

## **BRAINSTROMING WORKSHOP ON “EMERGING NEEDS AND CRITICAL GAPS IN MUGA AND ERI CULTURE”**

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### **RECOMMENDATION OF BRAINSTROMING WORKSHOP ON“ EMERGING NEEDS AND CRITICAL GAPS IN MUGA AND ERI CULTURE”**

As we are at the brink of a global transformation, India has set in motion a historic plan – Sustainable Development Goals (SDGs) – that aims to build a more prosperous, more equal, and more secure Nation by the year 2030. Further, our nation has begun work on a blueprint for India@2047- a vision plan for a 'future ready India' that befits the 100<sup>th</sup> year of Indian Independence. We at Central Silk Board, being part of this journey to India@2047, have to make plans for future that includes a short term plan for 2030 and a long term plan to achieve by 2047. Development & dissemination of improved technologies by R & D Institutes of Central Silk Board with effective implementation of developmental schemes in association with State Sericulture Department and Stakeholders during subsequent plan period could achieve production of 35820 MT of raw silk during 2019-20 comprising of 25239 MT Mulberry (70.46%) and 10581 MT of Vanya (29.54%) with CAGR of 6.16% in last 10 years. CSB is preparing an impressive and tangible Silk Vision Document for 2047 encompassing all the essences to attain new heights of Sericulture prosperity and to become world leader in sericulture sector by 2047.

The CMER&TI being the sole research organization to work on two economically important Vanya silkworms namely, Muga and Eri, organized a one day brainstorming workshop on 14<sup>th</sup> March 2022 at NEHU Guest House, Guwahati, to discuss the plans for developing vanya sericulture in Northeast India as a whole. In this meeting, the technological interventions for better seed availability, high yielding breeds, better host plants, climate resilient silkworm rearing and host plant management technologies, novel post cocoons technologies, etc., were deliberated in detail and a roadmap for the coming years was chalked out with experts opinion and panel discussion. Also a booklet entitled “Eri Chawki Rearing Practices (Mahesh D.S, Arun Kumar KP and KM Vijaya Kumari)” was released on this occasion for popularization of newly developed Eri chawki rearing technology.

Muga and eri culture form the basis of livelihood in rural areas of Northeast part of India. In unparalleled textures, with natural sheen, easy affinity for natural dyes, light in weight and high in moisture absorbency, and with baffling thermal properties, products of rich, salubrious climate and nourishing vegetation, muga and eri silks have their own unique beauty and ethnic culture. The vanya sericulture in India is as old as mulberry sericulture that originated in China. Owing to their semi-domesticated way of rearing, the problems in muga and eri sericulture are different from those of the domesticated silkworm. Therefore, we need to develop specific technologies for solving these problems. We can harness new developments in biology for improving vanya sericulture.

Eri culture forms a unique component of agriculture in north eastern India, where agroforestry based farming is predominant. Apart from providing spun silk, it provides food to farmers in the form of pre-pupa and pupa. Eri spun silk has good thermal properties and is used in various fabrics. Pre pupae and pupae are consumed

as food and are rich in proteins and lipids. Recently many new technologies are being developed and adopted in sericulture to transform it from a cottage industry to a large scale industrial production. The Ministry of Textiles, Government of India is funding to develop eri clusters to give sericulture an industrial status. With government support and technological interventions eri silk production is poised to increase significantly in the coming years. CMERTI is working on several projects to develop new technologies like Chawki rearing, hybrid development, improved host plant varieties, late age rearing technologies, large scale commercial egg production technologies, mounting devices, pupal preservation techniques, etc. These new technologies complement the government schemes in near future to develop sericulture at an industrial scale and help in achieving the sustainable development goals 2030.

Muga silkworm (*Antheraea assamensis*) is unique in its ability to produce glittering golden colour muga silk and it is available only in the North eastern states of India. This golden yellow colour silk is prerogative of India and the pride of Assam state. Muga silkworm being reared outdoors it is difficult to breed high yielding varieties through conventional breeding methods as the breeders will have less control over the whole process of breeding. A good quality host plant availability would help produce better quality silk and higher yield. Also, outdoor rearing makes the seed availability a significant issue during unfavourable (pre-seed and seed crops) seasons due to poor cocoon yield.

Currently we are at a juncture where new technologies are being developed specifically for muga and eri culture and readied for transfer to field. In view of these issues at hand, a brainstorming meeting on muga and eri silkworms was organized to discuss how muga and eri silkworm improvement has to be carried out to overcome limitations during rearing, grainage, etc,. The road ahead for muga and eri sericulture in India was deliberated. Also, the application of new biology to further improve the silkworms was discussed.

The program was inaugurated by the Director, CMERTI and two experts in muga and eri culture. It was followed by talks on muga culture, eri culture, seed availability and host plants of muga and eri silkworms. The talk on 'Technological interventions for improving muga culture in NE India' discussed different ways to improve muga silk production so that the SDGs2030 target can be achieved. The technological interventions included developing better breeds, introgressing hibernating character into cultivated lines of muga, applying cold reeling technology to improve seed availability in unfavourable seasons, etc. The second talk on 'Recent trends in sericulture' dealt with different new technologies that are now being developed in eri culture to take it from cottage type of rearing to industrial scale production. The next talk on 'Improving seed availability in eri and muga culture' deliberated on strategies to improve seed availability especially in muga sector. The last talk was on 'Strategies to improve host plant availability in muga and eri culture' in which the technologies developed by CSB to improve the availability of quality host plants for rearing of muga and eri silkworms were discussed.

The talks were followed by panel discussion separately for muga and eri culture. Experts discussed the strategies to increase the muga and eri silk production. Exploration of sericulture in potential non-traditional areas outside of Northeast India was also discussed. It was stressed that creating awareness among the stakeholders, avoiding insecticide spray on castor and convincing castor farmers

to take up ericulture for additional income are very important for spreading ericulture in non-traditional areas.

Further, the discussion with the stakeholders was also organized. The farmers' representative Mr. Haren Das informed that the farmers in general lack proper knowledge in grainage and rearing activities, and requested CSB/DoS to organize necessary awareness programs. Representative from silk entrepreneurs indicated the requirement of silk certification and purity, so that they would get better price for better quality silk in muga and eri.

Finally the experts came together and discussed on "Specific interventions needed to achieve SDGs in muga and eri culture".

All the four talks invoked scintillating discussions among the participants. Several suggestions and ideas were discussed to address the long standing problems in muga and eri culture. These plans will enable us to achieve SDGs 2030 and also to realize the blueprint for India@2047. Following are the brief Recommendations as outcome of the BRAINSTORMING WORKSHOP for over all development of Muga and Eri vanya silk industry for achieving the envisaged target of producing 60000 MT of raw silk by 2030 and 76000 MT by 2047 (tentatively) under perspective plan with Short term and Long term strategies by exploring existing potential & prospects.

### **Vanaya Sector (Eri & Muga):**

#### **A. Improvement of Host plants**

1. Augmentation of block plantation of perennial food plants of Muga and popularisation of S-3 and S-6 Som morphotypes having higher palatability and leaf yield (20MT/Ha/year).
2. Development of package of practices for systematic plantation of Dighloti (*Litsaea salicifolia*) and Mejankari (*Litsaea cubeba*) and popularization among the muga farmers under long term strategy.
3. Large scale multiplication and popularization of promising Kesseru accessions viz., HF008 & HF005 among the stake holders having leaf yield of about 25MT/Ha/year).
4. Development of package of practices for Borpat (*Ailanthus grandis*) promising eri food plant which is highly palatable with leaf yield of 35MT/Ha/year.
5. Evolving improved Castor varieties and massive plantation of NBR-1 & NBR-2 Castor varieties in all Eri growing states
6. Large scale plantation of Tapioca of H-97, H-648, CO-1 and improved local varieties for large scale production of eri cocoons.
7. Popularization of eri food plants Viz., Payam (*Evodia flaxinifolia*) in Nagaland and Meghalaya, Waljem (*Sterculia colorata*) in Meghalaya and Assam, Borpat and Kesseru in all NE states.

#### **B. Strategies and major interventions**

1. Intercropping of Castor, Kesseru, Som & Soalu with feasible agricultural crops viz., Ginger, Turmeric, Colocasia & Maize to ensure 35-40% increase in income among farmers.
2. Encouragement of Kissan nurseries for ensuring availability of seedlings in coordination with NGOs/agencies/ private organizations/ individuals under technical guidance of CSB.

3. Adoption of Clonal propagation technique of promising host plants and development of promising high yielding muga/eri host plant varieties suitable for different agro-climatic conditions through application of biotechnological tools.
4. Development of INM package with special reference to bio fertilizer (native soil microflora) for muga/eri host plants to reduce the excess inorganic NPK dose.
5. Development of rapid propagation techniques of Muga and Eri host plants to reduce gestation period under long term strategies.
6. Development of crop protection measures for all host plant diseases and pests.
7. Development of transgenic host plants for improvement in qualitative and quantitative traits.
8. Integration of Vanya host plants with Agro forestry/social forestry

### **C. Improvement/Development of Muga/Eri silkworm breeds**

1. Development of new silkworm (Muga & Eri) breeds tolerant to high temp & humidity and resistant to pests & diseases.
2. Development of diapause lines and strategies for maintenance of wild stocks for exploration.
3. Large scale multiplication & popularization of Eri C-2 breed (35% increase in commercial traits)
4. Development of cross combination of YZxYS, GBSxGBZ for improving ERR, SR% and absolute silk yield
5. Development of Improved cross breed/Hybrid through Inter and Intra-specific hybridization of promising eco-races and C-2 breed
6. Multiplication of Muga silkworm breed- CMR-1 & CMR-2 followed by validation through extensive multilocational trials
7. Development of new Muga/Eri silkworm breeds for better productivity and silk quality through molecular/conventional breeding having tolerant to high temperature, high humidity and resistant to silkworm diseases

### **D. Development of rearing technology**

1. Popularization of Chawki rearing Concept for Eri in the line of mulberry
2. Maintenance of Chawki plot for Muga silkworm rearing (40-45% increase in cocoon yield).
3. Popularization of large scale platform rearing technique for eri like mulberry silk
4. Replacing old technique of mounting devices and popularising Box type mountage & Collapsible plastic mountage and split bamboo type mountage
5. Adequate crop protection measures of silkworm diseases & pests
6. Development of rapid diagnostic technique for diseases of Muga silkworms through serological / molecular techniques and its control measures
7. Development of bio-control agents against silkworm diseases and pests for increasing productivity.
8. Standardization of protocol for preservation of Muga silkworm eggs to overcome adverse rearing seasons

### **E. Seed technology development & strengthening Seed sector**

1. Development of appropriate seed preservation schedule for Muga seed cocoons & eggs.
2. Exploration of potential seed zones for Muga to overcome summer grainage problems.
3. Large scale production of loose eggs in eri on commercial scale
4. Effective utilization of seed infrastructure by DOSs created under CDP & NERTPS
- 5. Supporting ASRs & Pvt. Graineuers for Eri & Muga seed production in PPP mode**
6. Enforcement & effective implementation of Central Silkworm Seed Act
7. Formation/Revival of **Task Force Committee** involving CMER&TI, Lahdoigarh & its nested units, MESSO, Guwahati and its nested units, DoS, Assam and other N.E. states **for Disease Survey, Surveillance and Suggestions of adoption of suitable prophylactic measures** in affected areas.

#### **F. Post Cocoon sector**

1. Improvement of stifling and cooking procedures of Muga cocoons for enhancing silk recovery.
2. Refinement of existing Muga reeling and Eri spinning machine for better extraction of quality silk yarn.
3. Value addition and diversification of Muga/Eri silk products through design development, blending
4. Production of purely organic silk and silk products. Blending of Eri yarn with wool and cotton.
5. Eri silk can be used for manufacture of effective base layer, thermal layer, insulator garments.
6. By product utilization and commercial exploitation of protein rich eri puae
7. Non-textile use of by-products of Muga and Eri silkworm, moth, cocoon and silk waste.
8. Use of muga & eri silk for high value products in biomedical science *viz.* medical health care, optical devices, adhesive gels, generate primary cell lines in collaboration with reputed national and international institutes.

#### **G. Conservation of silkworm Eco-races & host plants**

1. Survey, exploration and conservation (*in-situ* and *ex-situ*) of indigenous Muga and Eri silkworm eco-races/morphotypes/ genotypes & food plants
2. In situ & ex-situ conservation of Muga/Eri silkworm & their host plants for future exploitation
3. CMER&TI, Lahdoigarh has initiated project for *In-situ* conservation of muga and other wild silk moths in natural habitat at Upper Doigrung, Golaghat, Assam, Kukulong in BTC, Assam, Lura village, East Jaitia hills, Meghalaya and Mebo reserve forest, East Siang, Arunachal Pradesh. Regular monitoring and periodical release of muga dfls are being carried out in some sites which will be helpful for future breeding programme.
4. CMER&TI, Lahdoigarh needs to organize awareness on importance of silkworm's conservation among the local people at the conservation sites and strengthen Germplasm Conservation Centre (GCC) at Chenijan.

#### **H. Exploration of Ericulture in potential non-traditional States**

During the Workshop, Shri Sural Pal, Scientist-D, REC, Fahtehpur also shared his experience about the feasibility of exploring existing Castor plantation districts of Gujarat for ericulture in the line of Uttar Pradesh. He stressed that creating awareness among the stake holders, avoiding insecticide sprays in areas for eri silkworm rearing and convincing additional income from ericulture among the stakeholders are of paramount importance for exploring ericulture in Gujarat.

1. As 25-30% leaf harvest does not impair the seed yield in Castor, same may be explored for large scale production of eri cocoons on commercial scale by judiciously utilising Castor foliage cultivated as oil seed crop in the country.
2. Since there is high demand for Eri sliver/tops from USA and other countries; and many spun silk mills are facing shortage of eri cocoons, it is the need of the hour to explore ericulture activities in potential castor growing non-traditional states of the country to meet the huge demand of eri cocoons in the country and also to export Eri sliver/tops.

#### **I. Commercial exploitation of Eri pupae**

1. Eri pupae contain 53% protein, 25% fat, 5% carbohydrates and rich in minerals and vitamins and is delicacy for tribals in North east India.
2. CMER&TI, Lahdoigarh has formulated project for effective utilization of eri pupae. The Institute in collaboration with CFTRI, Mysore and IIT, Guwahati should explore for pupa processing and utilization as human food by canning and also as fish and poultry feed.

#### **J. Exploration of Tapioca/Cassava (*Manihot esculenta*) for Doubling farmers income through Ericulture**

1. Cassava is mainly grown for its tuber using as food, flour, animal feed, production of alcohol, bio- ethanol and starch for sizing paper and textiles, sweeteners and bio-degradable products.
2. Since 25-30% leaf harvest does not impair tuber yield in Cassava and extensively utilized for eri silkworm rearing as secondary food plant in N.E.states and Andhra Pradesh for large scale production of eri cocoons, same can be explored for large commercial eri cocoon production in the states of Tamil Nadu, Kerala, Andhra Pradesh, Karnataka and other north eastern states for doubling the income of farmers.

#### **General:**

- Climate resilient Sericulture & community based awareness strategies
- Decision support system for seri on weather forecast, GIS & Remote sensing mapping
- Product design, development & diversification and effective use of by-products
- Non-textile use of by- products of Muga & Eri silkworm, moth, cocoon & silk waste
- Capacity building/Training & skill development of DoSs staff/NGOs/SHGs

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