RMIS-06

PART-I

PROGRESS FOR THE YEAR 2021-2022

CMER&TI Ladoigarh

Name of the Institute: CMER&TI, Lahdoigarh, Jorhat (Assam)

1. Organizational Set up

Unit:	No.	Place
RSRS/ RSTRS	02	Boko (Assam) and Imphal (Manipur)
REC/ STSC	03	Lakhimpur (Assam), Coochbehar (WB) and Fatehpur (UP).

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

Item	Target	Achievement	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 -2022	15	16	**Annex 5.I.1**
1.1.2. Projects continued through & concluded during the year 2021-2022	03	02	**Annex 5.I.2**
1.1.3. New Projects initiated during 2021-2022	04	03	**Annex 5.I.3**
1.2. With CI from the Institute			
1.2.1. Projects carried out during 2021 -2022	02	02	**Annex 5.I.4**
1.2.2. Projects continued through &concluded during the year 2021-2022	01	01	**Annex 5.I.5**
1.2.3. New Projects initiated during 2021-2022	01	00	**Annex 5.I.6**
2. Trial of Technologies (ToTs)			
2.1 On Station Trials (OST)			**Annex 5.II.1**
2.1.1. No. of technologies validated	08	07	
2.1.2. No. of trials	39	26	
2.2 On Farm Trials (OFT)			**Annex 5.II.2**
2.2.1. No. of technologies demonstrated	12	10	
2.2.2. No. of locations covered	39	31	
2.2.3. No. of stakeholders covered	685	114	
3. Capacity Building & Training (CBT)			**Annex 5.III**
3.1. No. of programmes conducted	89	86	
3.2. No. of stakeholders covered	2050	1957	
4. Extension Communication Programs (No.)			**Annex 5.IV**
4.1. Krishi Mela / Reelers mela cum exhibition	03	03	
4.2. Farmers Field day	08	06	
4.3. Awareness programme	23	22	
4.4. Tech. demonstration / Enlightenment programs	23	20	
4.5. Workshop / Seminars & Conferences	02	03	
4.6. Other activities (*Please specify*).			
5. Soil Samples analyzed	80	20	**Annex 5.V**
6. Information, Education & Communication			**Annex 5.VI**
6.1. Periodicals	4	00	
6.2. Publications	65	39	
6.3. Extension literature	10	08	
6.4. Films / Videos	15	03	
6.5.Social media	25	112	
7. Patents filed/granted, technology commercialized, Software, mobile apps developed etc.	1/0/3/1	00	**Annex 5.VII**
8. Revenue generated (Rs. in Lakhs)	33.00	25.44	**Annex 5.VIII**

9. Procurement of equipments and other accessories	95.22	16.80	**Annex 5.IX**
10. Other activities*(pl specify)*	**-**	**-**	**Annex 5.X**
11. Progress at a glance	**-**	**-**	**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 during 2021-2022

#	Code	Title	Start	End	Milestone to be crossed	Progress achieved	Fund utilized (lakhs)
At main Institute							
1	MOE 5004 EF	Adoption of improved sustainable technologies of muga culture for elevation of cocoon production in the tribal belt of Assam (DST funded project)	Aug 2019	July 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	• 7 Awareness Programs, 2 Group discussion, 1 Field day and 1 technology demonstration conducted and 710 farmers sensitized. • 3 Farmers training programs conducted at study area. They were provided with inputs like fertilizers, nylon net, DFL, Lahdoi, sodium hypo chloride, improved bamboo mountage etc. • Hands on training on use of Foot sprayer, Lahdoi & disinfectants demonstrations were also provided. • Mid-term survey, on crop performance, knowledge & adoption level of improved technologies after the ECP & Training programs completed.	0.00
2	PIB-5005 SI	Genetic enhancement of Castor (*Ricinus communis* L.) germplasm as a source material for development of productive perennial	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 (1st & 2nd	• Morpho-metric, seed characteristics, biochemical and bioassay of 17 collected castor accessions was completed. Data revealed that variability in metric traits ranges from 11.12 to 37.66% and in Biochemical traits from 2.61 to 48.16%.	3.28

		varieties.			crossing lots, respectively) and mass selection lots for raising F_1 and F_2 generations. • Preliminary selection in F_1 and F_2 generations of 2nd and 1st crossing/mass selection lots, respectively (poor biomass plants will be rejected). • Data recording on morpho-metric traits from F_2 generation of 1st crossing and mass selection lots. Analysis of the data and selection of promising hybrid. Bagging of these hybrids for harvesting pure F_3 seed. • Maintenance of plantation as per recommended package of practices.	Comparative analysis has shown that Accession no. 22 is superior in most of the economic traits with 1.329 kg leaf yield/plant. • Total 29 cross combinations were carried out. 02 wide crosses (NBR-1 X NBR-P-Imphal and NBR-1 X SBR-P-Shillong) were successfully carried out. Preliminary selections were carried out in F_1 generations of 1st&2nd crossing lots. F_2 generation of 1st crossing lot and F_1 generation of 2nd crossing lot is in progress. • Plantation of collected castor accessions, F_1 & F_2 generations was maintained as per recommended package of practices.	
3	AIB 5006 SI	Breeding of muga silkworms for improved silk quality and disease tolerance	Oct., 2019	Sept., 2022	• Collection of genetic • resources. • Crossing *A. assamensis* x *A. mezops.* • Selection of pupae based on better cocoon characteristics • Setting up of crosses based on contrasting characteristics	• Crossing of *A. assamensis* with *A. mezops* could not be completed as *A. mezops* was not found in the wild habitat. • Pupae have been selected based on better cocoon characteristics and fecundity. • Crosses have been set up from the selected genetic stock. The selected line is now being stabilized.	2.40

					• Rearing of progeny and selection based on cocoon characteristics • Study of heterosis, hybrid vigour and other data analysis. • Selection for better cocoon characteristics and diseases tolerance.	• Progeny are being reared and further selection is going on based even for biotic and abiotic stress on farm. The wild muga collected from different geographical regions were included in the breeding program for development of hibernating genetic stock with better cocoon characters and fecundity.	
4	APR 5007 SI	Standardization of chawki rearing practices for Eri silkworm, *Samia ricini* (Donovan)	Oct., 2019	Sept., 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.	• Commercially available C2 breed, borduar and mixed strains were collected & reared continiously. • Supplied chawki worms to selected farmers at Jorhat, Dhemaji, Golaghat districts of Assam and Chungtia of Nagaland. • Biochemical compositions of selected castor varieties have been estimated and the range of leaf quality parameters required for eri chawki worms standardized. • Standardized the chawki rearing techniques for commercially available C2 breed, borduar and mixed strains. • Demonstrations and field testing of eri chawki rearing were carried at selected farmer's field level • Significantly higher yield (>30%) was found through chawki rearing in comparison to conventional rearing technique.	8.47

5	AIT 5011 EF	Molecular investigation into the ligno-cellulolytic system of a few wild silkmoth in North East India (DBT funded project)	Oct., 2019	Sept., 2022	• Metagenome sequencing of gut community and bioinformatics analysis. • Screening assays for cellulase, xylanase etc for lignocelluloses degradation. • Identification of potential isolates and archiving.	• 19 Raw Meta-genomic sequence data were obtained analysed and compared. • 25 no's of amplified bacterial DNA sequence data were obtained from sanger sequencing and analysis is being carried out. • 5th instar eri larval samples collected from rearing on different host plants has been processed for isolation of Metagenomic DNA. • The rearing is reinitiated to obtain different strains of eri. • Enzyme activity assays as well as Molecular investigation of cellulolytic positive strains is going on.	0.00
6	AIB-5012 SI	Inter and intra-specific hybridization for improvement of eri silkworm, *Samia ricini* Donovan	Mar, 2020	Feb., 2024	• Selfing and grainage activities of each eco race and C2 breed to produce F_5 selfed seed and rearing. • Crossing of selected pure lines. Crossing of wild eri (*S. canningi*) as a male parent with selected pureline eco races and C2 breed. • Grainage activities to produce F_1 crossed seed. Composite rearing method in F_1 Generation by rearing 5 to 6 dfls of each cross combination. • Estimation of	• Selfing, grainage and rearing activities were carried out upto $\mathbf{F_7}$ generation to get purelines as per 61st RC suggestion. • Purelines of each ecorace and C2 breed were obtained with more than 95% purity. • Inter-specific hybridization was carried out by utilizing pure wild eri *S. canningi* as male parent to cross with Borduar (Yellow plain), Genung (Greenish blue plain), Kokrajhar (Greenish blue plain) & C2 breed. • Intra-specific hybridization was carried out by selecting pureline parents of ecoraces & C2 breed to cross in full diallel fashion. • Intra & Interspecific hybridization was carried out by following full diallel crossing method. Total 12 cross combination have been executed till date. F_1	4.52

					general and specific combining ability. • Selfing and grainage activities to produce crosswise F_2 seed. F_2 generation rearing and selection of hybrids from top, optimum and poor performing lots. • Single pair mating of selected lots to produce F_3 seed. • Lot-wise F_3 generation rearing and recording of some economical traits. • Selection and elimination based on desired traits.	generation rearing is in progress, larval characteristics were recorded. • Wild eri, *S. canningi* selfed F_2 grainage for producing F_3 seed showed erratic emergence. The coupling moth showed average fecundity 175.2 nos. and hatching 74.20%. F_3 generation rearing performance was completed and larval characteristics and ERR % were recorded. Assessment of cocoon parameters like cocoon weight, shell weight, shell ratio were recorded.	
7	AIP-5013 SI	Impact of elevated CO2 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 analyzed. • Assessment of fecundity, hatching % and other related observations. • Grainage activity • Activities under Q4, Q5, Q6 will be repeated for 2nd and 3rd seed crop.	• Open Top Chambers (OTCs) are yet to be procured and installed. Tender process for procurement and installation of 04 OTCs has been completed and financial approval is awaited from the standing committee. Som plot selected for the experiment was maintained as per recommended package of practices. The initial analysis of the bio-chemical properties of the leaf has been completed. The treatment on the host plants will be given after the establishment of the OTCs. Study to analyze the impact of high temperature and humidity on the Som by	2.39

						utilizing the existing facilities was completed and results were compiled. A book on the analyzed data depicting the impact of environment on Muga production from last 20 years was prepared and is under process for publication.	
8	BPP 5014 CN	Standardization of processing and production of a consumable beverage from mulberry leaves and blending with green Tea	Mar, 2020	June, 2021 (Recommended for extension upto June 2022 by 39th RAC)	• Blending of mulberry powder and CTC green tea. • Testing of products by taster and biochemical analysis	• Preliminary trials of blending processed mulberry powder and CTC green tea have been done. • The processed mulberry and tea leaves and their blended products were tasted by tasters of different tea broker houses. Biochemical analysis is in progress. • TTRI and AAU were advised to complete the remaining work as per industrial standards besides preparing sample sachets for customer trials and popularization.	0.00
9	ARP 5015 SI	Development of chemical based control measures for management of pebrine disease in Muga silkworm, *Antheraea asamensis* Helfer	Jan 2021	Dec 2023	• Sample collection, isolation and purification of spores; Extraction of Microsporidian DNA - Designing of primers, amplification ITS, & sequence analysis • Taxonomic identification of micro-sporidian pathogen; Procurement of Trinocular stereo zoom dissection microscope with	• Genomic DNA of microsporidian pathogen isolated. Spores purified for further studies. • New set of PCR primers suitable for amplification of ITS region designed. • Detection of micro-sporidian pathogen ongoing. • Taxonomic and evolutionary relationship of micro-sporidian pathogen of Muga silkworm with other microsporidian pathogens is ongoing. • Trinocular stereo zoom dissection microscope with digital camera was	5.14

					digital camera.	procured.	
10	AIT 5016 MI	Integrating genomic and transcriptomics resources for functional insight into the biology of Muga Silkmoth *Antheraea assamensis*	Jan., 2021	Dec, 2023	• Development of a database to access the genomics and transcriptomics data of muga silkworm. • Annotation of genome, transcriptome and proteome data using bio-informatics tools using whole genome and transcriptome data.	• Basic structure of web accessible database "Vanya Silkbase" is completed. • Assembly of genome is completed and its annotation is in process. • Sequences for genes of interest extracted from *Antheraea assamensis* genome for synteny analysis. • De-novo assembly of sericin homologs extracted from RNA seq data of *Antheraea assamensis* is continued.	15.27
11	CFC 5017 MI	Exploration and adoption of novel 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.	• Reeling cocoons have been procured and the comparative analysis of different cooking techniques on muga cocoons was carried out through mass reeling. The shelf life of new formulation is under validation. • Isolation of microbes from the collected samples using Nutrient Agar media, and gram's staining for the isolated sample was done. • The request for including Dr. D.K.Gogoi as Co-PI sent to CO and response awaited.	3.42
12	APR 5018 MI	Effect of various host plants separately and in combination on Rearing and grainage performance of Muga silkworm, *Antheraea*	Mar 2021	Feb 2023	• Selection and maintenance of host plants for rearing performance of muga silkworm. • Analysis of effect of various hosts plants separately and in combination on	• Four host plants selected and maintained. • Rearing of muga silkworm on four different food plants viz., Som, Soalu, Dighloti and Mejankori both solo and in combinations was carried out. Larval duration was found shorter in solo rearing	1.18

		assamensis Helfer			Rearing performance of muga silkworm.	(20-22 days on Som and Soalu; 25 days on Mejankori; 30-32 days on Dighloti) during Summer and Autumn crop. Longer larval duration was observed in case of combination rearing with host plants Mejankori and Dighloti (28-32 days) in Summer and Autumn crop. Chawki worms reared on mejankori, dighloti and combination with other host plants showed less mortality as compared to solo rearing on Som and Soalu. It was also observed that there was reluctance in feeding of chawki worms initially reared on the food plants Som and Soalu, and transferred to Mejankori. However, Mejankori to Som and Saolu did not have any problem in feeding behaviour.	
13	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	• Insect morphological study was conducted for two commercial seasons and the data obtained was used to optimize the mountage cell dimensions. • Initial trials on the newly designed mountages were carried out to foresee the quality of cocoon construction in comparison to other traditional methods. • Outsourcing/fabrication for manufacturing the mountage prototype is under progress.	1.70
At nested units							
14	APR 5008	Standardization of Rearing	Oct., 2019	Sept., 2022	• Observation on	• During 1st crop,	4.58

	SI	and Grainage Technologies of *Antheraea frithi* Moore			emergence, coupling and diapauses behaviour. • Standardization of optimum coupling duration for maximum hatching and egg laying device. • Chawki rearing followed by adult silkworm rearing. • Photoperiodic treatment	*Antheraea frithi* moths started emergence after undergoing 140-150 days of pupal diapause. • 52% natural coupling obtained inside the bamboo basket covered with black cloth and 75-80% hatching when allowed for 14 hrs of coupling. • Chawki rearing in indoor followed by outdoor rearing using *L. dealbata, Q. serrata and Q. grifhith*i showed the highest cocoon yield of 43 cocoons/dfl in *L. dealbata* fed worms. • During 2nd crop, *A. frithi* seed cocoons were consigned to photoperiodic treatment (following the procedure of *A. proylei*). Emergence of moth started after 28 days. The emerged male and female moths were mixed together in different devices for coupling. 54% coupling obtained with 75-82% hatching and avg. fecundity of 185-225. • During 2nd crop, Chawki rearing of *A. frithi* are conducted in indoor by feeding three different food plants *viz., L. dealbata, Q. serrata* and *Q. griffithi* leaves and adult rearing in outdoor condition with *L. dealbata, Q. serrata* and *Q. griffithi* leaves. The worms reared on *L. dealbata* recorded 41 cocoons/dfl followed by 12 cocoons/dfl on *Q.*	

						serrata and 9 cocoons/dfl on *Q. griffithi*. 4% moths emerged erratically.	
15	AIB 5009 SI	Isolation of thermo-tolerant lines of oak tasar silkworm *Antheraea proylei* J	Oct., 2019	Sept., 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.	• Hundred larvae each of three silkworm breeds *viz*., RTRS-1, C27 and *A proylei* were exposed to heat stress upto spinning. A separate set of larvae without heat stress as control lot. • Survival % of the heat treated silkworms was low and cocoons showed less weight as compared to control lot • Grainage of 3 breeds *viz*., *A. proylei*, RTRS-1 and C27 was conducted under photoperiodic treatment • During 2nd crop, silk worms were heat treated at (25ºC, 32ºC, 35ºC and 38ºC) on third day 5th instar larvae. • Hemolymphs were collected and total proteins of each sample were separated on a 15% SDS-PAGE. • Out of about 14 protein bands separated, 5 major proteins bands having high molecular weight were expressed differentially after heat was induced at different temperature. These proteins will be further identified by amino acid sequencing. Seed cocoons of heat tolerant population are preserved for continuing the generation.	3.57
16	APR 5010 SI	Evaluation of eri silkworm races suitable	Oct., 2019	Sept., 2022	• Rearing of Eri silkworm races/	• Spring crop (1st crop) rearing data: highest	1.57

		for different agro-climatic conditions of Manipur			strains/ breeds on three host plants in four seasons will be continued.	ERR recorded in C2 breed (92%) followed by Titabar ecorace (90%). Among the strains, highest ERR was recorded in YZ (90%) followed by YP (88%) and GBZ (87%) in low altitude area. In high altitude area, highest ERR in Borduar (85%) and C2 (84%). In case of strains, highest ERR in YP (82%) followed by GBP (79%). • Summer crop (2nd crop) rearing data: highest ERR in C2 (82%) and Borduar ecorace (81%). Among strains, highest ERR was in GBP (78%) followed by YP (73%) in low altitude area. In high altitude area, highest ERR was in Borduar(78%) followed by C2 (76%). In case of strains, highest ERR was in YP (75%) and GBP (74%). • In 3rd crop: highest ERR was in Titabar (86.6%) ecoraces and in yellow plain (86%) among the strains in low altitude. In high altitude, highest ERR was in Borduar (82%) and yellow plain (81%) among strains. C2 breed was at par in both the places but slightly lower ERR% observed. • Castor was most preferred host plant in both the places with 80 to 85% ERR.	

Annex- 5.I.2

1.1.2. Projects continued through and concluded during 2021-2022

Sl. No	Code	Title	Start	End	Progress achieved	Utility of output/Impact on silk industry	Fund utilized
At main institute							lakhs
1	APS 050 01E F	Development of technology for enhancing egg laying in Vanya Silk moths by application of host plant volatiles. (DST funded project)	Mar, 2018	Feb, 2021 (extend-ed up to Sept., 2021)	• Volatile blends to enhance egg laying in muga and eri are prepared and tested. • Initial limited evaluation trials have confirmed the enhancement in egg laying capacity of both Eri and Muga by spraying host plant volatiles. • Large scale evaluation trials could not be carried out due to non-vailability of funds during 3rd year of the project. • Evaluation trials will be carried out to confirm the effect of volatile blends on egg laying capacity of muga and eri.	Enhancement in egg laying capacity of muga and eri with the help of volatile blends will lead to enhanced muga and eri production.	0.00
At nested units							
2	MOE-5003 EF	Socio-economic uplifting of farmers through adoption of improved technologies and skill development in eri culture- (DST funded project)	Sept 2018	Aug., 2021	• Beneficiary's annual income from eri-culture has been increased. • Perennial and seasonal food plant garden raised by beneficiaries. • Beneficiary's capacity of DFL rearing per crop and number of crops per annum	• Contributed country's Annual increase of eri cocoon production. • Transform Eri-culture from unorganized to organized practices through raising of food plant gardens. • Beneficiaries Eri	0.00

					increased. • Beneficiaries enhance their economy by intercropping food plant gardens. • Litters and other Eri-wastages converted into usable manure.	culture skill developed.	

Annex- 5.I.3

1.1.3. New projects initiated during 2021-2022

Sl. No	Code	Title	Start	End	Milestone to be crossed	Progress achieved	Fund utilized (In lakhs)
At main institute							
1	APS-05020 MI	Commercial egg production technology for eri-culture	Feb 2022	Jan 2024	• Design and fabrication of different egg laying devices	Work on design and fabrication of different egg laying devices was initiated.	0.21
2	MOE-05022 MI	Evaluation and popularization of improved technologies developed in the field of Muga, Eri & Oak sector for Northeastern India (On-farm/on-station trials of CMERTI-Lahdoigarh)	Feb. 2022	Jan. 2024	• On Station trial (OST) of 08 newly developed technologies and On Field Trial (OFT) of 12 technologies.	• OST of 08 technologies was carried out at 19 locations. • 95 beneficiaries have so far been covered under 12 OFTs. Some targets could not be achieved due to Covid. However, max target will be achieved in up-coming season (Feb-Mar 2022).	0.45
At nested units							
3	APS-05021 EF	Studies on population diversity and role of host plant volatiles cues for enhancing egg laying in temperate tasar	Jan. 2022	Dec. 2024	• Collection and rearing of Oak tasar silk moths across the NER. • Feeding bioassay and evaluation of best suitable host on egg laying productivity	Project just initiated and code awaited.	0.00

		silk moth (*Antheraea proylei*) (DBT funded project)			• Evaluation of standard synthetic oviposition stimulants for enhancing egg laying in Oak tasar silk moths in NER		

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 during 2021-2022

Sl. No	Code	Title	Start	End	Milestone to be crossed	Progress achieved	Fund utilization (In lakhs)
At main institute							
1	BPS 1013 CN	Utilization and diversification of silkworm pupae products for human & animal consumption and composting	Sept. 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.	• The microbial analysis done in muga pupae by using different media. • Isolated microbes and DNA for species level identification through sequencing. • Protein profiling of both eri and muga pupae by using SDS gel electrophoresis done. • MALDI-TOF/MS or LC-MS/MS analysis of proteins ongoing.	5.05
2	CYF 7014 MI	Development of 3D woven silk fabrics and their applications (In collaboration with CSTRI, Bangalore)	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 various combinations of yarn materials as per the	• Modification of existing 2D weaving loom for weaving 3D fabrics finalized and set-up at CSTRI. • Warp beam set up along with drawing, denting and gaiting is	0.00

					designs. • Physical characterization of 3D silk fabrics and their property evaluation	prepared and the loom made ready for second set of trials. Weaving of second trials for developing 3D fabrics has been started.	

Annex- 5.I.5

1.2.2. Projects continued through and concluded during 2021-2022

Sl. No	Code	Title	Start	End	Progress achieved	Utility of out-put/Impact on silk industry	Fund utilization (In lakhs)
At main institute							
1	CYF 7010 MI	Grading of Muga silk yarn- Development of methods and procedure (In collaboration with CSTRI, Bangalore)	June, 2019	May, 2021 (Extend-ed upto Nov. 2021)	• Selection & collection of muga raw silk samples in NER (220 lots). • Recorded muga silk cocoon characteristics and single filament denier variation of commercial crops • In-house yarn sample preparation at CMERTI & supplied it to CSTRI for testing & grading tabulation. • Statistical analysis of the recorded data and tabulation of grading table.	• The grading standards along with the test methods will be published through BIS and will be implemented for practise in muga market. The strict compliance to this standard will lead to fair market practices in time improve the quality of raw silk produced by the farmers.	2.79
At nested units							

Annex- 5.I.6

1.2.3. New projects initiated during 2021-2022

Sl.No.	Code	Title	Start	Closure	Milestone to be crossed	Progress achieved
At main institute						
At nested units						

2. Transfer of Technologies (ToTs) Programmes carried out during 2021-2022

Annex - 5.II.1

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

#	Name of the Technology	Unit Cost (Rs.)	CSB units	RSRS	DOS Units	Total	Fund used (Rs. in lakhs)	Findings
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	2	4	0.035	Percentage of uzi infestation recorded was 6 to 8 % with IPM as against 15 to 18 % in control.
1.2	Validation of use of Bio-pesticides for control of insect pest infesting *Q. serrata*.	3000	-	2	1	3	0.033	Recorded 70-72% reduction of pest infestation on 14th day after application of Bioneem.
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	20000	2	3	-	5	0.05	The MLT could not be conducted in May-June season due to lockdown. In Oct-Nov season due to poor hatchability the rearing was not successful. MLT will be repeated in next commercial season.
2.2	Multi-location trials of Eri breeds/cross breeds	10000	1	2	-	3	0.025	In Autumn crop, trial was conducted at RSRS Imphal & CMER&TI. No significant improvement as compared to C2 breed was observed. MLT will be repeated in next season at other locations.
2.3	Bio-formulation formanagement of *Alternaria* blight disease of castor	5,000	1	0	0	1	0.00	The formulation was test verified at CMERTI and results were not encour-aging. A detailed report has been submitted and is under review with technology verification committee of the Institute.
3	**Integration studies on Muga Seed Cocoon and Seed Preservation Technologies**							

3.1	Development of seed preservation technology for Muga silkworm, *Antheraea assamensis*	30000	1	-	-	1	0.10	70% moth emergence after 42 days cocoon preservation. From this cocoon preservation lot Eggs were preserved for 18 days and 21% hatching was recorded.
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	1000	2	4	-	6	0.17	Initial trials indicated that no significant difference was recorded in hatching and young silkworms survivability of treated muga eggs as compared to untreated. However, the trials will be repeated to validate the results.
5	**Summer crop management in Muga (in coordination with MSSO, Guwahati)**							
5.1	Rearing management of muga silkworm in cooler region during summer	20000	2	-	1	3	0.15	25% Cocoon yield gain was achieved as against control. Rearing of muga in cooler areas during summer will improve the yield and seed availability.
						Total	**0.563**	

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	Fund utilized (in lakh)	Findings
1	**On farm trials (popularization) of improved perennial host plant of eri silkworm**					
1.1	Popularization of KesseruEri host plant HF005 and HF008	2,210 (per farmer)	5 (Fatehpur, Boko, Imphal, Lakhimpur Upper Assam)	167	1.50	Total 17435 seedlings have been distributed among 167 beneficiaries. Kesseru (HF-008 & HF-005) = 4320 Borpat = 3505 Som (S3&S6) = 3110, Dighloti = 6500 Survivability will be recorded after 03 months.
1.2	Popularization of Borpat Eri host plant					
1.3	Popularization of other host pants					
2.1	LED light trap for control of muga insect pests	1,000/-	3 (Upper, Lower and Middle	20	0.06	Solar LED light traps were distributed and installed at 20 farmer's fields. Insect parasitoids Apanteles, Leaf

			Assam)			gall insects (Asphondylia spp., Pauropsylla beesoni), termites etc. are important insects trapped in the trials.
2.2	Evaluation and popularization of Eri egg incubation device	500/-	0 (Upper, Lower and Middle Assam)	00	0.00	Due to lockdown, this trial could not be performed due to seasonal trial. The trial will be performed in summer season (May- August, 2022).
2.3	Formulation for controlling bacterial flacherie disease in Muga silkworm	20,000/-	2	20	0.06	The trial was not conducted in July- August season due to lockdown. In kotia crop (Oct-Nov) trial was conducted in 2 locations. 3% increased ERR% was recorded. It will be repeated in summer crop 2022.
2.4	Validation of use of PET bottles for uzi trap in muga silkworm rearing	5,000	0 (Locations in Assam)	30	0.15	PET bottles were designed in the same manner as used in Oak tasar and installed in muga farms. No uzifly was trapped, instead wasp predators were trapped. The same trial will be repeated.
2.5	Integrated practice of ITK and modern technology for muga silkworm seed production	2,500	6 (Golaghat, Sivasagar, Lakhimpur, Dhemaji, Goalpara and Kamrup)	18	0.42	OFT conducted during Sep 2021 has shown to increase fecundity significantly by 15.5% over the normal practice. OFT conducted November 2021 has shown to increase fecundity significantly by 16.0% over the normal practice
2.6	Integrated Practice of ITK and Modern Technology for Higher Muga cocoon yield	5,000	6 (Sivasagar, Dibrugarh, Lakhimpur, Dhemaji and East Siang)	16	0.51	OFT conducted at 4 farmers showed significant enhancement in cocoon yield and ERR by 19.3% and 20.0% respectively over the existing practice.
3	**Integrated on farm trials of technologies for higher productivity in Oak Tasar rearing**					
3.1	Establishment & Popularization of new breed C27 among farmers.	6,000	3 (locations inManipur)	6	0.11	Rearing performance of C27 breed showed 20-25 cocoons per dfl as against 15-19 cocoons per dfl in *A.proylei* (control) during 2nd crop.

3.2	Validation of use of PET bottles for uzi trap in oaktasar silkworm rearing	5,000	3 (locations inManipur)	6	0.097	Percentage of uzi infestation recorded was 10 to 13 % with PET bottle uzi trap as against 15 to 18 % in control.
3.3	Validation of use of Sodium hypochlorite for seed treatment against tiger banddisease of oak tasar Silkworm.	6,000	3 (locations inManipur)	6	0.10	Rearing performance of 0.2 % Sodium hypochlorite treated lot showed 22 - 25 cocoons per dfl as against 16 - 19 cocoons per dfl in control during 2nd crop.
		Total	**31**	**289**	**3.007**	

Annex- 5. III

3. Capacity Building & Training programmes carried out during 2021-2022

Sl. No	Title of the training programme	Unit cost	Target		Achievement		
			No. of Prog	No. of stake holders	No. of Prog	No. of stake holders	Financial (Rs. in lakhs)
3.1	Structured Training Course*						
3.1.1	PGDS						
3.1.2	Intensive Sericulture Training						
3.2	Farmers Skill Training	1.125	16	400	15	400	18.00
3.3	Exposure visit for technology awareness						
3.4	Technology Orientation Programme	0.95	8	200	8	198	7.52
3.5	Sericulture Resource Centres (SRCs)	0.04	45	900	45	900	1.80
3.6	Training under Post Cocoon Sector**	0.90	6	150	5	122	4.32
3.7	Management Development Programme under STEP						
3.8	Training for Adopted Seed Rearers						
3.9	Training to Registered Seed Producers						
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*	Na	4	100	2	65	00
3.12.1	Training to KVK Scientist				1	15	2.237
3.13	**Training under SAMARTH**	49.16*	10	300	8	217	46.00
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		**89**	**2050**	**86**	**1957**	**79.88**

Annex- 5. IV

4. Extension Communication Programmes conducted during 2021-2022

#	Programme	Unit cost (Rs)	No. of events		No. of stakeholders		Fund Utilized upto Dec 2021 (In Lakhs)	
			Target	Achmt	Target	Achmt	Target	Achmt
4.1	Krishi Mela/ Reelers Mela cum exhibition	6.0	3	3	800	837	6.0	6.00
4.2	Farmers Field Day	1.20	8	6	560	455	1.20	0.90
4.3	Awareness Programme	2.30	23	22	1150	1402	2.30	2.20
4.4	Technology demonstration Enlightenment programs	0.23	23	20	460	602	0.23	0.20
4.5	Workshop/ Seminar & Conference	1.5	2	3	200	297	3.0	4.80
4.6	Other Activities							
	Total		**59**	**54**	**3170**	**3238**	**12.73**	**14.10**

Annex-5.V

5. Soil Samples analyzed during 2020 -21

#	State	Target (No.)	Achievement (No.)	Fund utilisation (Rs. in lakhs)
5.1	**Assam**	20	0	0
5.2	**Meghalaya**	20	0	0
5.3	**Manipur**	10	0	0
5.4	**Mizoram**	10	0	0
5.5	**Nagaland**	10	0	0
5.6	**Ar. P/WB**	10	**20**	**0.24**

Annex-5.VI

6. Information, Education and Communication during 2021-2022

#	Item	Target (No.)	Achievement (No.)	Fund utilized (Rs. in lakhs)
6.1	Periodicals	4	0	0
6.2	Publications			
6.2.1	Research papers-National	5	2	0
6.2.2	Research papers-International	15	20	0
6.2.3	Proceedings/ Abstracts	15	0	0
6.2.4	Books/ Book Chapters/ Manuals etc.	10	3	0
6.2.5	Popular Articles	10	6	0
6.2.6	Booklets, Brochures etc.	10	2	0.07
6.3	Extension literature	10	8	0.20
6.4	Films/ Videos	15	3	0
6.5	Social media	25	70	-
Total		**119**	**114**	**0.27**

Annex-5.VII

7. Patents obtained/ submitted for patenting/ technologies Commercialized/ Products Developed during 2021-2022

Sl. No.	Item	Patent details, date of filing technology commercialised/date of licence	Fund utilized
7.1	**Patents filed**	Nil	0.00
7.2	**Patents granted**	Nil	0.00
7.3	**Technologies commercialized**	Nil	0.00
7.4	**Android/mobile app, software developed etc.**	Nil	0.00

Annex-5.VIII

8. Revenue Generation during 2021-2022

Sl. No.	Source of Revenue Generation (Rs. in Lakhs)	Physical (No.)	Revenue generated	
			Target	Achievement
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	0.00
8.2.2	Quality analysis/ testing of products			
8.2.3	Testing of cocoons/silk yarn/fabric etc.			
8.3	**Consultancy (Services)**		1.0	
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	20,000	1.0	0.22
8.4.3	Mulberry chawki worms			
8.4.4	Mulberry Seed (DFLs)			
8.4.5	Vanya seed (DFLs)			
8.4.6	Cocoons/pierced cocoons/		2.0	3.66
8.4.7	Output from R&D Projects (Silk, fabric etc)		5.0	
8.4.8	Others (pl specify)			
8.4.8.1	Guest house /Hostel charges		4.0	0.28
8.4.8.2	Licenses fees/house rent		9.0	11.15
8.4.8.3	Convenience charge		0.35	0.25
8.4.8.4	Other Misc. receipt (excess payment recovery, computer advance recovery, auction proceeds, etc.)		8.0	8.89
8.4.8.5	Course fees		1.20	0.10
8.4.8.6	Intercropping in between Som, Kesseru etc.		0.95	0.00
	Electricity refund		0	0.07
	Total		**33.00**	**25.44**

Annex -5.IX

9. Procurement of Equipments and other accessories during 2021-2022:

#	Equipment/ other accessories purchased	Qty	Justification	Fund utilized (Rs. in lakh)
At main institute				
9.1	Smart 4-in-1 soil survey instrument	02	Procured under the Project AIP-5013SI for executing the project work as per objectives	0.039
9.2	Digital Calliper (0-300mm)	01		0.25
9.3	Digital microscope	01	Under project ARP05015SI	1.95
9.4	High performance work station	01	Under project AIT05016MI	5.65
9.5	10KVa online UPS	01	Under project AIT05016MI	2.99
9.6	SDS Gel electrophoresis	01	Under project BPS01013CN	0.30
9.7	Distillation Unit	01	Under project BPS01013CN	1.70
9.8	Microclimate chamber	01	Under project AIB-5894 concluded in (2020-21)	21.00* (ARD)
9.09	Chain Saw	07	Under project MOE 5004 EF	0.96*
9.10	Camera 12 MP	01	Under project MOE 5004 EF	0.35*
9.11	Other Miscellaneous items under Asset creation	-	-	31.21
At nested units				
RSRS, Imphal				
9.11	Furniture & Fixtures	-	-	2.95
9.12	Other miscellaneous assets created	-	-	0.97
			Total	**48.00**

*Procured under external funded project (not added into total)

Annex -5.X

10. Other Activities carried out during 2021-2022:

- Raising of Som / Soalu seedling
- Raising of Kesseru/Borpat seedlings
- Supply of 35 kg Kesseru seed to various CSB units
- Muga silkworm rearing and DFLs production
- Eri silkworm rearing and DFLs production
- Eri chawki worms supply
- Oak Tasar silkworm rearing, DFLs production and supply
- Activities under Swatch Bharat Abhiyan

Annex - 5.XI

11. Progress at a glance for the year 2021-2022

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)							Information, Education and Communication during	Soil Samples analyzed	No. of patents filed/granted and technologies to be commercialised	Revenue generated (Rs. in Lakhs)
	Projects of earlier year continued through	Projects concluded during the year	New Projects initiated	Projects of earlier year continued through	Projects concluded during the year	New Projects initiated	No. of technologies validated	No. of trials covered	No. of technologies demonstrated	No. of locations covered	No. of stakeholders covered	No. of Programs Conducted	No. of stakeholders trained	Krishi Mela / Farmers meet	Farmers Field day	Awareness programme	Technology demonstration / Enlightenment programmes	Workshop / Seminars & Conferences	Field Visits	Other activities				
CMER&TI, Lahdoigarh	**16**	**02**	**03**	**02**	**01**	**00**	**08**	**26**	**11**	**31**	**289**	**86**	**1957**	**03**	**06**	**22**	**20**	**03**	**00**	**00**	**152**	**20**	**00**	**25.44**