

CENTRAL MUGA ERI RESEARCH & TRAINING INSTITUTE, LAHDOIGARH**1. Organizational set up**

| Unit | Place |
|-----------------|--|
| RSRS/ RSTRS (2) | 1. RSRS, Imphal, Manipur 2. RSRS, Boko, Assam |
| REC/ STSC (3) | 1. REC, Lakhimpur, Uttar Pradesh 2. REC, Coochbehar, West Bengal 3. REC, Fatehpur, Uttar Pradesh |

2. R&D Projects, TOT, ECP, CBT etc:

| | Item | Target | Remarks |
|-------------|--|---------------|---------------------|
| 1. | CSB coded Research projects | | |
| 1.1 | With PI from the Institute | | |
| 1.1.1. | Projects of earlier year continued through the year 2021 -22 | 15 | Annex 5.I.1 |
| 1.1.2. | Projects to be concluded during the year 2021 -22 | 3 | Annex 5.I.2 |
| 1.1.3. | New Projects to be initiated during 2021 -22 | 4 | Annex 5.I.3 |
| 1.2. | With CI from the Institute (Collaborative) | | |
| 1.2.1. | Projects of earlier year continued through the year 2021 -22 | 2 | Annex 5.I.4 |
| 1.2.2. | Projects to be concluded during the year 2021 -22 | 1 | Annex 5.I.5 |
| 1.2.3. | New Projects to be initiated during 2021 -22 | 1 | Annex 5.I.6 |
| 2. | Transfer of Technology | | |
| 2.1 | On Station Trials (OST) | | Annex 5.II.1 |
| 2.1.1 | No. of technologies to be validated | 8 | |
| 2.1.2 | No. of trials to be conducted | 39 | |
| 2.2 | On Farm Trials (OFT) | | Annex 5.II.2 |
| 2.2.1 | No. of technologies to be demonstrated | 12 | |
| 2.2.2 | No. of locations to be covered | 39 | |
| 2.2.3 | No. of stakeholders to be covered | 685 | |
| 3. | Capacity Building & Training (CBT) | | Annex 5.III |
| 3.1 | No. of programmes to be conducted | 91 | |
| 3.2 | No. of stakeholders to be trained | 2050 | |
| 4. | Extension Communication Programs (No.) | | Annex 5.IV |
| 4.1 | Krishi Mela / Reelers Mela cum exhibition | 3 | |
| 4.2 | Farmers Field day | 8 | |
| 4.3 | Awareness programme | 23 | |
| 4.4 | Technology demonstration / Enlightenment programmes | 23 | |
| 4.5 | Workshop / Seminars & Conferences | 2 | |
| 4.6 | Other activities (<i>Please specify</i>). | | |
| 5. | Soil Samples to be analyzed | 80 | Annex 5.V |
| 6. | Information, Education & Communication | | Annex 5.VI |
| 6.1 | Periodicals | 4 | |
| 6.2 | Publications | 65 | |
| 6.3 | Extension literature | 10 | |
| 6.4 | Films / Videos | 15 | |
| 6.5 | Social media | 25 | |

| | | | |
|-----|---|---------|--------------|
| 7. | Patents to be filed/ granted, technologies to be commercialized, Software, mobile/ android app developed etc. | 1/0/3/1 | Annex 5.VII |
| 8. | Revenue generation (Rs. in Lakhs) | 33.00 | Annex 5.VIII |
| 9. | Procurement of equipments and other accessories | 162.13 | Annex 5.IX |
| 10. | Other activities (<i>pl specify</i>) | - | Annex 5.X |
| 11. | Targets proposed at a glance for the year 2021-22 | 1 | Annex 5.XI |

1. CSB coded Research projects

1.1. With PI from the Institute

Annex- 5.I.1

1.1.1 Projects of earlier year continued through the year 2021 -22

| # | Code | Title | Start | End | Milestone to be crossed | Progress to be achieved | Financial (Rs. In lakhs) |
|-------------------|---------------------|---|------------|-----------|--|---|--------------------------|
| At main institute | | | | | | | |
| 1 | MOE 0500 4 EF | Adoption of improved sustainable technologies of muga culture for elevation of cocoon production in the tribal belt of Assam (DST funded) | June, 2019 | May, 2022 | Assistance to the beneficiaries Exposure visit Integrated Sericulture with other agricultural crops Extension & communication program, farmers skill training program Midterm survey of Beneficiary of use of improved technologies | Assist the beneficiaries is help in quality and productivity Exposure visit will increase the knowledge of technology and skill Financially help and increase income To know the impact of ECP& training of the beneficiary farmers Get a full database and easy to compare | 0.00 |
| 2 | PIB 0500 5SI | Genetic enhancement of Castor (<i>Ricinus communis</i> L.) germplasm as a source material for development of productive perennial varieties. | Oct, 2019 | Sep, 2022 | Morpho-metric, biochemical and bioassay of collected castor accessions. New collections to continue. Harvesting and sowing of cross wise F ₂ /F ₁ seeds (1 st & 2 nd crossing lots, respectively) and mass selection lots for raising F ₁ and F ₂ generations. Preliminary selection | Enrichment of gene-pool with emphasis on perennial trait and characterization of already collected accessions. Selection of potential complimentary and donor parents for crossing. Preliminary selection of perennial castor | 4.69 |

| | | | | | | | |
|---|--------------------|--|-----------|-----------|--|--|------|
| | | | | | <p>in F₁ and F₂ generations of 2nd and 1st crossing/mass selection lots, respectively (poor biomass plants will be rejected).</p> <p>Data recording on morpho-metric traits from F₂ generation of 1st crossing and mass selection lots.</p> <p>Analysis of the data and selection of promising hybrid.</p> <p>Bagging of these hybrids for harvesting pure F₃ seed.</p> <p>Maintenance of plantation as per recommended package of practices.</p> | <p>hybrids in F₁/F₂ generations and harvesting of pure F₂/F₃ seeds from selected hybrids.</p> | |
| 3 | AIB 0500 6SI | Breeding of muga silkworms for improved silk quality and disease tolerance | Oct, 2019 | Sep, 2022 | <p>Collection of genetic resources.</p> <p>Crossing <i>A. assamensis</i> x <i>A. mezops</i>.</p> <p>Selection of pupae based on better cocoon characteristics</p> <p>Setting up of crosses based on contrasting characteristics</p> <p>Rearing of progeny and selection based on cocoon characteristics</p> <p>Study of heterosis, hybrid vigour and other data analysis.</p> <p>Selection for better cocoon characteristics and diseases tolerance</p> | <p>Genetic resources have been collected from both farmers' fields and from wild habitats.</p> <p>Crossing of <i>A. assamensis</i> with <i>A. mezops</i> could not be completed as <i>A. mezops</i> could not be found in the wild habitat.</p> <p>Pupae have already been selected based on better cocoon characteristics and fecundity.</p> <p>Crosses have been set up from the selected genetic stock</p> <p>Progeny are being reared and further selection is going on based on cocoon characteristics and fecundity.</p> <p>Analysis of data obtained from</p> | 5.94 |

| | | | | | | | |
|---|--------------|---|------------|-------------|--|---|------|
| | | | | | | breeding experiments is going on. Selection for better cocoon characteristics has been carried out and during the course of selection the lines were also selected for biotic and abiotic stress on farm. The wild stock collected from different regions will be tested for diseases tolerance and if any tolerant genetic stock is obtained, it will be incorporated in the breeding program. | |
| 4 | APR 05007 SI | Standardization of chawki rearing practices for Eri Silkworm, <i>Samia ricini</i> D | Oct, 2019 | Sep, 2022 | Selection and rearing of ecoraces collected from different regions. Selection of eri rearing farmers to supply chawki worms. Frequent chawki rearing of ecoraces and biochemical tests of castor leaves and chawki worms. Standardization of suitable chawki rearing practices of each ecoraces. Field testing and demonstration of standardized chawki rearing practices of different ecoraces. | Performance of different ecoraces. Suitable ecoraces and their performance. Standardization of chawki rearing practices. Standardization of suitable chawki rearing practices of different ecoraces. | 4.74 |
| 5 | AIT 05011 EF | Molecular investigation into the lignocellulolytic system of a few wild silkmths of | Oct., 2019 | Sept., 2022 | Metagenome sequencing of gut community and bioinformatics analysis. Screening assays for cellulase, xylanase etc | Submission of sequence data to NCBI SRA and possible publication. Characterization of lignocellulolytic | 0.00 |

| | | | | | | | |
|---|--------------|---|-----------|-----------|--|---|------|
| | | North East India(DST project) | | | for lignocellulose degradation Identification of potential isolates and archiving | gene | |
| 6 | AIB 0501 2SI | Inter and intra-specific hybridization for improvement of eri silkworm, <i>Samia ricini</i> Donovan | Mar, 2020 | Feb, 2024 | <p>Selfing and grainage activities of each eco race and C2 breed to produce F₅ selfed seed and rearing. Crossing of selected pure lines. Crossing of wild eri (<i>S. canningi</i>) as a male parent with selected pureline eco races and C2 breed. Grainage activities to produce F₁ crossed seed. Composite rearing method in F₁ Generation by rearing 5 to 6 dfls of each cross combination. Estimation of general and specific combining ability. Selfing and grainage activities to produce crosswise F₂ seed. Crosswise F₂ generation rearing by maintaining 03 replications/ cross and recording of all rearing performance data</p> <p>Selection of hybrids in F₂ from top, optimum and poor performing lots. Single pair mating of selected lots to produce F₃ seed. Lot-wise F₃ generation rearing by maintaining 3 replications /lot and recording of some economical traits. Selection and elimination based on desired traits.</p> | <p>Selection of pure line parental stock for utilization in actual breeding programme. Crossing of pureline selected parents will lead to selection of improved. Eri silkworm hybrid/breed. Estimation of general and specific combining ability will be helpful to identify suitable cross combinations for future breeding programmes. Single pair mating of selected hybrids and recurrent selection will lead to attaining a certain level of homozygosity in the desired traits.</p> | 6.59 |

| | | | | | | | |
|---|-------------------------|--|-----------|-----------|--|--|-------|
| 7 | AIP 0500 13 SI | Impact of elevated CO ₂ and temperature on muga silkworm and its primary host plant | Mar, 2020 | Feb, 2023 | Analysis for biochemical constituents, protein, lipid, carbohydrate, etc. for muga silkworm. Cocoon quality parameters will be analysed. Assessment of fecundity, hatching % and other related observations. Grainage activity Activities under Q4, Q5, Q6 will be repeated for 2 nd and 3 rd seed crop. | Change in biochemical properties of the muga silkworm, cocoon and silk characteristics, seed production affected under treatments. Nutrition parameters of host plants and their effects on silkworm growth will be quantified for 2 nd and 3 rd seed crop. Change in biochemical properties of the muga silkworm, cocoon and silk characteristics, seed production affected under treatments will be assessed in 2 nd seed | 5.38 |
| 8 | ARP 0501 5SI | Development of chemical based control measures for management of pebrine disease in <i>Antheraea assamensis</i> Helfer | Jan, 2021 | Dec, 2023 | Sample collection, isolation and purification of spores; Extraction of Microsporidian DNA; Designing of primers, amplification ITS, and sequencing analysis Taxonomic identification of microsporidian pathogen; Procurement of Trinocular stereo zoom dissection microscope with digital camera | Isolation and purification of spores; Extraction of Microsporidian DNA; Designing of primers, amplification ITS, and Taxonomic identification of microsporidian pathogen; Procurement of Trinocular stereo zoom dissection microscope with digital camera | 7.0 |
| 9 | AIT 0501 6MI | Integrating genomic and transcriptomics resources for functional insight into the biology of muga Silkmoth | Jan, 2021 | Dec, 2023 | Development of database to access the genomics and transcriptomics data of muga silkworm. Annotation of genome, transcriptome and | Project initiated recently. | 30.09 |

| | | | | | | | |
|------------------------|--------------|---|-----------|-----------|--|--|------|
| | | <i>Antheraea assamensis</i> | | | proteome data using bioinformatics tools using whole genome and transcriptome data | | |
| 10 | CFC 5017 MI | Exploration and adoption of novel solvent based muga cocoon cooking technology for increasing its reelability and raw silk quality | Mar, 2021 | Feb, 2023 | Procurement of cocoons, chemicals, identification and collection of micro-organisms from potential sources Purification, characterization and selection of potential isolates Lab scale trials on commercial reeling cocoons for differently dried cocoons, Comparative evaluation of treatments | Development of cooking formulation. Microbial consortium for an alternative eco-friendly Muga cocoon cooking Reelability and raw silk quality results indicating the efficacy of the newly developed formulation | 8.50 |
| 11 | APR 0501 8SI | Effect of various host plants separately and in combination on Rearing and grainage performance of Muga silkworm, <i>Antheraea assamensis</i> H | Mar, 2021 | Feb, 2024 | Selection and maintenance of host plants for rearing performance of muga silkworm. Analysis of effect of various hosts plants separately and in combination on rearing performance of muga silkworm. | Host plants garden will be maintained properly for rearing of muga silkworms. Rearing performance data will be generated for each host plants and will be analyzed | 5.00 |
| 12 | MFM 5019 MI | Development of honeycomb mountages and harvesting technology for Muga cocoon production with improved uniformity and raw silk recovery | Mar, 2021 | Feb, 2023 | Insect morphological study and design optimization. Fabrication of Honeycomb mountages. Feasibility trials (at CSB units & DoS units). | The silkworm morphology data will be utilized to optimize the cell dimensions of mountages. The mountages will be fabricated through suitable materials and techniques. Assessment of cocoon production and resulting cocoon characteristics | 6.90 |
| At nested units | | | | | | | |
| 13 | APR 05008 | Standardization of Rearing | Oct, 2019 | Sep, 2022 | Observation on emergence, coupling | Observation on emergence, | 5.55 |

| | | | | | | | |
|----|--------------|--|-----------|-----------|--|---|---------------|
| | SI | and Grainage Technologies of <i>Antheraea frithi</i> Moore | | | and diapauses behaviour. Standardization of optimum coupling duration for maximum hatching and egg laying device. Chawki rearing followed by adult silkworm rearing. Photoperiodic treatment | coupling and diapauses behaviour. Standardization of optimum coupling duration for maximum hatching and egg laying device. Chawki rearing followed by adult silkworm. Photoperiodic treatment. | |
| 14 | AIB 05009 SI | Isolation of thermo-tolerant line(s) of Oak tasar silkworm <i>Antheraea proylei</i> J. | Oct, 2019 | Sep, 2022 | Grainage and cellular rearing after induction of thermal stress and selection of tolerant population at every generation. Protein profiling and detection of heat shock proteins. DNA isolation and development of SCAR marker though RAPD-PCR and sequencing. | Grainage and cellular rearing after induction of thermal stress and selection of tolerant population at every generation. Protein profiling. DNA isolation and development of SCAR marker though RAPD-PCR and sequencing. | 6.50 |
| 15 | APR 05010 SI | Evaluation of Eri Silkworm Races suitable for different agro-climatic conditions of Manipur. | Oct, 2019 | Sep, 2022 | Rearing of Eri silkworm races/ strains/ breeds in three host plants in four seasons will be continued. | Rearing of Eri silkworm races/ strains/ breeds will be reared in four seasons. Rearing of promising eco-races will be done on three food plants. | 3.50 |
| | | | | | | Total | 106.38 |

Annex- 5.I.2

1.1.2 Projects to be concluded during the year 2021 -22

| # | Code | Title | Start | End | Project Outcome | Utility of output/Impact on silk industry | Financial (Rs. In lakhs) |
|-------------------|--------------|--|-----------|---------------------------|--|---|--------------------------|
| At main institute | | | | | | | |
| 1 | BPP 05014 CN | Standardization of Processing and Production | Mar, 2020 | May, 2021 (extended upto) | Standardization of protocol for preparation of mulberry leaf for production of | A standardized protocol for production of mulberry tea and mulberry green tea | 0.00 |

| | | | | | | | |
|-----------------|--------------|---|-----------|--|---|---|------|
| | | of a Consumable Beverage from Mulberry Leaves and Blending with Green Tea | | Nov, 2021) | mulberry tea and mulberry green tea (blending of green tea with mulberry leaves). Standardization of protocol for blending of processed mulberry leaf with green tea for value addition. Evaluation of biochemical and organoleptic properties and customer's acceptance of the products. | (blending of green tea with mulberry leaves). Biochemical and organoleptic properties and customer's acceptance of the products. | |
| 2 | APS 050 01EF | Development of technology for enhancing egg laying in Vanya Silk moths by application of host plant volatiles. (DST funded project) | Mar, 2018 | Feb, 2021 (extended up to Sept., 2021) | To survey and establish population diversity of Muga and Eri silk moths and host plants in relation to egg productions. Bioassay studies to confirm the enhancement of egg production in Muga and Eri. | To develop a technology which will directly involved in increasing the egg production and will be adopted by the Silkworm Seed production units of Vanya seed sector in North-Eastern states of India to support Vanya silkworm seed sector and the overall Vanya silk production in the country. | 0.00 |
| At nested units | | | | | | | 0 |
| 3 | MOE 05003 EF | Socio-economic uplifting of farmers through adoption of improved technologies and skill development in Eri culture | Sep, 2018 | Aug, 2021 | Permanent garden perennial food plant (Kesseru, Tapioca, Borpat) Seasonal garden of castor (high yielding). Intercropping of both perennial and seasonal food plant garden. Manure Package of Practices in food plant garden. Rearing of high yielding breed of Eri | All milestones are of great impact in Eri silk industry. | - |

| | | | | | | | |
|--|--|---------------------------|--|--|---|--|------|
| | | (External funded project) | | | silkworm (C-2 breed). Early Stage Rearing technologies. Late Stage Rearing technologies. Pest & diseases control technologies Seed Cocoon Production technologies. Yarn production using spanning machine. Utilization of Eri-culture wastages as organic manure. Value Addition to Eri Cocoon Shell through Colouring. Improvement of economies of scale : 1. through intercropping. 2. through rearing. Improvement through seed cocoon production. Improvement through DFLs production, value addition | | |
| | | | | | | | 0.00 |

Annex- 5.I.3**1.1.3 New Projects to be initiated during the year 2021 -22**

| # | Code | Title | Start | End | Objectives | Expected outcome | Financial (Rs. In lakhs) |
|-------------------|------|--|-------|------|--|--|--------------------------|
| At main institute | | | | | | | |
| 1 | - | <i>In-situ</i> conservation of muga silkworms in natural habitat –Phase II | 2021 | 2026 | Fortification of Muga silkworm host plants at natural habitat Enrichment of Muga silkworm population at conservation site Assessment genetic variability among | Muga silkworms will be conserved at natural habitat. It helps in preventing the extinction of this precious species The germplasm resource will be readily | 4.00 |

| | | | | | | | |
|------------------------|---|--|------------|------------|--|---|------|
| | | | | | gene pool of Muga silkworm at conservation sites | available for utilization in development of new breeds | |
| 2 | - | Evaluation of different bed disinfectants suitable for eri silkworm, <i>Samia ricini</i> rearing | Sept. 2021 | Aug. 2024 | Identification of Eri silkworm pathogens infect during different crops seasons Screening and evaluation of different bed disinfectants suitable for eri silkworm rearing Development of a new bed disinfectant for controlling microbial diseases in eri silkworm rearing. | Identification of Eri silkworm pathogens and their characterizations Identification of suitable bed disinfectants for application in eri silkworm rearing to enhance ERR and ultimately improvement in productivity | 8.50 |
| 3 | - | Commercial egg production technology in eri-culture for synchronization of hatching and subsequent rearing | July, 2021 | June, 2023 | Standardization and selection of suitable egg laying device for commercial loose egg production in eri. Synchronization of hatching and subsequent rearing. Popularization of loose egg production in Eri-culture. | Production of more DFLs per unit area. Significantly reduced labour and time. Synchronization in hatching and further rearing performance. Uniformity in rearing performance and less labour throughout the rearing and also during spinning stage. Scaling up of production of eri DFLs. The new technology may be applied in developing egg production enterprise in Northeast and other eri growing regions of India. | 5.00 |
| At nested units | | | | | | | |
| 4 | | Impact of adoption of improved oak tasar | Oct, 2021 | Sep, 2024 | To assess the adoption level of improved oak tasar technologies. | The proposed project will help in understanding the adoption level of | 4.00 |

| | | | | | | | |
|--------------|--|--------------------------|--|--|--|---|--------------|
| | | technologies in Manipur. | | | To explore further strategies for better adoption towards improved cocoon yield. | technologies among the farmers. The factors influencing the adoption of technologies by the farmers will be identified. More number of rural people would be motivated to take up oak tasar culture as an enterprise. | |
| Total | | | | | | | 21.50 |

1.2 With CI from the Institute (Collaborative projects with other CSB Institutes)

Annex- 5.I.4

1.2.1. Projects of earlier year continued through the year 2021 -22

| # | Code | Title | Start | End | Milestone to be crossed | Progress to be achieved | Financial (Rs. In lakhs) |
|-------------------|--------------------|---|------------|------------|--|---|--------------------------|
| At main institute | | | | | | | |
| 1 | BPS 01013 CN | Utilization and diversification of silkworm pupae products for human & animal consumption and composting. | Sep, 2020 | Aug, 2022 | Microbial analysis of spent pupae and Analysis of bioactive compounds. SDS-PAGE analysis of pupae proteins. 2D-Electrophoresis of pupae proteins. MALDI-TOF/MS or LC-MS/MS analysis of identified proteins. | Microbial and bioactive compounds analysis will be analysed. Molecular mass distribution of pupae proteins. Target proteins will be identified. Identification of target proteins by bioinformatics tools. | 6.00 |
| 2 | CYF 7014 MI | Development of 3D woven silk fabrics and their applications | July, 2020 | June, 2022 | Development for possible 3D woven fabric architectures and their respective weave designs and weaving process parameters. Weaving of 3D fabrics with | Weaving of 3D fabrics with various combinations of yarn and materials as per the designs will be done. Property evaluation and Physical | 0.00 |

| | | | | | | | |
|-----------------|--|--|--|--|---|---|-------------|
| | | | | | various combinations of yarn materials as per the designs. Physical characterization of 3D silk fabrics and their property evaluation | characterization of the developed 3D silk fabrics will be done. | |
| At nested units | | | | | | | 0.00 |
| Total | | | | | | | 6.00 |

Annex- 5.I.5**1.2.2. Projects to be concluded during the year 2021-22**

| # | Code | Title | Start | End | Project Outcome | Utility of output/Impact on silk industry | Financial (Rs. In lakhs) |
|-------------------|--------------------|---|------------|-----------|---|--|--------------------------|
| At main institute | | | | | | | |
| 1 | CYF 07010 MI | Grading of Muga silk yarn- Development of methods and procedure | June, 2019 | May, 2021 | Method of testing and grading for muga silk yarn. | It would bring fair trade practices among muga silk traders/weavers and reelers. | 1.70 |
| At nested units | | | | | | | 0.00 |
| Total | | | | | | | 1.70 |

Annex- 5.I.6**1.2.3. New Projects to be initiated during the year 2021-22**

| # | Code | Title | Start | End | Objectives | Expected outcome | Financial (Rs. In lakhs) |
|-------------------|------|--|-----------|-----------|--|---|--------------------------|
| At main institute | | | | | | | |
| 1 | - | Purification and characterization of nutraceutical grade Vanya sericin for its prospective application | Sep, 2021 | Aug, 2024 | To develop a low cost extraction method/process for separation of nutraceutical grade sericin from waste cocoons. To elucidate its potential in food sector. To study the anti-obesity, anti-diabetic and anti-canceric potential of sericin | Development of low cost protocol/technology for separation of nutraceutical grade sericin from waste cocoons. To elucidate its potential for nutraceuticals. Value addition to vanya sericulture silk waste | 6.60 |

| | | | | | | | | |
|-----------------|--|--|--|--|--|--|--|--------------|
| At nested units | | | | | | | | 0.00 |
| | | | | | | | | Total |
| | | | | | | | | 6.60 |

- 2. Transfer of Technology (ToTs) Programmes to be carried out during 2021-22**
(ToT programmes will be executed in the form of project involving MSS units. These will be submitted separately in project mode).

Annex- 5. II.1

2.1 On Station Trials (for validation of technology at CSB institutes/ RSRs/ DoS units etc.)

| # | Name of the Technology | Unit Cost (Rs.) | At CSB institutes | RSRs | DOS Units | Total No. of trials | Budget (Rs. in Lakhs) | Anticipated Impact |
|----------|--|-----------------|-------------------|------|-----------|---------------------|-----------------------|--|
| 1 | On Station trials of technologies developed for integrated pest management in Oak tasar rearing | | | | | | | |
| 1.1 | Validation of IPM technology for control of uzi fly in oak tasar culture | 3000 | | 2 | 3 | 5 | 0.15 | Reduction in uzi infestation below 10%. |
| 1.2 | Validation of use of Biopesticides for control of insect pest infesting <i>Q. serrata</i> . | 3000 | | 2 | 3 | 5 | 0.15 | 70-75% reduction in pest infestation. |
| 2 | On station multi-locational trials of muga and eri silkworm breeds/cross breeds | | | | | | | |
| 2.1 | Multi-location trials of muga breeds CMR-1 CMR-2 | 20,000 | 1 | 3 | 2 | 6 | 1.20 | For approval of new muga breeds by HAC |
| 2.2 | Multi-location trials of Eri breeds/cross breeds | 10,000 | 1 | 3 | 2 | 6 | 0.60 | Target as per HAC norms |
| 2.3 | Bio-formulation for management of <i>Alternaria</i> blight disease of castor | 5,000 | - | 1 | 5 | 6 | 0.30 | Reduction of disease incidence by 50-70% |
| 3 | Integration studies on Muga Seed Cocoon and Seed Preservation Technologies | | | | | | | |
| 3.1 | Development of seed preservation technology for Muga silkworm, <i>Antheraea assamensis</i> | 30,000 | 3 | - | - | 3 | 0.90 | 20,000 cocoons per treatment |
| 4 | On station trials of muga silkworm egg treatment (heat) for uniform hatching and higher survivability of young larvae | | | | | | | |
| 4.1 | Validation of muga silkworm egg treatment for uniform hatching and higher survivability | 1,000 | 5 | - | - | 5 | 0.05 | 200 dfls /unit |

| | | | | | | | | |
|--------------|---|-------|---|---|---|-----------|-------------|------------------|
| | of young larvae | | | | | | | |
| 5 | Summer crop management in Muga (in coordination with MSSO, Guwahati) | | | | | | | |
| 5.1 | Rearing management of muga silkworm in cooler region during summer | 20000 | 1 | 2 | - | 3 | 0.60 | 500dfls/ unit |
| Total | | | | | | 39 | 3.95 | |

Annex- 5. II.2**2.2 On Farm Trials (for demonstration of Technologies at farmers' level)**

| # | Name of the Technology | Unit Cost (Rs.) | No. of locations | No. of stakeholders | Cost (Rs. lakh) |
|----------|--|--------------------------|---|---|-----------------|
| 1 | On farm trials (popularization) of improved perennial host plant of eri silkworm | | | | |
| 1.1 | Popularization of Kesseru Eri host plant HF005 and HF008 | 2,210 (per farmer) | 5 locations (Fatehpur, Imphal, Boko, Lakhimpur, Upper Assam) | 400 | 8.84 |
| 1.2 | Popularization of Borpat Eri host plant | | | | |
| 1.3 | Popularization of other host plants | | | | |
| 2 | On farm trials of silkworm protection formulations, devices and practices for higher productivity (muga silkworm) | | | | |
| 2.1 | LED light trap for control of muga insect pests | 1,000/- | 3 (Upper lower and middle Assam) | 50 (10 farmers per location) | 0.50 |
| 2.2 | Evaluation and popularization of Eri egg incubation device | 500/- | 3 (Upper lower and middle Assam) | 50 | 0.25 |
| 2.3 | Formulation for controlling bacterial flacherie disease in Muga silkworm | 20,000/- per location | 5 (5 districts) | 50 | 1.00 |
| 2.4 | Validation of use of PET bottles for uzi trap in muga silkworm rearing | 5,000 | 3 (locations in Assam) | 30 | 0.50 |
| 2.5 | Integrated Practice of ITK and Modern Technology for Muga Silkworm Seed production | 2,500 | 6 (Golaghat, Sivsagar, Lakhimpur, Dhemaji Goalpara and Kamrup) | 30 (CMER&TI: 10, RSRS Boko: 10 and REC, Lakhimpur :10) | 0.75 |
| 2.6 | Integrated Practice of ITK and Modern Technology for Higher Muga cocoon yield | 5,000 | 5 (Sivsagar, Dibrugarh, | 25 (CMER&TI: 10 and | 1.25 |

| | | | Lakhimpur, Dhemaji and East Siang of Arunachal Pradesh) | REC:15) | |
|--------------|---|-------|--|------------|--------------|
| 3 | Integrated on farm trials of technologies for higher productivity in oak tasar rearing | | | | |
| 3.1 | Establishment and Popularization of new breed C27 among farmers. | 6,000 | 3 (locations in Manipur) | 10 | 0.60 |
| 3.2 | Validation of use of PET bottles for uzi trap in oak tasar silkworm rearing | 5,000 | 3 (locations in Manipur) | 30 | 0.50 |
| 3.3 | Validation of use of Sodium hypochlorite for seed treatment against tiger band disease of oak tasar silkworm. | 6,000 | 3 (locations in Manipur) | 10 | 0.60 |
| Total | | | 39 | 685 | 14.79 |

Annex- 5. III

3. Capacity Building & Training programmes to be carried out during 2021-22

| # | Title of the training programme | Target | | |
|-------------|--|----------------|---------------------|--------------------------|
| | | Physical (No.) | No. of stakeholders | Financial (Rs. in lakhs) |
| 3.1 | Structured Training Course* | | | |
| 3.1.1 | PGDS | | | |
| 3.1.2 | Intensive Sericulture Training | | | |
| 3.2 | Farmers Skill Training | 16 | 400 | 18.00 |
| 3.2.1 | | | | |
| 3.2.2 | | | | |
| 3.3 | Exposure visit for technology awareness | | | |
| 3.4 | Technology Orientation Programme | 08 | 200 | 7.60 |
| 3.5 | Sericulture Resource Centres (SRCs) | 45 | 900 | 6.75 |
| 3.6 | Training under Post Cocoon Sector** | 06 | 150 | 5.40 |
| 3.6.1 | | | | |
| 3.6.2 | | | | |
| 3.6.3 | | | | |
| 3.7 | Management Development Programme under STEP | | | |
| 3.8 | Training for Adopted Seed Rearers (ASRs) | | | |
| 3.9 | Training to Registered Seed Producers (RSPs) | | | |
| 3.10 | Training on Seed Act | | | |
| 3.11 | Other Need Based Training Programme | | | |
| 3.12 | Non-CBT: Training programme funded by | 04 | 100 | |

| | | | | |
|-------------|--|-----------|-------------|--------------|
| | agencies other than CSB* | | | |
| 3.12.1 | | | | |
| 3.12.2 | | | | |
| 3.13 | Training under SAMARTH *** | 12 | 300 | |
| 3.13.1 | Pre-cocoon (Silkworm rearing) | | | |
| 3.13.2 | Post cocoon – Silk (Reeling, Spinning, Wet processing) | | | |
| 3.13.3 | Post cocoon – Handloom (Designing & Weaving) | | | |
| | Total | 91 | 2050 | 37.75 |

* Pl specify the details, ** Name of training with duration, *** only NSQF aligned courses

Annex- 5. IV

4. Extension Communication Programmes to be conducted during 2021-22

| # | Programmes | Unit cost (Rs.) | Fund to be utilized (Rs. in lakhs) | No. of events | | | | | No. of stakeholders to be sensitized | | | | |
|-----|---|--------------------------|------------------------------------|---------------|-----------|-----------|-----------|-----------|--------------------------------------|------------|-------------|-------------|-------------|
| | | | | I Qtr | II Qtr | III Qtr | IV Qtr | Total | I Qtr | II Qtr | III Qtr | IV Qtr | Total |
| 4.1 | Krishi Mela / Reelers Mela cum exhibition | 3.0 and 1.50 (Each RSRS) | 6.00 | | | 1 | 2 | 3 | | | 400 | 400 | 800 |
| 4.2 | Farmers Field day | 0.15 | 1.20 | 2 | 2 | 2 | 2 | 8 | 140 | 140 | 140 | 140 | 560 |
| 4.3 | Awareness programme | 0.10 | 2.30 | 4 | 5 | 7 | 7 | 23 | 200 | 250 | 350 | 350 | 1150 |
| 4.4 | Technology demonstration / Enlightenment programmes | 0.01 | 0.23 | 4 | 5 | 7 | 7 | 23 | 80 | 100 | 140 | 140 | 460 |
| 4.5 | Workshop / Seminars & Conferences | 2 (1 RSRS Boko) | 3.00 | | | 1 | 1 | 2 | | | 100 | 100 | 200 |
| 4.6 | Other activities | | | | | | | | | | | | |
| | Total | | 12.73 | 10 | 12 | 18 | 19 | 59 | 420 | 490 | 1130 | 1130 | 3170 |

Note: i) As already communicated through AAP minutes, the budget to be restricted in accordance to the stakeholders attended.

ii) Krishimela at RSRSs with 200-300 farmers at Rs. 1.25 lakh per event

| Particulars | Krishi Mela/ Reelers Mela cum exhibition | Farmers Field day | Awareness programme | Technology demonstration / Enlightenment programmes | Workshop/ Seminars & Conferences |
|-----------------------|--|-------------------|---------------------|---|----------------------------------|
| No. of farmers | 400-500 | 50-100 | 50-100 | 20 | 100 |
| Unit cost (Rs. lakhs) | 2.50 | 0.07-0.15 | 0.05-0.10 | 0.01 | 2.00 |

Annex -5.V

5. Soil samples analysis to be carried out during the year 2021 -22

| # | Item | Unit cost (Rs. in lakh) | Target (No.) | Financial (Rs. in lakh) |
|--------------|-------------------|-------------------------------|--------------|----------------------------|
| 1 | Assam | 0.012 | 20 | 0.24 |
| 2 | Meghalaya | 0.012 | 20 | 0.24 |
| 3 | Manipur | 0.012 | 10 | 0.12 |
| 4 | Mizoram | 0.012 | 10 | 0.12 |
| 5 | Nagaland | 0.012 | 10 | 0.12 |
| 6 | Arunachal Pradesh | 0.012 | 10 | 0.12 |
| Total | | | 80 | 0.96 |

Annex -5.VI

6. Information, Education and Communication

| # | Item | Target (No.) | Financial (Rs. in lakh) |
|--------------|------------------------------------|--------------|----------------------------|
| 6.1 | Periodicals | 4 | 2.00 |
| 6.2 | Publications | | |
| 6.2.1 | Research papers-National | 5 | 1.00 |
| 6.2.2 | Research papers-International | 15 | 2.00 |
| 6.2.3 | Proceedings/ Abstracts | 15 | 0.75 |
| 6.2.4 | Books/ Book Chapters/ Manuals etc. | 10 | 1.00 |
| 6.2.5 | Popular Articles | 10 | - |
| 6.2.6 | Booklets, Brochures etc. | 10 | 0.50 |
| 6.3 | Extension literature | 10 | - |
| 6.4 | Films/ Videos | 15 | 0.50 |
| 6.5 | Social media | 25 | |
| Total | | 119 | 7.75 |

Annex-5.VII

7. Patents to be filed/ granted and Technologies to be Commercialized

| # | Item | Details | Financial (Rs. In lakh) |
|--------------|---|---|----------------------------|
| 7.1 | Patents to be filed | | |
| 7.1.1 | New Egg laying devices for synchronization of hatching in eri silkworms | Commercial egg production in eri culture | 0.50 |
| 7.2 | Patents to be granted | | 0.00 |
| 7.3 | Technologies to be commercialized | 1. New eri Cocoon opener 2. Muga Silk Plus 3. New disinfectant formulation for silkworm rearing | 1.50 |
| 7.3.1 | | | 0.00 |
| 7.4 | Software, mobile/ android app developed etc. | Mobile will be designed and developed to identify the disease of host | 3.00 |
| Total | | | 5.00 |

Annex -5.VIII

8. Revenue Generation for the year 2021-22

| # | Source of Revenue Generation | Physical (No.) | Revenue to be generated (Rs. In lakhs) |
|------------|--|----------------|--|
| 8.1 | Patent (Technology) | | |
| 8.1.1 | License Fee collected | | - |
| 8.1.2 | Royalty collected | | - |
| 8.2 | Testing & Analytical charges (Sample) | | |
| 8.2.1 | Testing of Soil / water / FYM / Leaf etc | | 0.50 |
| 8.2.2 | Quality analysis/ testing of products | | 0 |
| 8.2.3 | Testing of cocoons / silk yarn/fabric etc. | | 0 |
| 8.3 | Consultancy (Services) | | 1.00 |
| 8.4 | Supply/ sale proceeds of cutting / Sapling/ seedling/ chawki worms/ cocoons/ Silk etc. | | 0 |
| 8.4.1 | Mulberry cutting | | 0 |
| 8.4.2 | Vanya host plant sapling/ seedling | | 1.00 |
| 8.4.3 | Mulberry chawki worms | | 0 |
| 8.4.4 | Mulberry seed (DFLs) | | 0 |
| 8.4.5 | Vanya DFLs | | 0.00 |
| 8.4.6 | Cocoons | | 2.00 |
| 8.4.7 | Output from R&D Projects (Silk, fabric etc.) | | 5.00 |
| 8.4.8. | Others (pl specify) as given below | | |
| 8.4.8.1 | Guest house /Hostel charges | | 4.00 |
| 8.4.8.2 | Licenses fees | | 9.00 |
| 8.4.8.3 | Convenience charge | | 0.35 |
| 8.4.8.4 | Other Misc. receipt (excess payment recovery, computer advance recovery, auction proceeds, etc.) | | 8.00 |
| 8.4.8.5 | Course fees from students etc. | | 1.20 |
| 8.4.8.6 | Intercropping in between Som, Kesseru etc. | | 0.95 |
| | | Total | 33.00 |

Annex-5.IX

9. Procurement of equipments and other accessories

| # | Equipment/other requirement | Quantity | Justification | Approx. price (Rs. in lakhs) |
|---|-----------------------------|----------|--|------------------------------|
| | At main institute | | | |
| 1 | High power Binocular | 1 | Required for survey of host plants in natural forest areas under germplasm evaluation programme. | 0.50 |
| 2 | Clinometer | 1 | To measure elevation angle and height of the trees under germplasm evaluation programme.. | 0.30 |
| 3 | Digital caliper | 1 | Required for recording stem and petiole diameter under germplasm evaluation programme | 0.10 |
| 4 | Portable digital pH meter | 1 | For recording soil pH at the host plant collection sites under germplasm evaluation programme | 0.15 |

| | | | | |
|----|--|----|---|--------------|
| 5 | Gel Electrophoresis | 1 | Required for molecular characterization of Host Plant germplasm under germplasm evaluation programme | 4.00 |
| 6 | Medium throughput Drone with mounted high resolution camera | 1 | Required for the digital mapping of Host plant collection sites under germplasm evaluation programme. | 1.50 |
| 7 | Infra Red Gas Analysers (IRGA) with florescence probe | 1 | Evaluation of host plant leaves for their carbon assimilation process. In the changing environment and present climate change scenario, change in the carbon dynamics of the plants, this is very necessary to understand the various aspect of the carbon dynamic. Therefore due to high accuracy, utilization and performance over the various experiments IRGA with florescence probe is highly needed at CMERTI. This instrument will also be utilized in evaluation of the host plant germplasm. | 48.0 |
| 8 | Double Distillation Unit (02) | 2 | Required for the continuous supply of distilled water for the analysis of various parameters in different labs | 1.00 |
| 9 | Laboratory Working bench | 02 | For JRF, SRF project fellow working in various pr | 3.00 |
| 10 | Double distillation unit | 01 | For different project work in biotechnology division | 1.50 |
| 11 | Mobile App development | 1 | Mobile will be designed and developed to identify the disease of host plants and silkworms based on image analysis | 3.00 |
| 12 | Trinocular stereo zoom dissection microscope with digital camera | 01 | ARP 05015SI project activities (In the project budget) | 2.50 |
| 13 | Geneious prime software for molecular biology analysis (1 year subscription) | 01 | For analysis of genome sequencing data, primer design, bioinformatics, expression analysis, genomics, phylogenetics etc. for ARP 05015SI project | 0.50 |
| 14 | Liquid nitrogen container (7 ltrs approx) | 01 | For storing liquid nitrogen required for DNA, RNA extraction of silkworm and host plants- Additional requirement for pathology dept | 0.30 |
| 15 | UPS for desktop computer- Additional requirement for pathology dept | 01 | For backup of desktop during power failure | 0.06 |
| | | | Total (A) | 66.41 |
| | At nested units | | | |
| | RSRS, Imphal | | | |
| 1 | BOD incubator. | 1 | For incubation of eggs. | 2.50 |
| 2 | Refrigerator | 1 | For preservation of eggs. | 0.30 |
| 3 | Wooden cages for | 20 | Required to preserve the seed cocoons (separate | 2.00 |

| | | | | |
|----|---|----|---|--------------|
| | cocoon consignment and racks | | cage required for each replicate) for further grainage activities. | |
| 4 | Deep freezer (min. temp. = - 20°C) | 1 | Required for short term preservation of larval and pupal samples and other materials. | 0.60 |
| 5 | Environmental Test Chamber | 1 | For induction of thermal stress to silkworms | 5.00 |
| 6 | Hot air oven | 1 | Storing in samples preparation, disinfections and other purposed | 1.20 |
| 7 | Rearing equipments (Racks, secateurs, small plastic trays, bamboo basket etc) | | Rearing accessories are required | 0.50 |
| | | | Total (B) | 12.10 |
| | RSRS, Boko | | | |
| 1 | Distilled water plant | 1 | Distill water is required for any experimental works | 0.50 |
| 2 | Double Beam UV-VIS Spectrophotometer | 1 | Analysis of samples through spectrophotometric methods time to time, an very important equipment for laboratory | 4.00 |
| 3 | Hot water bath | 2 | Required for sample preparation of any biochemical and other works | 0.10 |
| 4 | Shaking Hot Water Bath | 1 | Required for sample preparation of any biochemical and other works | 0.20 |
| 5 | Magnetic stirrer | 2 | Required for sample preparation any biochemical and other works | 0.06 |
| 6 | Electronic Balance | 2 | Required for weighing the samples, larvae, cocoons and chemicals | 0.80 |
| 7 | pH Meter | 2 | Required for measuring the pH of any samples | 0.20 |
| 8 | Centrifuge | 2 | For preparation of samples for mother moth examination in grainage operation and other laboratory works | 2.00 |
| 9 | Microscope | 4 | Required for mother moth examination in grainage operation and other laboratory works | 0.80 |
| 10 | Refrigerator | 2 | Storing the samples in low temperature | 0.60 |
| 11 | Hot Air Oven | 1 | Storing in samples preparation, disinfections and other purposed | 1.00 |
| 12 | BOD Incubator | 1 | Storing in samples preparation, disinfections and other purposed | 1.00 |
| 13 | Bio-safety cabinet | 1 | Any microbiological works, biosafety cabinet is required to check contamination and infection | 3.00 |
| 14 | Micro pipette | 4 | Required to measure the smaller volumes of the liquid, sample preparation etc. | 0.10 |
| 15 | Autoclave | 1 | To sterilize the samples, media and other materials | 0.50 |
| 16 | Air conditioner (1.5 Ton) | 3 | To maintain the room temperature in laboratory, molecular biological samples preparation etc. | 1.20 |
| | | | Total (C) | 16.06 |
| | REC, Lakhimpur | | | |
| 1 | Repairing/renovati | 01 | Routine maintenance of old building | 0.50 |

| | | | | |
|---|-------------------------------------|----|--|---------------|
| | on of office building | | | |
| 2 | Plastic chair | 05 | Office use | 0.05 |
| 3 | Tarpaulin | 2 | Silkworm rearing shade at outdoor | 0.05 |
| 4 | Ceiling Fan/ Pedestrial fan | 02 | Office use | 0.05 |
| | | | Total (D) | 0.65 |
| | REC, Coochbehar | | | |
| 1 | Desktop computer with table and UPS | 1 | We have only one Computer so at least one alternative computer should be there as backup. (existing computer is about 17 year old) | 0.50 |
| | | | Total (E) | 0.50 |
| | | | Grand Total | 162.13 |

Annex -5.X

10. Other Activities to be taken up during the year 2021-22: Nil

Annex - 5.XI

11. Target at a Glance for the year 2021-22

| Name of the Institute | Research Projects as PI | | | Research Projects as CI | | | On Station Trials | | On Farm Trials | | | Capacity Building & Training | | Extension Communication Programmes (ECPs) | | | | | | | | | | |
|--------------------------------|--|------------------------------------|------------------------------|--|------------------------------------|------------------------------|-------------------------------------|-----------------------------|--|--------------------------------|-----------------------------------|---------------------------------|-----------------------------------|---|-------------------|---------------------|---|-----------------------------------|--------------|------------------|----------------------|--|---|--|
| | Projects of earlier year continued through | Projects concluded during the year | New Projects to be initiated | Projects of earlier year continued through | Projects concluded during the year | New Projects to be initiated | No. Of technologies to be validated | No. of trials to be covered | No. Of technologies to be demonstrated | No. of locations to be covered | No. of stakeholders to be covered | No. of Programs to be Conducted | No. of stakeholders to be trained | Krishi Mela / Reelers mela cum exhibition | Farmers Field day | Awareness programme | Technology demonstration / Enlightenment programmes | Workshop / Seminars & Conferences | Field Visits | Other activities | Soil sample analysis | Information, Education and Communication | No. of patents to be filed/ granted and technologies to be commercialised | Revenue to be generated (Rs. in Lakhs) |
| CMER&TI, Lahdoigarh | 15 | 03 | 04 | 02 | 01 | 01 | 08 | 39 | 12 | 39 | 685 | 91 | 2050 | 03 | 08 | 23 | 23 | 02 | 20 | - | 80 | 119 | 1/0/3/1 | 33.00 |