

CHAPTER - I

INTRODUCTION

Introduction

Silk is associated with mankind since 5000 years back. Although share of silk among world production of textile fibres is just 0.15%, it is appreciated for its unique qualities of texture so soft and smooth lustre, shine, graceful and sensuous, and elegance that place silk as the queen of textiles. The history of Indian silk is traced back to 1500 BC, as evidenced from the oldest known writing on silk in the epic Ramayana. India has the unique distinction of producing all the five varieties of silks of commerce viz. mulberry, oak tasar, tropical tasar, eri and muga (figure 1). India is the second largest producer of both the mulberry and tasar varieties of silk in the world with a share of 18% and 10% of the total respectively, while the golden yellow muga silk is produced only in India (Benchamin and Giridhar, 2005).

Table 1 World production of mulberry raw silk 1938 – 2003 (in tons)

Producer	1938	1978	1986	1997	2000	2003
Total of which	54675	45125	62460	79590	71163	117000
China	4855	19000	35700	55117	50683	94600
India	690	3475	8280	14048	15714	15472
Brazil	35	1250	1680	2120	1389	1563
Uzbekistan	1900	3240	4020	2000	1100	950
Thailand	NA	NA	NA	1039	955	1500
Japan	431150	15960	8220	1920	557	287
Rep of Korea	NA	NA	1680	146	15	150
Vietnam	NA	NA	NA	834	NA	750

Source: ISA, except for the year 2003 Central Silk Board

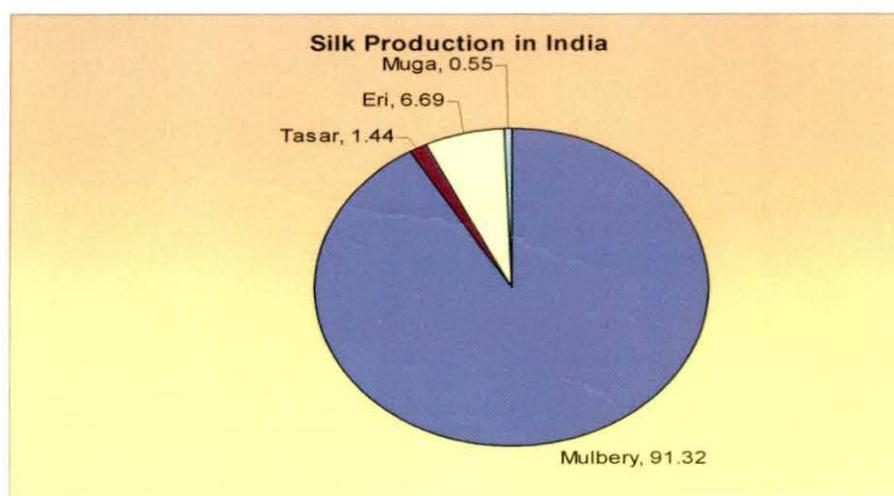


Figure 1 Silk production in India

Sericulture is not only the production of cocoons and silk for income generation, but has become the weft of the cultural fabric of the Asian countries in general and India in particular. Silk has a long tradition with pivotal role in Indian culture. It is a cottage industry spread over 53,184 villages in India, employing 5.8 million people, and it is potential tool for the improvement of economic conditions in rural area, involving the marginal and small farmers. Besides, sericulture has been accepted as a strong instrument of poverty alleviation and generation of rural employment for India, as 70% of the gross population of the country are rural and depend on land-based activities for their livelihood. Sericulture has also been considered as a women-friendly profitable enterprise ensuring the activity for socially deprived 50% women population of rural India. Considering the same, Govt. of India has rightly recognized its importance and included in the 10-point agenda of the common minimum programme of the centre.

The Indian sericulture industry has grown many folds since independence, i.e. from about measure 900 MT in 1950 to the present production level of about 19000 MT in 2007 (Table 2).

Table 2 Raw silk production-India (Unit: MT)

Variety	2003-2004	2004-2005	2005-2006	2006-2007
Mulberry	13,970	14,620	15,445	16,805
Tasar	315	322	308	325
Eri	1352	1448	1442	1515
Muga	105	110	110	115
Total	15,742	16,500	17,305	18,760

Source : Silk prices, *Indian silk*, vol. 46(2), 2007 and vol. 44(5), 2005.

This could be achieved due to the concerted research and development efforts of different institution of Central Silk Board, State owned institutions and different Universities. The breakthroughs made in past towards the evolution and release of improved host plant varieties as well as silkworm breeds together with the cultivation practices and rearing technologies led to the increase in silk production of better quality and sericulture could establish itself as the most remunerative enterprise. The technology and skill, which are within the reach of rural community, enables better and quick returns comparable to other cash crops besides frequent returns at regular intervals. All the four sectors of silk industry namely, egg production, silkworm rearing for cocoon production,

silk reeling and weaving, printing and dyeing have been well established with modern technologies and other support services.

A very interesting development in the recent years is that of diversification of employment structure from agriculture to services in some parts of the country. In most of the agriculturally developed states, the share of agriculture in total employment is gradually declining. The employment in the manufacturing industries in organized sector is practically stagnant due to modernization and technological developments and increased capital investments. The service sector-trade, financial, community and personal services is, of course, recording a good growth as well as increase in employment, but here again, the imperative need to improve efficiency and productivity requires that more and better services be rendered by a much smaller increase in employment than in the earlier years.

By carrying industries to the countryside large-scale rural out-migration can be avoided. Sericulture based rural industrialization could stop skill drain from the countryside if sufficiently lucrative alternatives for employment are provided. These could be not only in the form of workers but also as owner-manager. Rural investible surplus could be absorbed directly in local income generation processes. Development and growth in agriculture has brought prosperity and wealth to rural people that should be utilized for creating climate conducive for setting up more sericulture based rural enterprises for meeting local needs.

This will also have a significant spin-off for agricultural development. By creating of better rural infrastructure, it could raise agricultural productivity through provision of better roads, canals, storage facilities, commerce, transport and communication facilities, etc. There would be increased availability and improved capacity for maintenance, repair and improvement of farm machinery. Further, this would also help in reduction of regional disparities through location of such units in backward areas. It would thus help in generation of new employment opportunities, creation of new skills and open up space for rural entrepreneurship.

United States of America (US Market) is the biggest importing and consuming country for silk and silk products in the world. The European consumers (EU market) are

more respective to silk, silk products, and are most attracted towards fashionable high priced products (figure 2).

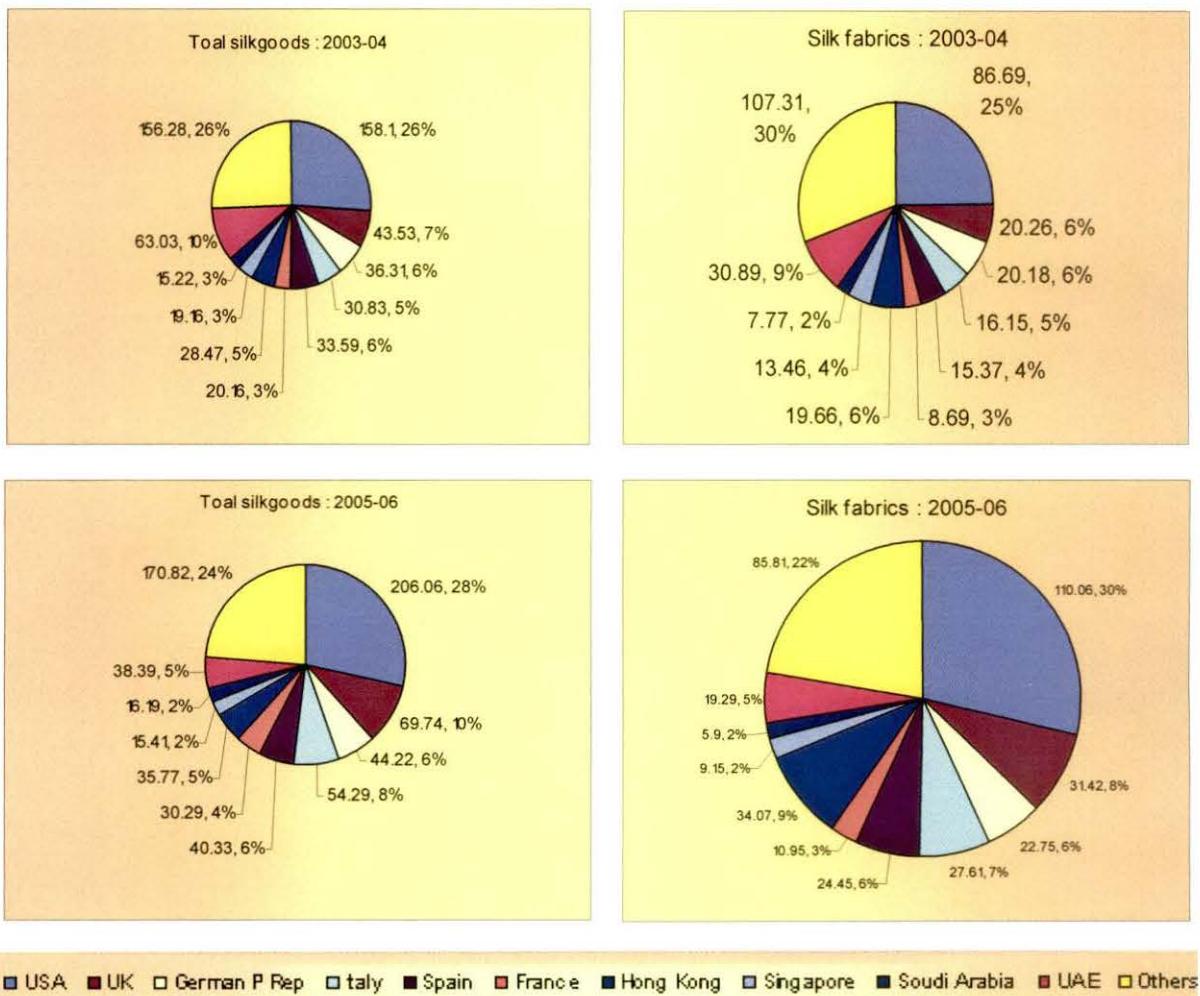


Figure 2 Country wise share of silk export from India (Mn US\$ and %)

China and India remained the dominant producers of silk, together contributing more than 80% of the world raw silk. New countries like Brazil and Thailand though small are fast emerging as major silk suppliers to the world leading to increased competition.

There are new challenges amongst silk producing countries Market access has become more liberal and consequently, the competition is becoming tougher This is already happening in India *vis a vis* China. There is going to be more competition from other textiles competing with silk This is going to happen in several Asian silk producing countries where local consumers are targeted by this external competition.

In export markets, the situation is also going to change whilst the quotas were in place, silk products were generally given preferential status, but from 112005, the competition is tougher since the quotas are no more a limiting factor for other textiles. It is still a little early to estimate how the producing countries are reacting to the new trading situation.

One of the positive features in the silk trade is unlike the other textile fibres, there has always been a long tradition of using silk in all Asian silk producing countries India is consuming about 85% of the country's silk production and in some other countries, such as China and Vietnam, where silk consumption temporarily decreased; one can expect a strong increase in silk consumption when the purchase power of local consumers continues to grow. As is usual in export trade, one can only note that a strong local market will support the country's export efforts in a healthy way.

However, it may be assumed that silk will remain a special luxury fiber, which will continue to attract consumers in various parts of the world Since there will be more competition in general, it is very important that silk will be offered to consumers in new forms, such as interesting blends with other exciting fibers Since the total production of silk is only about 120000 tons or less than 02% of total production of textiles fibers, it would seem to make sense to use this unique fiber only for high quality products in order to give the fiber the merit, it deserves. In the context, the Indian non-mulberry silk may play a very crucial role.

“Wild silk” or “Non-mulberry silk” includes that fiber spun by various species of silk spinning insect, belonging to the Saturniidae, Lasiocampidae, Thaumetopoeidae, Psychidae families and others Among these, many species from the Saturniidae produce a large size cocoon which is made by porous cocoon filaments and is different from *Bombyx* silk The porous raw silks have a more complicated high shining than the *Bombyx* silk. Moreover, the porous cocoon filaments inhibit UV transmissivity by their repeated reflections in the textiles Also the fabrics woven by the porous silks are soft against the skin and are favoured by the consumers. On the other hand, sericin solution and powders from the wild cocoons or silks are used in cosmetics and are highly appreciated by users. For these reasons, wild silks are now recognized as a new material and have a high additional value which is activating the silk industry.

Raw silk produced by *Bombyx* is the most popular textile material for high class fabrics and its uniqueness is highly praised, especially its special sheen. However, the silks of *A. yamama* and *A. assama* are even more shiny than that of *B. mori*. The reasons probably because the wild silks have fine porous structure in the filament In a compact cocoon filament like that of *B mori*, the incident rays pass straight through the filament while in the porous filament, fine porous structures create repeated reflections, hence, a more complex shine Commercially, porous silk is highly valued because of its sheen, soft feel and the retention of desired warmth and comfort in the fabric (Akai, 2005).

This family makes a large cocoon which sells for a high price characteristics of the cocoon or the cocoon filament mainly its natural cocoon colour and porous filaments or thick and fine size are greatly appreciated by users The cocoons of *Antheraea yamamai* are beautiful (green in colour) and extremely high priced The *Antheraea pernyi* cocoon and silk are produced in great quantities in China and are used widely The *Samia cynthia ricini* cocoon is produced in India and other Asian countries and the filament is characterized by its porosity and fine size while the *Antheraea mylitta* cocoon is largest in size and filament *Antheraea assama* produces a golden coloured raw silk, which is well known only, restricted to India, more preciously North-East India and northern West Bengal, and holds a high Price (table 3).

Table 3 Silk price in India

Variety	Price (Rs/kg)			
	2004	2005	2006	2007
Mulberry silk	1053	1094	1343	1248
Taser silk	1450	1468	1575	1575
Eri silk	1100	1000	1000	1200
Muga silk	3150	2950	2950	3150

Source : Silk price, *Indian silk*, vol. 46(2) : 2007, 45(2) : 2006, 44(6) : 2005

While mulberry silk is found in different parts of India, the North-Eastern Region of India including northern part of West Bengal is the only breeding ground of muga. Muga, famously known as “Golden silk”, is exotic and comes in two colours – golden yellow and creamy white. However, the golden yellow is the desire of all its natural sheen is such that it is used for embroidery instead of zari. The attraction of its natural bright colour is such that it is rarely dyed and the sheen increases with every wash Also

muga filters 80-88% of the ultra violet rays. Muga silk is produced by a variety of silkworm, *Antheraea assama*. In muga silkworm rearing, the worms feed on som and soalu leaves that are aromatic and rearing is done on trees. The leaves that worms feed upon, determine the colour of silk. The region accounts for 6% of India's total silk production of which 100% from muga.

Sericulture activities occupies thousands of hectors of land, engaging millions families in North Eastern States and northern West Bengal. In Assam, Handloom is the second largest employer after agriculture. This region has a large pool of workforce in mugaculture and includes part-timer like housewives. The sector, besides being the primary employer of many, also augments the income of thousands of families.

During 2002-03, India imported 9054 MT of raw silk valuing USD 13374 million. This is indicative of the huge shortfall of India's production, particularly of fine silk and the North Eastern states of India and northern part of West Bengal has the potential to fill the gap

However, there are major constraints. Firstly, the industry of the region has traditionally produced for markets within the region and has no knowledge of the market needs elsewhere. Although the products range from low end to high end, this primarily caters to regional tastes. The confined markets of the region cannot provide scope for growth of the industry. Therefore, there is an urgent need to identify and target new markets and develop products to cater to these markets.

Secondly, although the region is the exclusive producer of muga, this advantage is negated by the prohibitive cost of muga. Therefore, it is imperative that a niche market be created for muga. In addition, combination with other fibres should be experimented upon. Muga is now being combined with eri and pashmina. Waste muga is being combined with eri to create thicker yardage and furnishing material. Another experiment being carried out is combining muga and mulberry silk with lycra and spandex to provide off the loom stretchiness and the resultant fabric is suitable for blouses and tops in formal western wear. The export promotion council for handicrafts has also developed designs with cotton or some other fabrics as the base and silk being the value adder such innovating design has created a niche market for itself.

Table 4 Production statistic for the year 2004-2005 in muga silkworm

States	Dfl (Lk Nos.)	Reeling Cocoon (MT)	Raw Silk (MT)
West Bengal	0.48	11.64	0.20
Assam	98	4918	104.00
Arunachal Pradesh	0.05	4.42	0.10
Manipur	1.23	2.18	0.10
Mizoram	0.4	5	0.10
Meghalaya	5.08	254	5.40
Nagaland	0.2	2.1	Nil
Uttaranchal	0.01	0.25	Negligible
Grand Total	105.45	5197.59	110

Source : *Indian silk*, September, 2005, Page 30.

Thirdly, the muga silk contributes very little to India's silk production (Table 4). Emphasis, therefore, must be put on increasing production, particularly in terms of productivity, as land becomes scarce and on the other hand, exploration of non-traditional area for mugaculture under this region is needed.

Finally, the most important matter is that seed production is considered as the backbone of sericulture industry. The concept of quality seed production in mugaculture is lacking in spite of the socio-economic and cultural relevance of muga silk production as an age-old practice. Though the applicability of indigenously developed know how has some positive impact, farmers often suffer crop losses due to pebrine infection or other factors. Since, farmers themselves, without resorting to any prescribed scientific procedure, produced almost all the seeds, they often used to lose their crops or be satisfied with poor harvest. As a result, the muga silk production remained mostly stagnant ranging between 50-70 MT. Demand for muga layings could never be met to shortage of seed. The economic viability of a commercial grainage largely depends on the effective conversion of cocoons to laying the production ratio of muga seed during 1999-2004 is given in table 5.

Table 5 Muga Seed Production Ratio during 1999-2004

Year	Dfls reared (g)	Dfls produced (g)	Ratio (dfl : dfl)
1999-2000	20913	107290	1 : 5
2000-2001	16788	190103	1 : 11
2001-2002	19603	243446	1 : 12
2002-2003	18178	200967	1 : 11
2003-2004	14840	149364	1 : 10

The efficiency of any grainage improves with procurement of quality seed cocoons, proper preservation, and synchronization of emergence and maintenance of proper environmental conditions. Moreover, to overcome the huge gap between present annual requirement and overall commercial seed production. Private graineurs should be developed, though under UNDP assisted programs implemented the states of Assam, Meghalaya and West Bengal during 1999-2003 on mulberry sector some private graineurs were involved in activities (Table 6).

Table 6 Performance of private graineurs under UNDP assisted programme.

Particulars	Assam	Meghalaya	West Bengal
Private graineurs established (No)	57	6	6
Seed cocoon processed (No)	2835472	195345	231860
Dfls produced (g)	773635	74030	58350
Cocoon : Dfl	36 : 1	26 : 1	39 : 1
Income (Rs)	4641810	444180	350100

However, the post project scenario is not very much encouraging as most of the private graineurs lost the track and interest to continue the activity systematically. Hence, it is very important to give sufficient stress until the system became self sustainable. As sufficient plantation and reeling unit have already been developed during last decade, production of quality of eggs is need of the hour.

The present work has rightly being formulated following the objectives mentioned bellow:

- (1) To identify seasonal influence on seed production and hatchability in order to harvest better yield of commercial cocoon crop at desired level.
- (2) To standardize critical / optimum combination of key abiotic factors responsible for production of better quality and productivity of seed with higher hatchability.
- (3) To standardize techniques towards synchronization of male and female moth emergence for production of assured fertilized eggs with higher hatchability.

- (4) To standardized mating behaviour in view to manipulate them in production of quality eggs.
- (5) To characterize the seed cocoons for practical use during commercial crop rearing season.
- (6) To develop seed (eggs) preservation technologies for supply of better quality seed during commercial growing seasons.