Denkanikota	Denkanikota Bamboo Basket Makers Industrial Coop Society, Denkanikota - 110 members.	110 members
94.	"	Periakadamadan	M. Doraiswamy S/o. Madappa Goundar	8
95.	"	Narsapur	Nagaraj S/o. Muniyappagonda	3
96.	"	Pudalapatti	V. Palani S/o. Vyapuri	5
97.	"	"	Manikkam S/o. Palani	4
98.	"	Pennagaram	G. Rajendran	6

99.	"	"	Venkatesan	3
100.	"	"	Raja	3
101.	"	Denkanikota	Rajanna S/o. Sundararajan	4
102.	"	"	Govindarajan S/o. Ramaswamy	5
103.	"	"	Anandan S/o. Natarajan	3
104.	"	"	Mariappa S/o. Ponnaiah	2

C. ANDHRA PRADESH

105.	Anantapur	Anantapur	Bamboo Basket Makers Industrial Coop Society - 85 members.	85
106.	"	Goruntla	Lakshmi Venkateswara Coop Society	N.A.
107	"	Kurgunta	Sunkanna	6
108.	"	Bethalapalli	Shankar	4
109.	"	"	Subbanaidu	4
110.	"	"	Sri Venkateshwara Bamboo	N.A.

			Weavers Coop Society, Bettalapalli.	
111.	“	“	Village & Children DWCRA Group, Bukkapatnam.	
112.	“	Dharmavaram	Dharmavaram Bamboo Weavers’ Society, Dharmavaram – 65 members.	65
113.	“	“	Saisankar	5
114.	“	Penukonda	T.M. Kirankumar	5
115.	“	Hindupur	Hindupur Medar Cooperative Society.	N.A.
116.	“	“	Sankar	5
117.	“	Goruntala	Laxmi Venkateshwara Coop Society.	N.A.
118.	Chittoor	Madanapalli	Madanapalli Bamboo Coop Society.	N.A.
119.	“	Madanapalli	Lakshmi Bamboo Equipment	N.A.

			Making Coop Society, Madanapalli.	
120.	"	"	Sairam	4
121.	"	Kuppam	Adarsha Mahila Bamboo Equipment Making Society, Gundisettypalli, Kuppam.	N.A.
122.	"	Punganur	Sri Ayyappaswamy Bamboo Workers Indl. Coop Society, Pungapur.	N.A.
123.	Nellore	Atmakur	Sri Venkateshwara Mahendra Bamboo Indl. Coop Society,	
124.	Kurnool	"	Atmakur Women Welfare (sericulture) Coop Society, Atmakur.	15
125.	"	"	The Nandikettur Women Welfare Coop Society, Nandikettur.	
126.	"	Mahboobnagar	Mahendra Bamboo workers Indl. Coop Soc.	60

Annexure-H - Abstract of Field Data of Farmers

Ha = 2.5 acres

Sl. No.	District	No. of Farmers sampled	Area ha	Total cocoon produced			No. of Mountages per ha	No. of Trays Per ha	Number of Leaf baskets Used per ha	Remarks
				Av.no. of /ha	Kg.	Av.kg per ha				
1.	Kolar	10	21.2	8.4	48,285	2277	1412	1044	253	
2.	Chamarajnagar	3	1.6	5.0	1,125	703	547	390	75	
3.	Mysore	8	6.7	5.0	3,576	534	NA	229	NA	
4.	Tumkur	47	60.8	7.0	71,389	1170	602	1110		Av. holding for 315 farmers is 0.51 ha
	Medak	6	2.3	5.5		510	62	150	NA	Borrowed & Hired also
	Karimnagar	4	1.6	5		620	125	150	NA	
	Warangal	5	0.7	5		540	150	110	NA	

	Mahboobnagar	1	0.4	5.4		630	150	125	“	
	Nizamabad	1	1.2	5		NA	20	15	“	
	Dharmapuri	4	2.0	6		466	177	215	“	
	Total	89	98.5	5.8		830	361	354	130	

Photographs

Photo 1: Leaf basket

Photo 2: Rearing tray

Photo 3: Feeding on mulberry leaves

Photo 4: Stored bamboo mountages

Photo 5: Rear of mountage

Photo 6: Cocoons in mountage

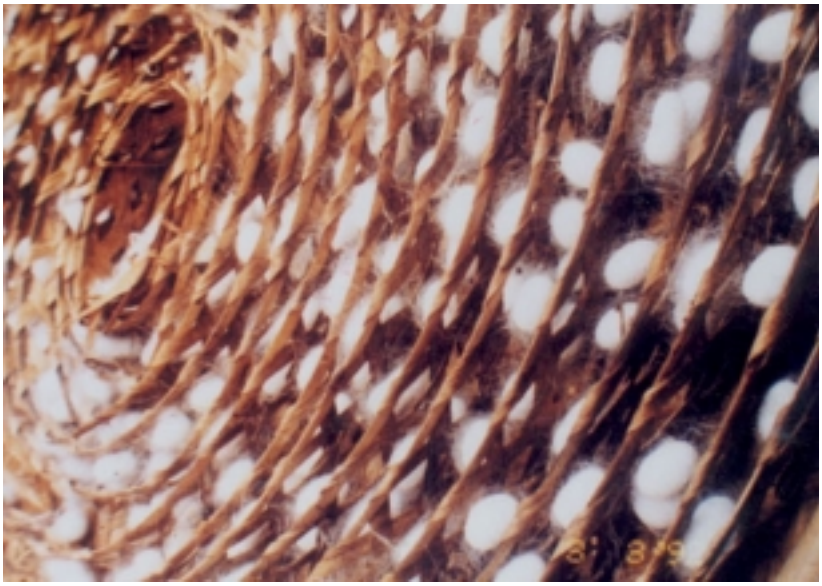

Photo 7: Mature larvae transferred to mountage

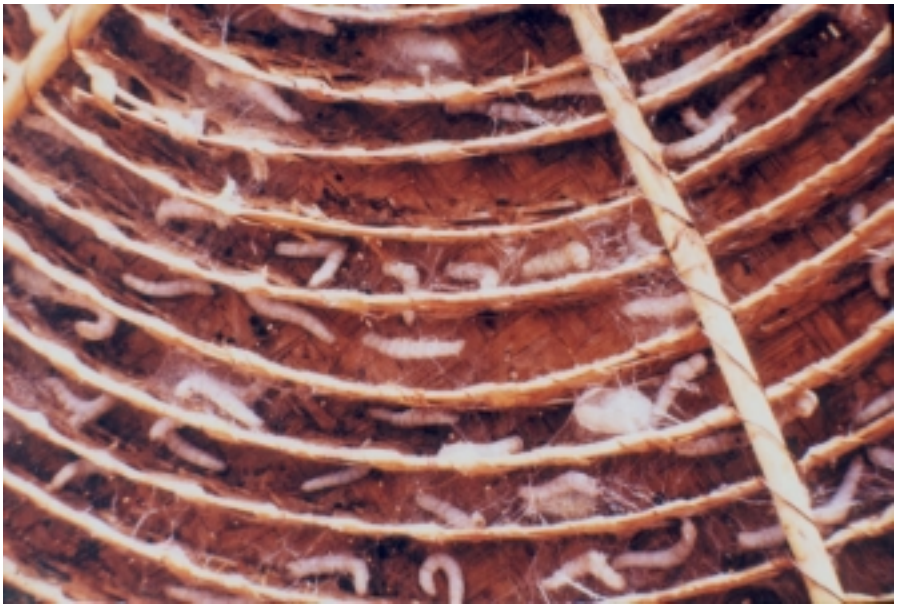

Photo 8: Transporting mountages

Photo 9: Rearing stand

Photo 10: Stifling baskets

Photo 11: Mountage maker 1

Photo 12: Mountage maker 2