Sericulture and traditional craft of silk weaving in Assam

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Sericulture is one of the oldest professions the human race developed and practiced. Weaving as a craft also developed independently in ancient China, India, and Thailand as well as in the Middle East, Europe, Africa and in South America. The process of working out new techniques continued for millennia and continues even today. With the change from subsistence farming to the present commercial system and incorporation of mechanical technology have brought in drastic changes in both sericulture and weaving industry. Consequently, people realize the present day techniques adopted for commercial system may be unsustainable in the long run. Currently, scientists are relearning the traditional or indigenous know how and exploring possibilities of using the old practices wherever possible. Further in case of tribal weaving in Northeast India, each region has unique aptitude for the craft of weaving and each tribe has its own traditional style and design. Therefore, introduction of indigenous know how (traditional craft, style, design, etc.) in the field of sericulture and weaving blended with modern techniques can produce low cost quality product with quantity production to sustain present day competition market.

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The hand-woven textiles have occupied an important place in the culture and civilization of India since very ancient times. The artisans living in the countryside were influenced in their textile production by the elements of physical environment as well as by their myths, legends, rituals, ceremonies, festivals, social organizations and cultural norms. All these elements reflected upon their respective textile traditions in one way or another. As a result, each culturally definable region of India has developed distinctive characteristics of its own in the craft of weaving and production of textiles of diverse types and designs. The weavers, whether they are housewives or full time artisans, worked not merely to cater to the needs of the individual, the household or the community, but also to satisfy their personal urge for self expression and creative impulse (Fig. 1). In Northeast states of India, Assam enjoys a place of pride for its rich heritage of artistic handloom products. There is an immensely rich assembly of tribal cultures in this region. In fact, except for the Brahmaputra and Barak plains of Assam and the Imphal plains of Manipur, the indigenous inhabitants of most of this largely hill region are tribal. The beautiful hand woven products of the tribal and non-tribal of this region not only reflect the skills of individual weavers and artisans, but the creative capacity and deep perception of beauty in colour and design of the people as a whole. The very socio-cultural life of the communities is revealed significantly in their textiles. The traditional handloom fabrics of Assam unfold the creative genius of the local weavers. Apart from cotton textiles, three varieties of silk, viz. muga, pat (mulberry) and endi (also called eri) are produced in Assam. The traditional textiles, woven out of these silks are known for the fine quality, brightness of colour and durability. On the other hand, cotton textiles were known for their bright colours, specific textures and bold loom-embroidered designs.

Sericulture in Assam

Silk culture is a traditional cottage industry rooted in the life and culture of Assam. Sericulture in Assam comprises mulberry (pat) and non-mulberry silkworm culture. The latter includes endi, muga and oak-tassar. Endi and muga silks are considered to be of indigenous origin and found only in Assam and the foot-hills of Meghalaya. Oak-tassar culture is a recent
introduction in some temperate zones of Northeastern region especially in Manipur. The commercial prospect of which are yet to be ascertained. Endi culture has always remained as a subsidiary occupation of Indo-Mongoloid and Tibeto-Burman ethnic groups of the Brahmaputra valley (i.e. the Assam Plains) and the adjacent hill areas. It is carried out traditionally by the rural and tribal womenfolk in their leisure hours. Endi silkworm (Philosamis ricini) derives its name from the castor oil plant (Ricinus communis), called era in Assamese, on which it is usually fed (Fig. 2). Endi cocon is open at one end for which the silk does not form into a continuous filament. Hence, the cocoon is spun, not reeled. The coarse, durable endi cloth is regarded as the silk of the poor (Fig. 3). The status of endi clothes in the folk life of Assam can easily be gauged from an old Assamese proverb, dair pani, erir kani, which implies that while curd cools, endi cloth warms up a person.

Muga worm (Antheraea assama) is basically a wild variety. It is, commonly fed on som (Persea bombycina) tree in Upper Assam and sua (Listea monopetela) in Lower Assam. Mejankari (Listea cubeba), pan chapa (Magnolia sphenocarpa), dighlati (Listea salicifolia) are secondary host plants (Figs. 4 & 5). Muga silk in general is a rich golden yellow or light brown in colour depending on the host plant on which the worms are fed and the season. Most of the cocoons are purchased ultimately by the traders of Sualkuchi (in Kamrup district of Lower Assam), where commercial reeling and weaving are done almost as a monopoly. Though the bulk of the rearing is done in Upper Assam, the womenfolk there reel a very small quantity of cocon to utilize in their looms for household use. The most important muga cocoon rearing villages lie in Lakhimpur, Dibrugarh, Sibsagar and Jorhat districts. The item of dress made out of muga is Assamese women's apparel (riha, mekhela, chadar) saree and wrapper. Mulberry silk industry in Assam is also pretty ancient. The climatic condition of Assam is favourable for mulberry culture. Mulberry silk, locally pat, is produced by a silkworm, known as Bombyx mori, which feeds solely on mulberry (Morus indica) leaves. Hence, the name of the silk, the mulberry yarn reeled by the rural folk are primarily meant for domestic consumption. The commercial weavers purchase every year about 25,000 kg of twisted mulberry silk from Karnataka. Mulberry silk is light and cool; has sheen and is strong; delicate and resilient. It is used in Assam primarily for manufacturing items of dress such as mekhela, chadar, riha, saree, wrapper, dhoti and men's upper garment.

Raw materials for handloom weaving in Assam
Cotton of various counts ranging from 10, to 80, is generally used by the weavers. Three varieties of silk, viz. endi, muga and pat are commonly used in Assam as raw materials and majority of the silk weavers (Figs. 6 & 7). Rayon (also called artificial silk) is also used as raw materials for commercial weaving units at Sualkuchi, Palasbari and Hajo.

Pre-weaving process of silk textiles
Cooking of Muga cocoon
Cocoon cooking or boiling is the work to make the cocoon fibre reelable by swelling, softening and a little dissolution of sericin (Fig. 8). After cooking, fibers ends are collected from boiled cocoons and then several fibres are reeled together by imparting twists. When dropping occurs or a cocoon is finished to reel, a new end is to be supplemented to keep continuity of raw silk yarn. Reeling involves deflossing of cooked cocoons, end picking and uniting, twisting, reeling and re-reeling and other subsidiary works. One of the traditional cooking processes involves boiling muga cocoon with alkaline solution prepared from plaintain ash and straw ash by keeping definite material: liquor (1:25) ratio. The cocoons are stirred at 5 min interval with the help of a wooden spoon which helped in even cooking of cocoons. The lid of the saucepan used to cover the container during cooking to prevent excessive evaporation of water and also to boil the solution at a lower temperature. Around 225 gm of plaintain and straw ash are taken for preparation of ash extract to cook each set of cocoons (100 nos). While optimizing the cooking conditions, locally/easily available alkali’s, enzymes, slippery agents from natural sources are used during cooking of muga cocoon which enhanced the quality of yarn.

Chemicals obtained from natural sources used for muga cooking
The procedure involves preparation of straw ash by burning of rice straw in open air. Straw ash is then put and tied in a loosely woven white cotton cloth (½ m) and kept the bundle in definite quantity of water. Next day, extract is filtered and the clear filtrate is taken for cooking (15-20 minutes). Generally, 30-40 ml straw ash extracts is used for cooking
400 numbers of cocoons. *Carrica papaya* latex (acts as crude enzymes) from crude matured papaya is used for *muga* cooking. One of the traditional cooking processes involves cooking with latex and straw ash mixture. 1.5 to 2 ml of latex is generally used along with 30-40 ml of straw ash extract for cooking 400 numbers of *muga* cocoons for 15-20 minutes. Bark of *simolu* (*Bombyx mulbarium*) are chopped into small pieces and dried under strong sunlight till it dries properly. Dried pieces are powdered and stored properly in air tight container. Generally, 5-7 gm of powder is used during cooking (15-20 minutes) of 400 numbers of *muga* cocoons along with 30-40 ml of straw ash extract. Inner core of elephant fruit (*Dilenia indica*) contains mucilaginous a substance (5-7 ml) which is used to cook 400 *muga* cocoons along with 30-40 ml of straw ash extract. 15-20 minutes cooking is required for general commercial grade cocoons. Fresh leaves of China rose (*Hibiscus rosasinensis*) are plucked and washed properly, chopped into small pieces; 5-7 gm are used for 400 cocoon along with 30-40 ml of straw ash extract during cooking for 15-20 minutes.

**Reeling of cocoons**

*Bhir* or *Bhowri* is the most common process used for *muga* reeling. Two expert reelers reel in *Bhowri* with warm water at 40°-45°C by keeping the material: liquor of 1:20. Proper deflossing of cocoon is essential to get the filament end. Filaments (6-8 nos) are collected at a time to get the filament yarn. During reeling, raw silk is generally washed with water to remove the excess alkali from it. Raw silk is subjected to re-reeling which produces the yarn in hank form. The circumference of a standard hank is 125-150 cm (Fig. 9).

**Silk handloom weaving**

Handloom weaving in Assam is an age-old cottage industry (Fig. 10). Besides economic importance, it has great cultural relevance for the people of Assam. In the sphere of weaving in Assam, three types of establishment are generally seen: (a) Those consisting of amateur weavers, who produce cloth to meet the requirements of members of their family only. In most of the *muga* growing areas, some families are engaged in this type of weaving activities and produce cloth for their family requirement. Whole upper Assam districts like, Sivasagar, Jorhat, Golaghat, North Lakhimpur, etc. are the areas of this type of activities (Fig. 11). (b) Those who carry out weaving more or less on a commercial basis. Besides fulfilling the family requirements, the weavers sell their surplus products. The weavers of this group are mostly part-time workers. In Kamrup and Goalpara district of lower Assam and some upper Assam districts, mostly female weavers weave silk cloth of this category (Fig. 12). (c) Those who are purely commercial weavers. In this group, there are all full time workers, who either work individually or collectively under co-operative societies' and factories. Sualkuchi and Palashbari in Kamrup district and in few pockets of upper Assam, commercial silk weaving is taking place. In Assam, handloom weaving activity still remains its predominant position in contrast to declining trend throughout India. Around 12.5 lakh weavers working in more than 13 lakh different types of looms which are mostly loin, semi-automatic, through shuttle pit loom to fly shuttle jacquard loom. Due to use of improved looms mostly fly shuttle looms, the productivity per day per weaver in Assam increases from 1.55 m to 2.50 m.

**Dyeing of silk**

The tradition of dyeing is closely connected with handloom weaving and is an ancient art of Assam. Dyeing with natural dyes is still in practice in some parts of Assam and vegetable dyeing of silk yarn is a usual practice. Vegetable dyes are obtained from various parts of plants and herbs such as stem, wood, root, bark, leaf, flower, fruits and seed, etc. The prominent among then are indigo (*Indigofera tinctoria* L.), *Isatis tinctoria* L., turmeric (*Curcuma longa*), *Lawsonia inermis* L.; *Morinda* (*Morinda citrifolia* L.), *Maddar* (*Rubia tinctorum* L.), Elephant apple (*Dilhenia indica*), etc. Dyeing is done by boiling the vegetable extracts in certain concentrations (light to deep) and then fixing the colour by treatment with some fixing agents (mordant). Various bright shades are obtained through this process but the fastness property is not good. Dyeing of *eri* silk yarn with extract of *seuli* (*Nyctanthes arbor-tristis*) flower gave a bright yellow colour (Fig. 13). It is reported by a dyer of Dhemaji district of upper Assam that the dyeing conditions like temperature etc. are optimized and the best temperature for dyeing corel *seuli* with *eri* silk yarn was found 70° C. Silk can also be dyed with *kamela* (*Mallotus phillipensis*), henna (*Lawsonia alba*) and turmeric. The *eri* silk fabrics could be dyed with turmeric dyes by treating with different mordant to improve the colour fastness properties.
Fig. 1 Warping drum  
Fig. 2 Eri silk worm larvae  
Fig. 3 A group of lady wearing endi chadar  

Fig. 4 Muga rearing in traditional way  
Fig. 5 Muga silk worm moth  
Fig. 6 Muga hank  

Fig. 7 Eri hank  
Fig. 8 Cooking of muga cocoon  
Fig. 9 Reeling of cocoons  

Fig. 10 A group of tribal weaver busy in pre-weaving process  
Fig. 11 Traditional weaving with jacquard  
Fig. 12 A Bodo lady weaving eri cloth in a traditional loom
Some of the most important dyes derived from insect and animal sources such as lac (Laccifer lacca Kerr.), kermes (Kermococcus ilicis Linn.), cochineal (Dactylopins coccus Costa), lichen, etc. The detail process of lac dyeing of eri silk yarn practiced in Udalguri is narrated and also demonstrated by one of the leading eri rearer and weaver, Srimati Deepti Daimari. Pieces of lac (around 250 gm) was dissolved in hot water and boiled for an hour till the pieces are mostly dissolved (Fig. 15). After this, the solution was filtered by a piece of clean cotton cloth and the filtrate (dye solution) was taken for dyeing eri yarn (Fig. 16). Potash alum was used as stabilizing agent and during dyeing; tamarind extract was used in the dye bath to make the solution acidic (Fig. 17). 500 gm of lac was used to produce 2 L of dye solutions. The hank of eri yarn was dipped in the boiling solution of lac, alum and tamarind and rotated for half an hour till the dye was completely exhausted by the yarn (Figs. 18-21). After dyeing, the hanks were squeezed and dried. The shade became maroon when the hank was completely dried (Figs. 22&23). Eri cocoons are open mouthed and filament is discontinuous. Therefore, eri cocoon can only be used for spinning purpose.

Degumming

Eri cocoons are degummed by traditional methods (Fig. 14). The cocoons loosely tied in cloths are boiled in a 10% sodium solution for 45 minutes to one hour. The individual cocoons are then stretched or open in plain carbonate water into thin sheets. Four to five such sheets are joined to make a cake, which is dried and used for spinning. In Assam, ash obtained from banana leaves, wheat stalk, paddy straw, pieces of green papaya are commonly used as degumming chemicals. In some places, soap and soda are used for degumming eri cocoons.

Spinning

Eri spinning is mostly done by hand spinning method, which is very common in Northeastern states. The takli spinning which is the traditional spinning process consists of a spindle with disc-like base. The spinner holds the cocoon cake in the left hand, draft and then feeds the strand with the right hand to the spindle. The spindle is occasionally rotated by the right hand to impart twist. After a certain length of yarn is spun, spinning is discontinued in order to wind the yarn to the spindle. Production is around 40-60 gm from two persons per day.

**Eri cooking and hand spinning**

**Improved spinning wheel**

Although the takli is very simple and cheap, its output is quite low (Fig. 24). Improved spinning devices have been developed from time to time in which CSTRI spinning wheel is the latest one (Fig. 26). The spinning is done on continuous spinning principle with drafting twisting and winding. The production is around 150-200 gm per person per day with 70-80% recovery from the cocoon shell. It consisting of horizontal spindle with ring, traverse mechanism in an iron frame structure. It is driven by motor with pedal mechanism. In addition to this, other improved hand spinning machines (Fig. 25) are also available, of which the important ones are Hind Machinery spinning wheel, Chowdhury spinning machine and CSTRI flyer machine spinning.

**Looms and accessories**

Despite the long history of weaving in Assam, the loom and the accessories used by the weavers have remained very simple (Fig. 28). Throw-shuttle loom (also called country loom) and the loin-loom constitute the traditional looms of Assam. The fly-shuttle loom originated from the difficulties faced in weaving broad cloths on throw shuttle looms. Drawboy, dobby and jacquard machines are mounted on looms to be used for fancy weavers and produce elaborate designs. These are mainly found in commercial and Government production centers. The traditional handloom, locally called sal used is the same for cotton as well as for silk. Besides the loom and its accessories, other small appliances such as letai, chereki and ugha, mostly of bamboo are used traditionally in the process of manufacturing of fabric. These are still being used today although improved handloom accessories are also used in some places. Throw shuttle is still predominantly prevalent in the plains areas, while loin-looms are commonly found in the hill areas of Assam and the demand for improved fly-shuttle looms exists throughout the state. Except in commercial centers, introduction of drawboy system has markedly negligible. The other improved mechanisms like dobby and jacquard are also not within the reach of the common weavers.

**Motifs and designs**

Textiles of Assam including silk consists of abstract figures of animals, birds, human forms, creepers, flowers, diamond motifs and celestial phenomena (Figs. 29-35). These designs used in
weaving by different groups, both tribal and non-tribals are indigenous and carry special meaning and cultural significance. Symbolisms of ritual nature are also often conveyed by the motifs and designs. The motifs and designs of Assam are mostly taken from nature. These motifs and designs are known as *phul* (flower and floral pattern) or *phuljali* (flower and creeper). The bright hued diamond motif on contrasting background representing fine workmanship is typical and traditional feature of the tribal textiles of Assam. In *pat* and *muga* silk delicate designs of flowers, creepers etc. are found while bold motifs and design of geometric shapes are found on cotton and *eri* silk. Weaving designs in the hills are almost found in angular geometric type. The folk and tribal designs of Assam also consist of birds, butterflies and animals like horses, elephant, tiger, etc. with diverse geometrical forms for the ornamentation of textiles. The specific tribal designs are found in the traditional products such as Mizos are having *paun*, Nagas are famous for their bright attractive shawls. The tribes of Arunachal Pradesh viz. Adi, Idu, Mishimi, Khampiu, Nishi, Monpa, Shedukpen, etc. have their own specialist in
their dress designs. Monpa carpets (Tankhas) are unique in design depicting the dragon. The Garo women are expert in eri weaving. The Khasi is the only tribe having no weaving tradition but their mode of dress is very intricate. The Missings in the plains have their own styles and motifs (Fig. 27). The Rava women weave rufan and patani- the kambung worn over rufan. The breast cloth is known as kans-remainan. Nen-sukhai is a dress used by both the sexes. The traditional man’s attire is saskhi and the loin cloth is pajak. The plain tribes of Assam like Bodo Kacharis and Ravas indicate their specific rich tradition of textiles with indigenous culture specific, colour specific, motifs and designs; Bodos use bright yellow, Ravas use dark green colour with specific designs.

Finished handloom products and marketing

The handloom fabrics produced traditionally in Assam has very little in common with those manufactured in other parts of India. The important textile items like barkapoor, khania kappoor (gents wear) gamocha, (ornamental cloth connected with Assamese culture) mekhela (Fig. 36), riha chadar (ladies wear) and churia (or dhoti) produced by the plains of Assamese. The handloom products are mainly confined to the local markets due to the fact that most of these are cultural-specific items suitable for local use only. Besides purchase by local consumers, a part of the products reaching the local markets are also bought by traders and middlemen who resell the products in other markets. Since, the weavers have no marketing organization of their own (except for a few co-operative societies), they are often forced to sell their products in a buyers market. The profit margin is thus very low, but they cannot withhold sale since ready cash is needed to buy the raw materials. It is also apparent that the existing marketing system is inadequate. Marketing facilities for handloom fabrics are considered most essential for the weavers, especially for those who have to depend on weaving for their livelihood.

Conclusion

Handloom weaving is an integral part of the rural culture and economy of Assam. The growing awareness among various communities about the role of indigenous textile items in vivifying cultural identity has helped in their continuance. Handloom weaving is likely to survive and prosper because of the force of traditions as well as for the new meaning and substance acquired by it in the present times. The distinctive cottage industry is in need of organized help and assistance so that it can further develop and flourish. The position of handloom weaving as a household craft is in constant jeopardy because of power competition from mills and commercial producers. Textile production in the different communities showed a signs of deteriorations in respect of design, colour and aesthetics. The overall status of textile production in Assam was much higher in the past than it is today. The art of dyeing with indigenous dyes was an important aspect of traditional handloom weaving. Though dyeing is no more vogue, indigenous dye substances are still found in the environs of villages. There are knowledgeable individuals in various communities, who can identify these substances and know how to prepare indigenous dyes. Textile items with indigenous dyes are aesthetically much more pleasing compared to fabrics woven out of shop bought dyed yarn and is eco-friendly. Moreover, indigenously dyed yarn lends an authentic character to the fabrics. Here is scope and genuine need for revival of indigenous dyes in the state. Sericulture and weaving are the most culturally and traditionally practiced industry in Assam and other Northeastern states. Knowledge of traditional practices provides valuable inputs to make efficient use of these industries incorporating natural resources and advance technology for sustainable development. Traditional practices used are mostly organic, eco-friendly, sustainable, viable and cost effective. But there is a need to explore, verify, modify and scientifically validate these practices for their wider used and application.

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