CHAPTER 1
INTRODUCTION

Sericulture is production of raw silk through rearing of silkworm and one of the most labour intensive, combining activities of both agriculture and industry. The production process involves a long chain of interdependent, specialized operations which provide a means of livelihood to a large section of the population, i.e., silkworm seed producers, rearers, reelers, twisters, weavers, spinners of silk waste, traders, etc. Silk is the queen of all fabrics historically one of India's most important industries. The Indian Silk industry has shown significant growth both domestically and internationally fuelled by innovations in the field. The Indian silk industry is an integral part of the Indian Textile Industry and one of the largest generators of employment and foreign exchange for the country. It is practiced in about 53,814 villages all over the country. It provides employment to 7.9 million people, most of them being small and marginal farmers or household industry mainly in rural areas. It is considered to be a high income generating industry which is regarded as an important tool for economic development of a country. There are five major types of silk of commercially importance, obtained from different species of silkworms. India has the unique distinction of producing all these varieties of silk. The five varieties of silk may be divided into two broad categories:

1. **Mulberry Silk:** It comes from the silkworm, *Bombyx mori* (Linnaeus) which solely feeds on the leaves of mulberry plant. The bulk of the commercial silk produced in the world comes from this variety. In India, the major mulberry silk producing states are Karnataka, Andhra Pradesh, West Bengal, Tamil Nadu and Jammu & Kashmir which together accounts for 92 % of country's total mulberry raw silk production.

2. Vanya Silk or Non-Mulberry Silk: Following four varieties of silks are fall in this category.

Tropical Tasar Silk: It is generated by the silkworm, *Antheraea mylitta* which mainly thrive on the food plants Asan and Arjun. Tasar is a copperish colour,

coarse silk mainly used for furnishings and interiors. In India, the major tasar silk producing states are Jharkhand, Chattisgarh and Odisha, Maharashtra, West Bengal and Andhra Pradesh.

Temperate Tasar Silk or Oak Tasar Silk: It is a finer variety of tasar generated by the silkworm, *Antheraea proyeli* which feeds on natural food plants of oak. In India, it is mainly produced in the sub-Himalayan belt of India covering the States of Manipur, Himachal Pradesh, Uttar Pradesh, Assam, Meghalaya and Jammu & Kashmir.

Muga Silk: It is a golden yellow colour silk obtained from semi-domesticated multivoltine silkworm, *Antheraea assamensis* (Helfer). These silkworms feed on the leaves of Som and Soalu plants. Muga Silk is the pride of Assam and is an integral part of the tradition and culture of the State.

Eri Silk: It is the product of a domesticated silkworm, *Samia ricini* (Donovan) that feeds mainly on castor and kesseru leaves. It is a multivoltine silk spun from open ended cocoons, unlike other varieties of silk. In India, this culture is practiced mainly by the tribal communities in the North-Eastern States. It is also found in Bihar, West Bengal and Odisha. Ericulture is a household activity practiced mainly for protein rich pupae, a delicacy for the tribal. The silk is used indigenously for preparation of chaddars (wraps) for own use by these tribals.

Geographically, Asia is the main producer of silk in the world and produces over 95 % of the total global output. Even though silk has a small percentage of the global textile market (less than 0.2%), its production base is spread over 60 countries in the world. The major silk producing countries in the world are China, India, Uzbekistan, Brazil, Japan, Republic of Korea, Thailand, Vietnam, DPR Korea, Iran, etc. (Table 1.1). Few other countries *viz.* Kenya, Botswana, Nigeria, Zambia, Zimbabwe, Bangladesh, Colombia, Egypt, Japan, Nepal, Bulgaria, Turkey, Uganda, Malaysia, Romania, Bolivia, etc. are also engaged in the production of cocoons and raw silk in negligible quantities. China is the world's single biggest producer and chief supplier of silk to the world markets. India is ranked as the second major raw silk producer in the

world. It contributes about 18% to the total world raw silk production. Among the varieties of silk produced, mulberry silk accounts for 89.45%, followed by eri, tasar and muga at 8.04%, 1.89% and 0.62%, respectively**.**

Table 1.1: Global Silk Production Scenario 2013-2016 (in MT)

Country	**2013**	**2014**	**2015**	**2016**
China	130000	146000	170000	158400
India	26480	28708	28523	30348
Uzbekistan	980	1100	1200	1256
Thailand	680	692	698	712
Brazil	550	560	600	650
Vietnam	475	420	450	523
North Korea	300	320	350	365
Iran	123	110	120	125
Bangladesh	43	44.5	44	44
Japan	30	30	30	32
Turkey	25	32	30	32
Others	51.1	41.12	27.83	205.45

Source: http://inserco.org

Muga culture in Assam

The muga silkworm is a holometabolus sericigenous insect endemic to North East region of India particularly in Assam. Remarkably, the silkworm is mainly confined in the Brahmaputra valley of Assam (Borthakur, 2003) and some parts of Meghalaya, Manipur, and Arunachal Pradesh. This silkworm produces the unique golden colour silk which is more durable and has high demand in the global market. This silkworm is polyphagous in nature and feeds on a wide range of host plants. The silkworm is a semi domesticated multivoltine insect reared on two primary host plants *viz.* Som (*Persea bombycina)* and Soalu (*Litsea polyantha)* and six crops can be reared in a year. Mainly two crops i.e., *Jethua* (during April-May) and *Kotia* (during October-November) are considered as commercial crops to produce golden yellow muga

silk. Out of the remaining four crops, two crops i.e, *Jarua* (during December-January) and *Aherua* (during May-June) are considered as pre seed crops followed by two main seed crops i.e, *Chatua* (during February-March) and *Bhadia* (during August-September) respectively.

Since time immemorial, the muga culture was being practiced by the rural folk in the Brahmaputra valley in Assam. With the congenial climate and plenty of nature grown food plants, the state alone contributes more than ninety percent of the total production of muga silk in the country. The first official record of muga silkworm and muga silk was related to 1662. A remark that, the silks are good, but the people produce little more than they require for use is attributed to the famous traveler Lean Joseph Javernier, who made special mention of a silkworm variety from Assam that remained on trees all the year round and the brilliant stuff made out of them (Thangavelu *et al.*1988a). As on 2015-16, a total of 11416 ha area is covered under cultivation of muga host plantation (Table 1.2).

Table 1.2: Silkworm Food Plants in NE (Hectare) during 2015-16

#	State	Mulberry	Eri	Muga	Oak Tasar	Total
1	Assam	7752	10797	11416	-	**29965**
2	Ar. Pradesh	361	1179	805	100	**2445**
3	Manipur	7196	14811	1566	8040	**31613**
4	Meghalaya	2739	3575	2953	-	**9267**
5	Mizoram	4303	720	568	117	**5708**
6	Nagaland	746	4861	521	87	**6215**
7	Sikkim	198	183	3	-	**384**
8	Tripura	2806	4	-	-	**2810**
Total		**26101**	**36130**	**17832**	**8344**	**88407**

Source: Regional Office, CSB, Guwahati

Muga industry also provides employment to more than 46000 families in North East India out of which about 40000 families are actively involved in the

culture in Assam (Table 1.3). Muga silk was recognized as a protected geographical indication (GI) in 2007 and was granted a GI logo for trademark purposes in 2014. The Central Silk Board of India has been granted the authority to inspect muga silk products, certify their authenticity and allow producers to use the GI logo. The board is also involved in R&D and infrastructure development sericulture including muga and eri through the Central Muga Eri Research & Training Institute (CMER&TI) in Jorhat, Assam.

Table 1.3: Sericulture families in NE during 2015-16

#	State	Number of Families engaged in Sericulture				
		Mulberry	**Eri**	**Muga**	**Oak Tasar**	**Total**
1	Assam	32163	230760	39375	-	**302298**
2	Ar.Pradesh	400	1650	400	50	**2500**
3	Manipur	13000	18961	359	9409	**41729**
4	Meghalaya	2,788	12345	4809	-	**19942**
5	Mizoram	3500	150	95	135	**3880**
6	Nagaland	492	9699	983	63	**11237**
7	Sikkim	227	103	17	-	**347**
8	Tripura	13500	-	-	-	**13500**
Total		**66070**	**273668**	**46038**	**9657**	**395433**

Source: Regional Office, CSB, Guwahati

Trends in muga silk industry

Assam is the 3rd largest silk producing state in India with more than 90% Muga, 65% Eri and 1% Mulberry silk (Table 1.4). Over the last few decades muga silk industry has registered an impressive growth, both horizontally and vertically. Plans and schemes implemented by central and state agencies and continuous efforts of researchers and extension personals contributed lots in this context. In the recent past, various improved technologies of muga culture for cultivation and management of host plants, production of disease free laying (dfl), early and late stages silkworm rearing, prophylactic measures against pests and diseases, improved mountage, etc. were developed and recommended

for the benefit of farmers. Study on integration of improved technology package of muga culture has shown the production of 52 cocoons against the production of 29 cocoons per dfl in traditional method (Barah *et al.* 2006). Demonstrations of integrated technologies package of muga culture at farmer's fields also showed the average production in seed crop is 50 cocoons against benchmark of 28 cocoons per laying (Mech *et al.* 2007a). Impact study on frontline technology demonstration of muga at the farmers' field revealed that average number of cocoon yield was 69 per dfl under FLD with 42.9 % improvement over the yield of 48 cocoons under traditional practice (Mech *et.al*. 2015).

Table 1.4: Raw Silk Production Scenario in N.E. States during 2014-15

State	**Raw silk production (MT)**			
	Mulberry	**Muga**	**Eri**	**Oak Tasar**
Assam	31.00	136.00	3055.00	-
Ar.Pradesh	2.00	2.00	30.00	0.20
Manipur	150.00	0.90	361.00	4.20
Meghalaya	17.00	16.00	622.00	-
Mizoram	40.00	0.10	10.00	0.10
Nagaland	6.00	3.00	610.00	0.30
Sikkim	5.00	0.20	3.00	-
Tripura	48.00	-	-	-
Total	**299.00**	**158.00**	**4691.00**	**4.80**

Source: Regional Office, CSB, Guwahati

In order to enhance production of muga raw silk through adoption of improved technologies, CSB has implemented various developmental schemes for assisting the farmers to adopt the improved technologies. Apart from, various extension programme like, technology demonstration, exhibition, technology awareness meet, farmer's training programme, exposure visits, etc, are also organizing regularly for popularization of technologies. Probably, due

to these efforts, the production of muga raw silk is increasing steadily during last one decade (Table 1.5).

Table 1.5: Muga raw silk production scenario (2000 to 2014)

Year	Muga silk production in Assam (MT)	Muga silk production in the country (MT)
2000-01	94	99
2001-02	91	100
2002-03	91	102
2003-04	94	105
2004-05	98	110
2005-06	98	110
2006-07	107	115
2007-08	105	117
2008-09	105	119
2009-10	93	105
2010-11	117	124
2011-12	119	126
2012-13	108	119
2013-14	126	148
2014-15	136	158

Source: Regional Office, CSB, Guwahati

Need for the study

Improved technology package of muga culture has been reported to be effective for higher yield as well as income of the farmers. In view of enhanced production and productivity of muga culture through adoption of improved technologies among the farmers, different strategies were adopted by state and central govt. organization continuously for last two decades. CSB has implemented various developmental schemes like Catalytic Development Programme (CDP), Special CDP, etc to provide financial supports to the farmers for adopting the improved technologies. Apart from, various extension programmes like, technology demonstration, exhibition, technology awareness meet, farmer's skill development training, exposure visits, etc, were organized regularly for popularization of the technologies. But, the production of muga raw silk is yet to be reached in to a desired level. There is still a wide gap

between potential production (200 MT) and present production (158 MT during 2014-15) of muga culture. Barah *et al.* (2004b) reported that in muga culture, yield gap between demonstration centre and the farmers is 50% in seed and 30% in commercial crop. Choudhury, *et al.* (2016) reported that the production of muga raw silk is still behind the potential production of 200 MT and has been swinging from 105-158 MT during last 10 years. The reasons behind low production may be due to unaware of adoption of improved technologies among the muga farmers.

Further, being an age old traditional practices, muga culture involves lot of indigenous technical knowledge and beliefs over the time. Improvement of the socio-economic condition of the muga farming community would be almost impossible, if this rich tradition of indigenous practices is kept with a few people. Indigenous Technical Knowledge (ITK) is an integral part of the cultural practices and day to day life of a given community based on long experience. It has immense potential for innovation, especially at the grassroots level. India is a country populated by a number of indigenous communities, most of which have their own set of unique traditional knowledge and technology base. Many of these knowledge and technologies are at par with the modern knowledge and technology system and have been provided the indigenous communities with comfort and self-sufficiency. These traditional knowledge and technologies have played a significant role in the overall socio-economic development of the communities. Hence, documentation of indeginious traditional practices associated with the muga culture is also an urgnt need for sustainable development of muga industry.

Therefore, it was felt necessary to make a systematic study on knowledge and adoption of improved technology among the muga farmers, impact of improved technology in terms of production and productivity, socio-economic factors associated with the extent of knowledge and adoption of technologies and identification of constraints for non adoption of improved technologies, if any. At the same time, it was also felt necessary to recognize, collect and

documentation the indigenous practices associated with muga culture. Incorporating ITKs into R & D can add value to the development of sustainable technologies of muga culture which in turn, help the farmers for improving their socio-economic condition.

Golaghat district of Assam, India is one of the important muga producing district contributed more than five percent state's production (Table-1.6) and have both traditional as well as non traditional muga farmers. Central Muga Eri Research & Training Institute, Lahdoigarh, Jorhat have been made special efforts to popularize the improved technologies among the muga farmers in the district through demonstration of technologies, training, exposure visits, etc and provided required financial supports for adoption of technologies through some special programme *viz.*, establishment of Farmers Field School (FFS), Seri Resource Centre (SRC), Seri Model Village, etc directly under supervision of the institute.

Table 1.6: Raw silk production in Golaghat District from 2009 to 2014

Year	Raw Silk Production in Golaghat District (MT)			
	Eri	Muga	Mulberry	Total
2009-10	35.13	7.70	2.03	44.86
2010-11	29.74	3.87	0.225	33.83
2011-12	40.04	6.16	0.44	46.64
2012-13	45.38	6.52	0.684	52.58
2013-14	49.49	8.13	0.68	58.3
2014-15	101.48	5.60	0.64	107.72

Source: District Sericulture Office, Golaghat

Hence, with this background the present study was carried out in Golaghat district of Assam with the following objectives.

1. **To understand the knowledge and adoption of technologies by the muga farmers.**
2. **To study the association between the socio economic factors of the farmers and knowledge and adoption of improved technologies.**
3. **To assess the muga cocoon yield through adoption of improved technology and traditional practices at the farmers' level.**

4. **To identify the constraints for non adoption of improved technologies by the muga farmers, if any.**

Scope of the study

The study was intended to know the various knowledge and adoption of technologies of muga culture which would serve as an eye-opener to the policy maker, researchers, concerned authorities to make suitable strategies for development of the muga farming community based on the reality. In addition, the study could enable to development the right information at right time, which helps in formulating the various developmental programmes and policies and better decision making to reduce the constraints and fetch the muga culture in a very attractive way. The findings of the study would throw light on the association of personal, socio-economic and psychological factors with the adoption behavior and the constraints experienced by the muga farmers. It would have practical implications to trace the variables responsible for the adoption of improved technologies. It would help different developmental agencies and the govemment to intervene in minimizing the constraints faced by the muga farmers, thus facilitating a sustainable venture to the traditional muga farmers in the coming days.

The study was restricted only to muga culture and the study was on wide objective basis by following all the norms of scientific research, well structured interview schedule, pre-testing and objective measurement.

Presentation of the thesis

The research study is presented in 6 chapters. The first chapter deals with introduction covering presentation of the problem, objectives and scope of the study. The review of literature and the conceptual frame work are included in the second chapter. The third chapter deals with methodology dealing with the present research works adopted for the study. The fourth and fifth chapters are presented with results and discussion. The sixth chapter summarizes the study followed by references and appendices.