

**CENTRAL MUGA ERI RESEARCH & TRAINING INSTITUTE (CMER&TI),
LAHDOIGARH**

1. Organizational set up

Unit	Place
RSRSs (2)	1. RSRS, Imphal, Manipur 2. RSRS, Boko, Assam
RECs (3)	1. REC, Lakhimpur, Uttar Pradesh 2. REC, Coochbehar, West Bengal 3. REC, Fatehpur, Uttar Pradesh
Field laboratory (1)	1. FL, Titabor, Assam

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 2020-21	11	Annex 5.I.1
1.1.2.	Projects to be concluded during the year 2020-21	10	Annex 5.I.2
1.1.3.	New Projects to be initiated during 2020-21	05	Annex 5.I.3
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1.2.1.	Projects of earlier year continued through the year 2020-21	01	Annex 5.I.4
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1.2.3.	New Projects to be initiated during 2020-21	01	Annex 5.I.6
2.	Transfer of Technology		
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2.2.2.	2.2.2. No. of locations to be covered	16	
2.2.3.	2.2.3. No. of stakeholders to be covered	240	
3.	Capacity Building & Training (CBT)		Annex 5.III
3.1	No. of programmes to be conducted	83	
3.2.	No. of stakeholders to be trained	1950	
4.	Extension Communication Programs (No.)		Annex 5.IV
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4.4.	Awareness programme	16	
4.6.	Technology demonstration / Enlightenment programmes	16	
4.7.	Workshop / Seminars & Conferences	01	
4.8.	Other activities (<i>Please specify</i>).	-	
5.	Soil Analysis Service to be Provided	80	Annex 5.V
6.	Information, Education & Communication		Annex 5.VI
6.1.	Periodicals	04	
6.2.	Publications	15	
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6.4.	Films / Videos	05	
6.5.	Social media	20	

7.	Patents to be filed/ granted, technologies to be commercialized, Software, mobile/ android app developed	1/0/1	Annex 5.VII
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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 2020-21

#	Code	Title	Start	End	Milestone to be crossed	Progress to be achieved
At main institute						
1	MOE 05004 EF	Adoption of improved technologies of muga culture for sustainable elevation of cocoon production in the tribal belt of Assam	Aug., 2019	Jul., 2022	Benchmark Survey of remaining 50 farmers has to be conducted in the study area. Remaining Extension program and training program has to be conducted in the study area.	Benchmark survey of 50 farmers in the study area. Database of the farmer updated. Training program to the targeted beneficiary. Exposure visit and extension programs like farmers day , field day etc
2	PIB 05005 SI	Genetic enhancement of Castor (<i>Ricinus communis</i> L.) germplasm as a source material for development of productive perennial varieties.	Oct., 2019	Sept., 2022	Data recording on morphometric, biochemical and bioassay traits from collected castor accessions. Selection of top ranking desired complimentary parents from collected accessions. Plantation of F ₁ seed (1 st crossing lot) and selfed seed (Mass selection lot). Preliminary selection from F ₁ generation of 1 st crossing and mass selection lots. Bagging of selected plants for selfing to harvest pure F ₂ seeds. Crossing of selected complimentary and donor parents in different cross combinations such as Wild/Un-adapted perennial × Shortlisted castor accession collected from IIOR, Hyderabad and YTP-1 perennial variety X Improved/elite breeding material (NBR-1) (2 nd crossing lot). Maintenance of plantations as per recommended package of practices.	Enrichment of gene-pool with emphasis on perennial trait. Selection of potential complimentary and donor parents for crossing. Preliminary selection of perennial castor hybrids in F ₁ generation and harvesting of pure F ₂ seed from selected hybrids.
3	AIB 05006	Breeding of muga	Oct., 2019	Sept., 2022	Selection of pupae based on better cocoon	Basic genetic stock to start the breeding program.

	SI	silkworms for improved silk quality and disease tolerance			characteristics. Setting up of crosses based on contrasting characteristics. Rearing of progeny and selection based on cocoon characteristics. Study of heterosis, hybrid vigour and other data analysis.	Better genetic stock from the selection for breeding. Better progeny resulting from different crossing regimes
4	APR 05007 SI	Standardization of chawki rearing practices for Eri silkworm, <i>Samia ricini</i> (Donovan).	Oct., 2019	Sept., 2022	Establishment of castor garden, procurement of equipment for rearing and fabrication of rearing equipment, 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 eco-races	Suitable castor garden for chawki and fabrication of rearing equipment. Performance of different ecoraces. Suitable ecoraces and their performance. Standardization of chawki rearing practices. Standardization of suitable chawki rearing practices of different ecoraces
5	AIT 05011 EF	Molecular investigation into the ligno-cellulolytic system of a few wild silkworm in North East India (DBT funded)	Sept. 2019	Aug., 2022	Rearing of silkworm and feeding experiments of different host plants. Gut extraction, PCR enrichment, library creation and sequencing. Cultivation of microbes (fungi, bacteria) with potential for ligno-cellulolytic potential. Bioinformatics and biostatistical analysis for structure, variation and composition for inference on foliage influence	20 microbiome samples from eri and muga silkworm fed on different host plants will be sequenced and achieved in NCBI database. LCMS analysis of digested metabolite will be assayed
6	AIB 05012 SI	Inter and intra-specific hybridization for improvement of eri silkworm, <i>Samia ricini</i> Donovan	Mar., 2019	Feb., 2024	Three eco-races viz., Borduar, Kokrajhar and Titabar and C2 breed will be collected from GPB. Rear wild eri silkworm in <i>ex-situ</i> condition for F ₂ generation. Recording of all rearing performance data. Selfing of wild eri	Collection of Ganung ecorace and wild eri silkworm. Inbreed rearing to obtain homozygous population. Rearing will be conducted following standard methodology and the rearing data of each

					silkworm, selected ecoraces and C2 breed. Grainage activities for producing F ₁ , F ₂ , F ₃ selfed seeds, fecundity, morphologies of moths, eggs etc. Rearing of wild, eco-races and C2 breed separately and maintain F ₁ , F ₂ , F ₃ generations and recording of all rearing performance data Preservation of seed cocoons separately for each eco race, C2 breed and wild silkworm in cages under NRT.	generation will be calculated.
7	AIP 05013 SI	Impact of elevated CO ₂ and temperature on muga silkworm and its primary host plant	Mar., 2020	Feb., 2023	Recruitment of the project staff. Procurement process for equipments required in the project	Request for project staff has been made. Indent for the instrument such as open top Chamber, Soil thermometer and vernier caliper has been made.
At nested units						
8	MOE 05003 EF	Socio-economic uplifting of farmers through adoption of improved technologies and skill development in eri culture - (DST funded)	Aug., 2018	Jul., 2021	Training for skill development. Increase in crop production Increase in land productivity and Change in land use pattern Increase in family income new technologies adapted Publications produced	Production of eri silkworm cocoons through improved technologies and skill development in eri culture
9	AIB 05008 SI	Standardization of Rearing and Grainage Technologies of <i>Antheraea frithi</i> Moore	Oct., 2019	Sept., 2022	Designing of different devices of cocoon preservation. Photoperiodic treatment. Chawki rearing followed by adult rearing in different devices and their standardization. Photoperiodic treatment and maintenance of optimum microclimatic condition. Designing of different devices of cocoon preservation. Studies on diapause behaviour.	Collection of <i>Antheraea frithi</i> seed cocoons. Designing of different devices of cocoon preservation, Observation on emergence, coupling and diapauses behavior. Rearing of silkworm in different devices.

10	AIB 05009 SI	Isolation of thermo-tolerant line(s) of oak tasar silkworm <i>Antheraea proylei</i> J	Oct., 2019	Sept., 2022	Rearing of larvae by indoor rearing technique, induction of thermal stress during V instar, Selection of live pupae after thermal. Protein profiling, detection of HSP expression from larval samples. Grainage and Cellular rearing of F1 to F5 progenies followed by thermal stress induction to larvae. Selection of tolerant populations at every generation. DNA isolation, development of SCAR markers through RAPD-PCR and sequencing after every generation	Procurement of equipments, appliances and consumables. Grainage activities and preparation of DFLs. Rearing of larvae by indoor rearing technique, induction of thermal treatment (32-38°C). Protein profiling, detection of HSP expression from larval samples obtained from 1st generation of treated larval population. stress during V instar, Selection of live pupae after thermal treatment (32-38°C). Grainage and Cellular rearing of F1 to F5 progenies followed by thermal stress induction to larvae. Selection of tolerant populations at every generation. DNA isolation, development of SCAR markers through RAPD-PCR and sequencing after every generation
11	AIB 05010 SI	Evaluation of eri silkworm races suitable for different agro-climatic conditions of Manipur	Oct., 2019	Sept., 2022	Collection of eri silkworm races/ strains/ breeds from the germplasm. Cultivation and management of eri food plants. Rearing of Eri silkworm races/ strains/ breeds in three host plants in four seasons	Procurement of infrastructure and equipments, rearing appliances and consultation of literature. Collection of eri silkworm races/ strains/ breeds from the germplasm. Rearing of Eri silkworm races/ strains/ breeds in three host plants in four seasons. Cultivation and management of eri food plants.

Annex- 5.I.2

1.1.2. Projects to be concluded during the year 2020-21

#	Code	Title	Start	End	Project outcome	Utility of out-put/ Impact on silk industry
At main institute						
1	APS 05001 EF	Development of technology for enhancing egg laying in Vanya Silk	Mar., 2018	Feb., 2021	To enhance the potential fecundity of Muga and Eri silk moths by treating with host plant leaf volatiles prepared from different	After large scale bioassay trial of the volatiles or their blending, we can identify a suitable volatile which can enhance the

		moths by application of host plant volatiles (DBT funded)			host plants. Establishment of population diversity of Muga and eri silkworm across India in relation to Egg laying. The leaf volatile of <i>P. bombycina</i> enhances the fecundity of Muga silkworm in comparison to control and other secondary host plants. Similarly, Eri silkworm realized fecundity was found maximum when Castor leaf volatile was applied in the Kharikas during oviposition. The highly sensitive Muga and Eri host plant leaf volatiles identifications and their response to silk-moth antenna are under progress.	realized fecundity of Muga and Eri silkworm.
2	AIT 5876	Establishment of Institutional biotech hub 3 rd phase (DBT funded)	Feb., 2014	Nov., 2020	The Biotech Hub successfully organized many workshops cum hands on training programmes to the selected participants besides organizing many other science popularization programmes from schools to postgraduate students in the area of Seribiotechnology and related disciplines and the Coordinators were able to deliver a lot through these programme. Many graduate and postgraduate students completed their dissertation work in support with the Hub from nearby and other institutions. The facilities created under Biotech Hub have been continuously utilizing by the Scientists and scholars of the institute and other neighboring institute for their projects/Ph.D. research etc. The Biotech Hub was able to disseminate knowledge and popularize basic science and R&D advancement in the area of modern bioscience through	2 nd phase of the project will be started once the funding agency will release the grant along with guidelines.

					its different HRD programmes organized since its inception. Due to awareness and motivation, many college students came to the institute and availed the lab. facility for their dissertation work.	
3	PPA 5879	Assessment of phytochemical diversity in Som (<i>Persea bombycina</i> Kost), the primary host plant of <i>Antheraea assamensis</i> Helfer from Northeast India	Sept., 2016	Aug., 2019 (upto Aug., 2020)	Seasonal and Regional Phytochemical Diversity of Som and soil nutrient availability has been evaluated for Aherua and Bhodia 2019. Morphological data sheet/descriptor preparation is completed. Phytochemical diversity of the three different location has been studied for pigment content (Chl a, Chl b, carotenoids, and Anthocynins), carbohydrate, protein, lipid, phenol, moisture content, extractable pH, membrane stability etc for Aherua and Bhodia season. Anthocynin content at Dakuakhanna was observed 30% lower than compared to Tura and Goalpara during Bhodia-19 in all three leaf stages. Moisture content was found significantly lower at Dhakuakhanna in Bhodia-19 season. The reduction in rainfall during Aherua season-19 was observed at Goalpara (20%) and Tura (17%) and increase at Dakuakhanna (15%).	This study will support to understand the impact of intrinsic soil nutrient capacity and their effect on phytochemical diversity of Som.
4	ARP 5887	Isolation and characterization of lytic bacteriophages infecting bacterial pathogens of Muga silkworm <i>Antheraea assamensis</i> Helfer (DST funded)	Apr., 2017	Mar., 2020	Fresh infected cadavers of Muga silkworms were collected for isolation of the bacterial pathogens and preserved at 4°C for isolation of phages from environmental purposes. Soil, water, litter, manure samples from cattle, sheep etc., and sewage effluent were collected for screening for the presence of phage active against	The phage cocktail will be used for management of bacterial disease in muga silk worm. This will / may reduce mortality due to the bacterial flacherie in the field.

					these bacteria. During spot test, clear zones are spotted in the samples and spot test are again performed with the dilutions to obtain single plaques of phage which confirms the presence of phage. The clear plaques containing phage are picked and dissolved in SM buffer and stored at -20°C as phage stocks for further purification. <i>In vivo</i> tests of the formulated phage stocks (phage cocktail) were conducted <i>in-vitro</i> condition which will be repeated for confirmation.	
5	ARP 5889	Studies on the cross transmission of pebrine spores from lepidopteran caterpillars to Muga silkworm (<i>Antheraea assamensis</i> Helfer) and its control measures	Jun., 2017	May, 2020	Isolation of pebrine spores from wild silkworms belong to Saturniidae insects has been performed. Pathogenicity test of the isolated spores has been conducted and positive result obtained. Experiments on cross transmission of pebrine disease between different insect species belong to Saturniidae family has been conducted. Morphometric studies of different spores isolated from different lepidopteran caterpillars have been performed.	From the studies, it will give ideas on cross transmission of pebrine spores from wild lepidopteran insects to muga silkworm coexisting in the same ecosystem.
6	APR 5890	Biodiversity Assessment of Wild silk moths and Rearing Potentialities of Muga (<i>Antheraea assamensis</i> Helfer) and Eri (<i>Samia ricini</i> Donovan) for sustainable development in Nagaland (DBT-funded).	Feb., 2017	Jan., 2020	Cross breeding and hybridization experiments Diversity assessment of collected sericigenous insect Collection of morphological data on the specimens As per RAC comment; recording of earlier works done on similar aspects to be appraised	DNA barcoding techniques are laboratory standardized for diversity assessment Morphological data of collected specimens done Samples sent for sequencing by outsourcing and data obtained for analysis and open source database submission.

7	APR 5892	Formulation of Semi-synthetic diets for rearing of Muga silkworm, <i>Antheraea assamensis</i> Helfer	Apr., 2017	Jul., 2020	Ten different combinations of semi-synthetic diet were prepared and two diets (D ₇ and D ₁₀) were selected based on larval mortality, body weight gain and ERR% (10 & 14%) against the control 18%. Rearing of silkworms on selected artificial diet and outdoor. Analyses and compiling of data for final submission.	The formulated semi-synthetic diet (D ₁₀) can be use for rearing of young age larval during unfavourable seasons and old age worms rearing will be taken up in the outdoor field conditions.
8	PPF 5893	Impact assessment of petroleum crude oil activities on Muga Silkworm (<i>Antheraea assamensis</i> Helfer) and its host plants in Assam	Oct., 2017	Sept., 2020	Results finding suggested that the larval period of Muga silkworm was longer at contaminated site than the control site during seasonal crops. Silk ratio (%) of female cocoon was ranges 5.19 to 8.49 which are lower than the control (8.25 to 9.01). Silk ratio (%) of male cocoon was ranges 3.63 to 9.56 which are lower than the control (9.71 to 11.01). ERR (%) was 36.24, 44.40, 31.02, 30.00, 38.36 and 45.08 in Chatua (Feb-Mar), Jethua (Apr-May), Aherua (Jun-Jul), Bhodia (Aug-Sep), Kotia (Oct-Nov) and Jarua (Dec-Jan) crops, respectively which are lesser than the control. Seasonal distribution of Chlorophyll, Protein, Carbohydrate, Lipid, Amino Acid and Phenol constituents in Som plant leaf samples suggested that significantly declined due to overload of aerosol and particulate matters on leaves.	The multiple trial of rearing at contaminated sites will helps to evaluate the impact level of petroleum crude oil activities on Muga silk. Based on the above activities, the best results will be shared between Muga farmers and DoS and transferring of knowledge towards Muga rearers. It also helps in the better utilization of land masses in these areas.
9	AIB 5894	<i>In-situ</i> conservation of muga and other wild silk moths in Natural Habitat	Apr., 2016	Jun., 2020	Established <i>in situ</i> conservation sites for muga silkworms in three different states namely Assam including BTC, Meghalaya and Arunachal Pradesh MOU signing between CSB and State sericulture departments of Assam,	Utilization of Muga germplasm developed at conservation sites for breeding purpose Conservation of Muga silkworms in their natural habitat

					BTC, Meghalaya and Arunachal Pradesh up to 30 years for – <i>in situ</i> conservation sites	
At nested units						
10	ARE 4726	Bio-ecology, economic injury level and management of insect pest infesting oak ecosystem	Jun., 2017	May, 2020	Population dynamics of Uzi fly, semi-looper and hairy caterpillar studied for 2 years and correlation analysis with abiotic factors worked out. Studied the biology of uzifly, semi-looper and hairy caterpillar. Determined larval instars of hairy caterpillar, <i>Phalera raya</i> and semilooper, <i>Hyblaea puera</i> as six and five larval instars respectively through application of Dyars Law. Developed an IPM strategy for control of uzi fly. Developed a PET bottle trap for control of uzi fly. Economic Injury level for <i>P. raya</i> is determined as 1.45 larva per plant and that of <i>H.puera</i> as 5.90 larva /plant. Bioneem (10ml/l) is found to be most effective and significantly superior over all other treatments in reducing the <i>P. raya</i> and <i>H.puera</i> population. Prepared technology booklet on Integrated pest Management of uzi fly .	Large scale adoption of PET bottle uzi trap at farmers level reduced the uzi fly infestation. This will ultimately increase the seed cocoon recovery ranging from 13% to 16% from control. The determined economic injury level (EIL) will helped the farmers in timely application of biopesticides. The recommended biopesticides (Bioneem 10ml/l) for control of oak pest reduced the indiscriminate use of hazardous chemical insecticides by the farmers for insect pest control.

Annex- 5.I.3

1.1.3. New Projects to be initiated during 2020-21

#	Title	Start	End	Expected outcome
At main institute				
1	Development of control measures for management of pebrine disease in <i>Antheraea assamensis</i> Helfer.	Sept., 2020	Aug., 2023	The proposed study may generate a protocol for integrated management of pebrine disease in Muga culture on the basis of information generated on the etiology and pathogenesis of Microsporidian pathogen in Muga silkworm. This information will be useful to generate strategies for interrupting the life cycle of the pathogen to reduce the disease spread in Muga culture at North Eastern states. In addition to this 6 reliable diagnostic methodology will be achieved for detection of

				all life stages of microsporidian sp. causing pebrine disease in Muga silkworm. The developed technology will promote a common practice for governmental institutions and private sectors involved in Muga sericulture. Besides, it can be routinely used to monitor and protect the proliferation of microsporidia in Muga silkworm rearing and basic seed production centres (P4, P3 and P2) of MSSO for the safe supply of disease free layings (dfls) to farmers/stakeholders.
2	Exploration, collection, conservation and evaluation of tapioca (<i>Manihot esculanta</i>) varieties for large scale eri rearing in North East India.	Sept., 2020	Aug., 2023	Popularisation of high palatability varieties of tapioca toward farmers for mass cultivation, to increase production and productivity. Higher income generation of farmers due to dual utilities of tapioca plants.
3	Collection, characterization and conservation of genetic resources of Eri and Muga host plants	Sept., 2020	Aug., 2023	The existing gene pool will be enriched with varied genotypes of Eri and Muga host plants. Collection and conservation of diverse genetic stocks will help breeders in choosing the parental material for utilization in various breeding programmes for the improvement of Eri and Muga Host plants. Evaluation of the enriched gene pool will consequently lead to identifying the most suitable accessions of Muga and Eri host plants for commercialization. CMER&TI, Lahdoigarh will be developed as the only germplasm resource centre for Muga and Eri host plants in the country.
4	Utilization of genomic and transcriptomics data in breeding of muga silk moth <i>Antheraea assamensis</i> – Phase II	Sept., 2020	Aug., 2023	SNP markers for marker-assisted breeding to speed up the breeding process in muga culture. Information on silk genes of wild silk moths. Complete gene list of muga silkworm with putative functions including immunity and silk characters. Public release of muga genome resources via web-enabled database embedded with BLAST functionality. Genes linked to peculiar behavior of muga silkworm
5	Degumming of <i>Antheraea assamensis</i> Helder cocoon with novel enzymes (protease, lipase etc.) to enhance silk recovery	Sept., 2020	Aug., 2023	Muga silkworms are exclusively found in the North eastern regions of India and hitherto the possibility of microbial enzymes in effective degumming of cocoons for better silk recovery. As commercial enzymatic preparations are expensive and not readily accessible to reelers, the untapped microbial gene pool of entire Northeast India can be a potential source of novel proteolytic enzymes. The use of proteolytic enzymes will help to strengthen Muga silk industry by enhancing productivity (silk recovery), saving resources like energy and chemicals and improving quality of silk.
At nested units				

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 2020-21

#	Code	Title	Start	End	Milestone to be crossed	Progress to be achieved
At main institute						
1	CYF 07010 MI	Grading of Muga silk yarn- Development of methods and procedure (In collaboration with CSTRI, Bengaluru)	Jun., 2019	May, 2021	To develop standard test procedures and photographs for assessment of muga silk yarn quality. To develop suitable grading / classification norms for quality assessment.	The muga yarn samples will be tested to generate data that will be used to develop suitable muga yarn testing methods for grading of muga silk. The test results will be compiled, analysed and extrapolated to form a flexible scale grading method.

Annex- 5.I.5

1.2.2. Projects to be concluded during the year 2020-21

#	Code	Title	Start	End	Project outcome	Utility of out-put/impact on silk industry
At main institute						
At nested units						
1	ARP 3606	Development of a diagnostic tool for early detection of baculovirus causing Tiger band disease in <i>Antheraea proylei</i> (in collaboration with SBRL, Kodathi)	Feb., 2017	Jan., 2020 (Extended to upto Aug., 2020)	Confirmed that the possible source of tiger band disease infection is through the egg surface. Developed an effective egg disinfection technique with 0.2 % Sodium hypochlorite (NaOCl) and found the disinfected eggs to be free from <i>AnprNPV</i> contamination and demonstrated to the stakeholders. Determined the LT ₅₀ value of <i>AnprNPV</i> polyhedra against III instar larvae of <i>Antheraea proylei</i> as 7.2 and 9.3 days during summer and spring crop respectively. Screened other Lepidopteran pests for presence of the viral pathogen through PCR technique and revealed that <i>AnprNPV</i> can cross-infect only across the closely related lepidopterans belonging to the	The developed egg disinfection technique with 0.2 % Sodium hypochlorite (NaOCl) helped in preparation and supply of tiger band disease free layings. RSRS, Imphal has started adopting 0.2 % Sodium hypochlorite egg disinfection technique in oak tasar grainage. The egg disinfection technique ensured 88-92 % hatching (control 80-90%) minimizing the tiger band infection and enhancing the cocoon productivity by 12 to 15 % over control. The disinfectants / formulations developed will also help in reducing the tiger band disease spread thereby enhancing oak tasar silk production and providing the rural poor with better remuneration.

					<p>Saturniidae family. Confirmed <i>Anpr</i>NPV infection in the haemolymph and different tissues of tiger band infected <i>A.proylei</i> larvae.</p> <p>Studied the rearing performance of 0.2 % Sodium hypochlorite (NaOCl) and recorded 12 to 15% increases in cocoon productivity over control.</p> <p>Prepared technology booklet on egg disinfection technique using 0.2 % Sodium hypochlorite and distributed to the stakeholders.</p>	
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Annex- 5.I.6

1.2.3. New Projects to be initiated during 2020-21

#	Title	Start	End	Expected outcome
At main institute				
1	Development of 3D Woven Silk Fabrics And Their Applications (in collaboration with CSTRI, Bengaluru)	Jun., 2020	May., 2022	Optimized and easily adoptable technology of weaving for producing specific end use fabric structures. Increased value addition particularly for low cost silken materials like noil yarns etc. thereby improving the prospectus and added income for weaver's community. Possibility to increase the Indian export potential of silken materials.

2. Transfer of Technology Programmes to be carried out during 2020-21

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.in lakhs)	At CSB institutes	RSRs REC, etc	DOS Units	Total	Total cost (In lakh)
1	Validation of new disinfection formulations for controlling flacherie disease	0.10	1	3	2	6	0.60
2	Validation of microbial formulation for reclamation of oil contaminated soils	0.15	-	-	3	3	0.45
3	Validation of LED light trap for control of Muga insect pests	0.01	1	5	4	10	0.10
4	Validation of use of Sodium Hypochlorite for seed treatment against tiger band disease of Oak tasar silkworm	0.06	-	2	5	7	0.42
5	Validation of use of PET bottles for uzi trap in Oak tasar silkworm including Muga	0.05	2	3	5	10	0.50

6	Establishment and Popularization of new breed C27 among farmers (300 dfls per unit)	0.06	-	2	5	7	0.600
Total budget				12	24	43	2.67

Annex- 5.II.2

2.2. On Farm Trials (for demonstration of Technologies at farmers' level)

#	Name of the Technology	Unit Cost (Rs. In lakhs)	No. of locations	No. of stakeholders	Total cost (Rs)
1	Popularization of Eri host plants Kesseru morpho-types HF005 and HF008	0.02	02 (Upper and lower Assam)	50	1.00
2	Popularization of Eri host plants Borpat <i>Alianthus Grandis</i>	0.02	02 (Upper and lower Assam)	10	0.20
3	Evaluation of INM package for castor	0.02	02 (Upper and lower Assam)	10	0.20
4	Evaluation of Beneficial gut microflora in muga silkworm rearing	0.02	02 (Upper and lower Assam)	10	0.20
5	Evaluation of New Eri cocoon opener	0.004	04 (Assam, Meghalaya, Manipur, Nagaland)	100	0.40
6	Evaluation and Popularization of eri egg incubation device	0.001	02 (Upper and lower Assam)	50	0.05
7	Validation of ITK for higher muga cocoon yield	0.05	02 (Upper and lower Assam)	10	0.50
Total budget				240	1.95

Annex- 5. III

3. Capacity Building & Training programmes to be carried out during 2020-21

#	Title of the training programme	Unit cost (Rs.)	Target	
			Physical (No.)	Financial (Rs. in lakh)
3.1	Structured Training Course*	-	-	-
3.1.1	PGDS	-	-	-
3.1.2	Intensive Sericulture Training	-	-	-
3.2	Farmers Skill Training	4500	16 (400)	18.00
3.3	Exposure visit for technology awareness	-	-	-
3.4	Technology Orientation Programme	3800	08 (200)	7.60
3.5	Sericulture Resource Centres (SRCs)	75000	45 (900)	6.75
3.6	Training under Post Cocoon Sector**	3600	04 (100)	3.60
3.6.1	5 days training on pedal cum motorized eri spinning machine			
3.6.2	5 days training on MRTM and Sonalika reeling machine			
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 agencies other than CSB*	-	05 (200)	-
3.13	Training under SAMARTH ***	-	05 (150)	-
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		83 (1950)	35.95

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

Annex- 5. IV

4. Extension Communication Programmes to be conducted during 2020-21

#	Programmes	Unit cost (Rs. In lakhs)	No. of events					No. of stakeholders to be sensitized					Budget (in Lakhs)
			I Qtr	II Qtr	III Qtr	IV Qtr	Total	I Qtr	II Qtr	III Qtr	IV Qtr	Total	
4.1	Krishi Mela / Farmers meet	2.50 / 1.25	--	--	1	2	3	--	--	400	600	1000	5.00
4.2	Farmers Field days	0.07-0.15	1	1	1	1	4	50	50	50	50	200	0.60
4.3	Awareness programme	0.05-0.10	1	5	5	5	16	50	200	200	200	650	1.60
4.4	Technology demo. / En-lightment programmes	0.01	1	5	5	5	16	20	100	100	100	320	0.16
4.5	Workshop / Seminars & Conferences	2.00	--	--	1		1	--	--	100	--	--	2.00
4.6	Other activities	--	--	--	--	--	--	--	--	--	--	--	--
	Total	--	3	11	13	13	40	120	350	850	950	2170	9.36

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

ii) Krishimela at RSRs 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 Analysis services to be provided during the year 2020-21

#	Name of state	Target	Unit cost (Rs. In lakhs)	Total (Rs.in Lakhs)
5.1	Assam	20	0.012	0.24
5.2	BTC, Assam	20	0.012	0.24
5.3	Manipur	20	0.012	0.24
5.4	Arunachal Pradesh	20	0.012	0.24
	Total			0.96

Annex -5.VI

6. Information, Education and Communication

#	Item	Target (No.)	Budget (lakhs)
6.1	Periodicals	4	5.00
6.2	Publications		
6.2.1	Research papers-National	5	
6.2.2	Research papers-International	10	
6.2.3	Proceedings/ Abstracts	15	
6.2.4	Books/ Book Chapters/ Manuals etc.	5	
6.2.5	Popular Articles	10	
6.2.6	Booklets, Brochures etc.	10	
6.3	Extension literature	10	
6.4	Films/ Videos	5	
6.5	Social media	20	
Total		94	5.00

Annex-5.VII

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

#	Item	Details	Budget in lakhs
7.1	Patents to be filed		
7.1.1	New disinfectant formulation for silkworm rearing	A new chemical disinfectants formulation is developed for management of bacterial flacherie disease of Muga silkworms. The formulations can protect Muga silkworm larvae from infection and enhance cocoon production (~18 %) in summer crops. The formulation may be even applied during rearing time in the field.	1.50
7.2	Patents to be granted		
7.3	Technologies to be commercialized		
7.3.1	Muga Silk plus	Muga silk plus - an effective cooking chemical for Muga cocoon A chemical formulation has been developed for cooking Muga cocoon which can enhance the Muga silk recovery up to 55%, against 40- 48% silk recovery in traditional Khar and soda cooking method. This low cost chemical (Rs. 30/ per 500 gm) is soluble in water. Hence, the cooking process is simple. The quality of reeled yarn is also improved by this chemical	0.50
7.3.2	New Eri cocoon opener	A new cocoon opener is designed for easy and smooth removal of eri pupae from the cocoons along with following advantages– <ul style="list-style-type: none"> ➤ Increased productivity in Eri cocoon opening without damaging the pupa / larvae. ➤ Quick and operator friendly equipment compared to the previous cocoon opener. 	0.50
7.4	Software, mobile/ android app developed etc.	Decision support based Mobile app for silkworm disease	2.00
		Total	4.50

Annex -5.VIII

8. Revenue Generation for the year 2020-21

Sl. No.	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.		-
8.4.1	Mulberry cutting		-
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
8.5.	Others (pl specify) as given below		
i	Guest house /Hostel charges		4.00
ii	Licenses fees		9.00
iii	Convenience charge		0.35
iv	Other Misc. receipt (excess payment recovery, computer advance recovery, auction proceeds, etc.)		8.00
v	Course fees from students etc.		1.20
vi	Intercropping in between Som, Kesseru etc.		0.95
		Total	33.00

Annex-5.IX

9. Other Activities to be taken up during the year 2020-21:

9.1 Land use and resource conservation (Rupees in Lakhs)

#	Details	Target	
		Physical	Financial (in lakhs)
1	Raising of Som / Soalu seedling (@Rs.5/- per seedling in polybag)	145000	7.25
2	Raising of Kesseru /Borpat seedlings (Raising cost per seedling Rs.3/- (without poly bag); Rs.5/- (in polybag)	32000	1.60
3	Raising of Oak seedlings (Raising cost per seedling Rs.3/-(without poly bag); Rs.5/- (in polybag)	10000	0.50

4	Supply of Som / Soalu seedling @ Rs.5/- per seedling	56000	-
5	Supply of Kesseru/Borpat seedling per seedling @ Rs. 3/-(without poly bag); Rs.5/- (in poly bag)	21000	-
6	Dfls brushing of Muga Commercial crop (Cost @ Rs. 10/- per dfl)	4700	0.470
7	Dfls brushing of Muga Seed crop (Cost @ Rs. 10/- per dfl)	2000	0.2000
8	Dfls brushing of Eri (Cost @ Rs. 5/- per dfl)	600	0.030
9	Muga Commercial cocoon production (@ 60 cocoons/dfl)	182000	-
10	Muga Seed cocoon production @ 40 cocoons/ dfl	112000	-
11	Eri cocoon production @ 10.0 kg shell /100dfl	60	-
12	Muga dfls production from 60% of cocoons generated from seed crop @ Cocoon : dfl is 3 :1 (g)	16800	-
13	Eri dfl production from own source of seed cocoons @ Cocoon : dfl is 3 :1 (Nos)	1600	-
14	Muga dfls supply @ Rs.10/- per dfl (g)	16800	-
15	Eri dfls supply	1600	-
16	Oak tasar rearing (dfls)	8800	-
17	Oak tasar cocoon production	300770	-
18	Oak tasar dfl production	45100	-
19	Oak tasar dfl supply	42300	-