PPS 3559

TESTING OF CARBON CAPTURING POTENTIAL OF MULBERRY IN DIFFERENT LOCATIONS

Coordinator
R. Kar (Up to June 2016)
M. Choudhuri (From July 2016)

DURATION

APRIL, 2015 - MARCH, 2018

Investigators

S. Chatterjee, S. K. Misro, G. S. Singh and S. N. Gogoi

REGIONAL SERICULTURAL RESEARCH STATIONS, KALIMPONG, KORAPUT, RANCHI AND JORHAT
CENTRAL SILK BOARD
MINISTRY OF TEXTILES (GOVERNMENT OF INDIA)
BERHAMPORE-742101, WEST BENGAL

PROFORMA – I (To be filled by applicant)

PART I: GENERAL INFORMATION

1.	Name of the Institute / University / Organization submitting the Programme Proposal	:	RSRSs, Kalimpong, Koraput, Ranchi and Jorhat in association with CSR&TI, Berhampore (WB)
2.	Status of the Institute(s)	:	Not applicable
3.	Name(s) and designation(s) of the Executive Authority of the Institute / University forwarding the application	:	Dr. S. Nirmal Kumar, Director
4.	Programme Title	:	Testing of carbon capturing potential of mulberry in different locations
5.	Category of the Programme	:	Applied
6.	Specific Area	:	Plant and Environmental Science
7.	Duration	:	3 years (April, 2015 – March, 2018)
8.	Total cost	:	Rs 2.58 lakh
9.	Is the Programme single institutional or multi-institutional	:	Single institutional
10.	If the Programme is multi-institutional, please furnish the following: Name, Designation and Address of the Project Co-ordinator.	:	Not applicable
11.	Programme Summary	:	The trend of result under the on-going project, PPS 3452, entitled "Terrestrial carbon sequestration for sustained high productivity of quality mulberry" has highlighted the performance of farming practice, 'moderate tillage with grass cover', for successive two years in terms of CCE (6.85 mt ha^{-1} $year^{-1}$) and the same is comparable with the existing farming practice (6.69 mt ha^{-1} $year^{-1}$). The experimentation is being conducted at the farm of CSR&TI, Berhampore (WB) under irrigated alluvial soil condition. Mulberry is being grown in different eco-geographic regions of Eastern and North-Eastern India. Regional Sericultural Research Stations (RSRS) situated at Kalimpong, Ranchi, Koraput and Jorhat are taking care of executing region specific R & D assignments. Considering the current agenda of Global Warming, it is proposed to assess carbon sequestration potential of mulberry growing in other regions also and for that purpose, the altered farming practice diagnosed competent so far, will be tried at RSRS-level. The diagnosed altered farming practice will be tested against existing farming practices of different regions for comparison.

PART II: PARTICULARS OF INVESTIGATORS

12.	Name: Date of birth Sex Indicate whether Principal Investigator / Co-investigator Designation Department/Institute / University: Address	: 	S. Chatterjee 22.11.1956 Male Principal Investigator, RSRS, Kalimpong Scientist-C RSRS, Kalimpong, Darjeeling (W.B.)
	Name: Date of birth Sex Indicate whether Principal Investigator / Co-investigator Designation Department/Institute / University: Address	: 	S. K. Misro 23.07.1965 Male Principal Investigator, RSRS, Koraput Scientist-C RSRS, Koraput, Odisha
	Name: Date of birth Sex Indicate whether Principal Investigator / Co-investigator Designation Department/Institute / University: Address	: 	G. S. Singh 01.04.1962 Male Principal Investigator, RSRS, Ranchi Scientist-D REC, Bhandra, Lohardaga, Jharkhand
	Name: Date of birth Sex Indicate whether Principal Investigator / Co-investigator Designation Department/Institute / University: Address	: 	S. N. Gogoi 01.11.1958 Male Principal Investigator, RSRS, Jorhat Scientist-D RSRS, Jorhat, Assam
13.	No of Projects/ Programmes being handled by each investigator at present: 1. S. Chatterjee 2. S. K. Misro 3. G. S. Singh 7. S. N. Gogoi	: 	 Ten Five Three Three
14.	Proposed Research Fellow	:	Nil

PART III: TECHNICAL DETAILS OF PROJECT

15.	Introduction	:	
15.1	Definition of the Problem	:	Under this programme, a relationship between altered managerial practices for mulberry cultivation towards offsetting carbon emission in the atmosphere and productivity of mulberry will be studied. The study envisages assessment of carbon sequestration potential of mulberry growing in different regions of Eastern and North-Eastern India.
15.2	Origin of the Proposal / Rationale of the Study	:	Mulberry is being grown in different eco-geographic regions of Eastern and North-Eastern India. Regional Sericultural Research Stations (RSRS) situated at Kalimpong, Ranchi, Koraput and Jorhat are taking care of executing region specific R & D assignments. Considering the current agenda of Global Warming, it is proposed to assess carbon sequestration potential of

			mulberry growing in different regions and for that purpose, the altered farming practice diagnosed competent so far, will be tried at RSRS-level. The diagnosed altered farming practice will be tested against existing farming practices of different regions for comparison.
15.3	Relevance to the Current Issues and Expected outcome	:	The rising level of atmospheric CO_2 is believed to cause global warming at an alarming rate of 0.2^oC per decade with an estimated average rise in global temperature of 3^oC by 2100 (Giles, 2007). Therefore, sequestration of the excess carbon from the atmosphere necessitates a sustainable approach to capture excess CO_2 in an integrated manner that satisfies biogeochemical and ecosystem norms. Carbon mitigation by photosynthetic capture by far remains a natural and sustainable proposition that complements environmental priorities and socio-economic interests. Introduction of tree/ bush in farming system is a useful tool to lock up the carbon in its components and increase the soil carbon status because presence of the same affects carbon dynamics directly or indirectly (Khan and Chaturvedi, 2007). Mulberry (*Morus* spp.) is being cultivated in bush/ tree form for its foliage for feeding purpose of silkworm (*Bombyx mori* L.). Like other crops, mulberry is also considered as an agent of carbon-biosequestration and is capable of storing carbon in its above-ground components. Considering the current agenda of Global Warming, it is proposed to assess carbon sequestration potential of mulberry growing in different regions and for that purpose, the altered farming practice diagnosed competent so far, may be tried at RSRS-level.
15.4	Objectives	:	To assess carbon capturing potential of mulberry growing under varying eco-geographic conditions
16.	REVIEW OF STATUS OF RESEARCH AND DEVELOPMENT ON THE SUBJECT	:	
16.1	INTERNATIONAL STATUS		

The balance of terrestrial ecosystems can be changed markedly by the direct impact of human activities including deforestation, biomass burning, land use change and environmental pollution, which release trace gases that enhance greenhouse effect (Bolin, 1981; Trabalka and Reichle, 1986; IPCC, 1990). Several workers (Mayfield and Tailor, 1984; Yan *et al*., 2006) studied uptake of photosynthetic proteins in developing maize leaves and pea root and it was observed that carbon-reducing enzymes were the significant attributes. Since photosynthesis is an unsaturated biochemical reaction in plants, rising CO_2 concentrations increase photosynthetic rates.

Productivity enhancement can be achieved through plant physiological adjustments. About 90% of the dry weight of higher plants is derived from CO_2 assimilated by photosynthesis (Zelitch, 1982). Increasing the duration of photosynthesis offers an opportunity of increasing the total amount of carbon fixed by a crop. Delaying leaf senescence has, therefore, become a prime target for crop improvement (Thomas and Howarth, 2000). Again, an increase in biomass is possible through an increase in net photosynthesis (Cassman, 1994) and the same can be achieved by an increase in leaf area index.

Mulberry (*Morus* spp.) is being cultivated in bush/ tree form for its foliage for feeding purpose of silkworm (*Bombyx mori* L.). Like other crops, mulberry is also considered as an agent of carbon-biosequestration and is capable of storing carbon in its above-ground components. Woodrow and Berry (1988) reported enzymatic regulation of photosynthetic CO_2 fixation in C_3 plants. Mulberry being a C_3 plant can change the level of carbon-reducing enzymes by external nitrogen supply (Yamashita, 1986). Higher concentration of CO_2 can have a positive influence on photosynthesis under optimal growing conditions of light, temperature, nutrient and moisture supply and thus, biomass production can be increased, especially of plants with C_3 photosynthetic metabolism (Sombroek and Gommes, 1996). The yield of a crop is the cumulative consequence of various physiological as well as biochemical processes, namely, CO_2 assimilation, translocation of photo-assimilates, mineral uptake etc.

16.2	NATIONAL STATUS

It is assumed that carbon management plays a significant role towards mitigation of vagaries due to climate change. Carbon sequestration potential differs with the kind of land use. It is a proven fact that forest ecosystems are the best way to sequester carbon. Koul and Panwar (2008) reported carbon sequestration potential of fallow land and agriculture field as only 5.86% & 4.73% respectively, compared to natural forest of *S. Robusta*.

Finding low-cost methods to sequester carbon is emerging as a major international policy goal in the context of global climate change (Nath *et al*., 2008). Smallholder farming systems throughout the world are believed to be potential sinks to remove atmospheric CO_2 (Nath and Das, 2011). Several reports are available on the potential of bamboos in carbon storage and as carbon sink (Isagi *et al*., 1997; Das and Chaturvedi, 2006; Kumar *et al*., 2005). Carbon estimate in above ground vegetation in bamboo farming system at Barak Valley, Assam ranged from 6.51 (2004) to 8.95 (2007) Mg ha^{-1} with 87%, 9%, and 4% of the total carbon stored in culm, branch & leaf respectively. The rate of C sequestration was 1.20 - 1.46 Mg $ha^{-1}year^{-1}$, with a mean of 1.32 Mg $ha^{-1}year^{-1}$(Nath and Das, 2011).

Development of high yielding mulberry varieties is the basic need of sericulture industry for enhancing the rearing capacity of silkworm. A number of improved mulberry varieties have already been developed and their extent of adaptability in different conditions has also been evaluated through National-level trial. Principally growth and yield parameters have been considered during evaluation.

Ability of the terrestrial biosphere to sequester and store atmospheric CO_2 has been recognized as an effective and low-cost method of offsetting carbon emissions (Koul and Panwar, 2008). Moreover, carbon mitigation by photosynthetic capture by far remains a natural and sustainable proposition that complements environmental priorities and socio-economic interests (Lavania and Lavania, 2009). High yielding mulberry varieties correspond to high biomass and thus, may prove to be competent enough for the purpose as discussed above.

16.3	IMPORTANCE OF THE PROPOSED PROGRAMME IN THE CONTEXT OF CURRENT STATUS	:	Carbon sequestration depends upon biomass production capacity, which in turn depends upon interaction between edaphic, climate and topographic factors of an area. Hence results obtained at one place may not be applicable to another. Therefore, region-based potential of different land uses needs to be worked out. Development of high yielding mulberry varieties is the basic need of sericulture industry for enhancing the rearing capacity of silkworm. Besides higher productivity, the high yielding mulberry varieties are providing huge biomass for carbon mitigation by photosynthetic capture and thus, prove to be an effective agent for offsetting carbon emissions. But, evaluation of those mulberry varieties in terms of carbon sequestration potential in varying conditions has not been paid serious attention hitherto. To match the current Global agenda for terrestrial sequestration of carbon, it is high time to prioritize the assessment of carbon sequestration potential of high yielding mulberry varieties developed for different agro climatic conditions.
16.4	ANTICIPATED PRODUCTS, PROCESSES/TECHNOLOGY PACKAGES, INFORMATION OR OTHER OUTCOME FROM THE PROGRAMME AND THEIR EXPECTED UTILITY	:	Revised farming protocol to maximize carbon sequestration in mulberry cultivation will be standardized in different eco-geographic regions. Economics of mulberry production under such packages will also be evaluated with a view to popularise the standardized packages among the sericultural farmers to meet up the current Global need.
16.5	EXPERTISE AVALABLE WITH PROPOSED INVESTIGATION	:	All the Investigators are having sufficient expertise in the field of mulberry cultivation.

	GROUP/INSTITUTION ON THE SUBJECT OF THE PROGRAMME		

17.	**WORK PLAN**	:	

17.1 Methodology:

- The field experimentation will be done at farm level of each of the four RSRSs, namely, Kalimpong, Koraput, Ranchi and Jorhat
- Each farm has to spare a land of 0.1 bigha (0.033 acre) each for existing farming practice and altered farming practice
- As all the RSRSs follow three crop-schedules under rainfed condition, deep digging during one crop and shallow (single surface) diggings during other two crops along with grass cover will be considered under altered farming practice. The grass cover will be incorporated with the soil during digging
- Under existing farming practice, all the diggings are deep and there will be regular weeding, but no incorporation of grass with soil
- Crop wise recording of leaf productivity and collection of leaf samples for estimation of carbon
- Recording of shoot productivity and collection of shoot samples for estimation of carbon matching with the pruning schedule
- Estimation of moisture% of leaf and shoot samples (at $70^{O}C$)
- Ignition of oven-dried (at $70^{O}C$) leaf and shoot samples at $550^{O}C$ for 6 h in a muffle furnace to determine the carbon content (Nath and Das, 2011)
- Computation of carbon capturing potential of mulberry on the basis of dry weights of leaf and shoot

17.2 ORGANISATION OF WORK ELEMENTS:

Name of the Scientist	Prgramme Capacity	Work Component
S. Nirmal Kumar	Executive authority	Scrutinizing programme proposal in terms of its viability towards appropriate execution and evaluation of final outcome in terms of its viability for further extension at field level.
M.Choudhuri	Coordinator	Programme preparation, coordination among nested units with the purpose of appropriate execution of field works under the experimentation followed by sampling of leaf as well as shoot and estimation of carbon content of the same, interpretation of results in terms of generation of information on carbon capturing potential of mulberry growing under different eco-geographic conditions of Eastern and North-Eastern India

Name of the Scientist	Programme Capacity	Work Component
S. Chatterjee	PI for RSRS, Kalimpong	Execution of field works under the experimentation as per methodology, recording of crop wise mulberry leaf and shoot yield, crop wise sampling of mulberry leaf and shoot, Estimation of carbon capturing potential of mulberry leaf and shoot samples

S. K. Misro	PI for RSRS, Koraput	Execution of field works under the experimentation as per methodology, recording of crop wise mulberry leaf and shoot yield, crop wise sampling of mulberry leaf and shoot, Estimation of carbon capturing potential of mulberry leaf and shoot samples
G. S. Singh	PI for RSRS, Ranchi	Execution of field works under the experimentation as per methodology, recording of crop wise mulberry leaf and shoot yield, crop wise sampling of mulberry leaf and shoot, Estimation of carbon capturing potential of mulberry leaf and shoot samples
S. N. Gogoi	PI for RSRS, Jorhat	Execution of field works under the experimentation as per methodology, recording of crop wise mulberry leaf and shoot yield, crop wise sampling of mulberry leaf and shoot, Estimation of carbon capturing potential of mulberry leaf and shoot samples

17.3	PROPRIETARY / PATENTED ITEMS, IF ANY, EXPECTED TO BE USED FOR THIS PROGRAMME	:	Not applicable
17.4	SUGGESTED PLAN OF ACTION FOR UTILIZATION OF THE EXPECTED OUTCOME FROM THE PROGRAMME	:	Standardized farming protocol in terms of maximizing carbon sequestration in mulberry cultivation will be popularized among the sericultural farmers to meet up the current Global need.

17.5. TIME SCHEDULE OF ACTIVITIES GIVING MILESTONES

Sl No.	Milestone / Activity	Expected Date of		Expected outcome/ visible / measurable indicators
		Starting	Completion	
Step-1	Execution of field works as per methodology, crop wise sampling of mulberry leaf and shoot, recording of crop wise mulberry leaf and shoot yield, estimation of moisture and carbon content of the collected leaf and shoot samples	April'2015	March'2018	Carbon capturing potential of mulberry under revised farming protocol will be assessed in varying eco-geographic conditions
Step-2	Data compilation and analysis, interpretation of results and submission of final report	February'2018	March'2018	

PART IV: BUDGET PARTICULARS

18. BUDGET (in rupees): [In case of multi-institutional projects, the budget details should be provided separately for each of the institute]

A. **Non-Recurring** (e.g. equipments, accessories etc.):

Sl. No.	Item	1st year	2nd year	3rd year	Total
01	Muffle furnace (4 nos., one for each of 4 RSRSs)	1,60,000=00	-	-	1,60,000=00
02	Electric dry grinder (4 nos., one for each of 4 RSRSs)	80,000=00			80,000=00

B. Recurring:

B1. Manpower:

Sl. No.	Position	Nos.	Consolidated Emoluments	1st year	2nd year	3rd year	Total
1	JRF	Nil	-	-	-	-	-
2	HRA		-	-	-	-	-
3	CCA		-	-	-	-	-
	Sub-total B1:		-	-	-	-	-

B2: Consumables:

Sl. No.	Item	1st year	2nd year	3rd year	Total
01	Chemicals	-	-	-	-
02	Glasswares	4,000=00	4,000=00	4,000=00	12,000=00
	Sub-total B2:	4,000=00	4,000=00	4,000=00	12,000=00

Other Items:

Sl. No.	Item	1st year	2nd year	3rd year	Total
B3	Travel	-	-	-	-
B4	Contingency	2,000=00	2,000=00	2,000=00	6,000=00
B5	Overhead charges	-	-	-	-
	Sub-total (B1+B2+B3+B4+B5)	6,000=00	6,000=00	6,000=00	18,000=00

PART V: EXISTING FACILITIES

19. AVAILABLE EQUIPMENTS AND ACCESSORIES TO BE UTILIZED FOR THE PROGRAMME:

[Should be provided separately for each of the Institute]

Sl. No.	Name of the Equipment/ Accessory	Make	Model	Funding Agency	Year of Procurement
Nil					

PART VI: REFERENCES

Bolin, B. (1981) Carbon cycle modeling, SCOPE 16, John Willy & sons, Chichester.

Cassman, K. G. (1994) Breaking the yield barrier, *Proceeding of a workshop on rice yield potential in favourable environments*. Los Banos, The Philippines, IRRI.

Das, D. K & Chaturvedi , O. P. (2006) Bambusa Bambos (L) Voss plantation in eastern India :I. Culm recruitment, dry matter dynamics & Carbon Flux . *J. Bamboo Rattan*, **5**, 47-59.

Giles, J. (2007) Nature, 445, 578-579.

Khan, I. A. & Chaturvedi, O. P. (2007) Agro forestry & Carbon sequestration: global scenario. *Journal of Tropical Forestry*, 23 (3 & 4): 1-15.

Koul, D. N. & Panwar, P. P. (2008) Prioritizing land management option for Carbon sequestration potential. Curr. Sci., 95, 658-663.

Kumar, B. M., Sudheesh, K. G. & Rajesh, G. (2005) Standing stock of thorny bamboo [*Bambusa bambos* (L.) Voss] in the home gardens of Thrissur, Kerala. J. Trop. Argic., 43(1-2), 51-56.

Lavania, U. C. & Lavania, S. (2009) *Current science*, 97 (5), 618-619.

Mayfield, S. P. & Taylor, W. C. (1984) The appearance of photosynthetic proteins in developing maize leaves, *Planta*, 161, 481-486.

Nath, A. J. & Das, A. K. (2008) Bamboo resources in the home gardens of Assam: a case study from Barak Valey. *J. Trop Agric*., 46, 46-49.

Nath, A. J. & Das, A. K. (2011) Carbon storage & sequestration in bamboo-based smallholder home gardens of Barak valley, Assam. *Current science*, 100, 229-233.

Sombroek,W. G. & Gommes, R. (2005) The climate change-Agriculture conundrum, In: Global climate change & agriculture production (F. Bazzaz & W. Sombroek, eds.), PP. 1-14.

Trabalka, J. R. & Reichle, D. E. (1986) The Changing Carbon Cycle: a Global Analysis, Springer-Verlag, New York.

Woodrow, I. E. & Berry, J. A. (1988) Enzymatic regulation of photosynthetic CO_2 Fixation in C_3 Plants, *Annual Rev plant Mol.Bio*., 39, 533-594.

Yan, X., Khan, S., Hase, T., Emes, M. J. and Bowsher, C. G. (2006) Differential uptake of photosynthetic & non photosynthetic protein by pea root plastids. *FEBS*, 580, 6509-6512.

Zelitch T. (1982) The close relationship between net photosynthesis & crop yield *Bioscience*, 42, 505-512.

PART VII: BIODATA OF INVESTIGATORS

INVESTIGATOR-I

1. Full Name (In Block letters) **:** MR. S. CHATTERJEE
2. Designation : Scientist-C
3. Department / Institute / University : Regional Sericulture Research Station, Kalimpong, Darjilling, West Bengal
4. Address of communication : Regional Sericulture Research Station, Kalimpong, Darjilling, West Bengal
5. Date of birth : 22.11.1956
6. Sex : Male
7. Education (Post Graduation onwards & Professional Career)

Name of the University	**Degree Passed**	**Year of Passing**	**Subjects taken with Specialization**	**Class / Division**
Visva Bharati, Santiniketan, W. B	M. Sc	1979	Zoology spl. in Entomolgy	1st Class

8. Awards:
[Not required for in-house personnel]

Year	Award	Agency	Purpose	Nature
Not applicable				

9. Positions Held / Research Experience in various institutions: Not applicable
[Not required for in-house personnel]

10. Memberships/ Fellowships [Not required for in-house personnel]: Not applicable

11. Patents [Not required for in-house personnel]: Not applicable

12. Publications (Numbers only): 06

13. Project (s) submitted / being pursued / carried out by Investigator:

14. Highlights of outcome / progress of the project (s) handled during the past 10 years, their outcome and utilization (in 200 words):

PPS 3435:

Cationic micronutrients, critical for mulberry productivity, have been diagnosed for West Bengal hills. Optimum foliar requirement of the same along with critical level of soil availability have further been estimated. Concentration of foliar spray for individual micronutrient has also been derived.

INVESTIGATOR-II

1. Full Name (in Block letters) : SUNIL KUMAR MISRO
2. Designation : Scientist-C
3. Department/Institute/University : RSRS, Koraput, Odisha
4. Address for Communication : Post Box No. 9,
   RSRS, Central Silk Board,
   Koraput - 764020, Odisha
5. Date of birth : 23.07.1965
6. Sex : Male
7. Education (Post Graduation onwards & Professional Career):

Name of the University	Degree Passed	Year of Passing	Subjects taken with Specialization	Class / Division
Andhra University	M. Sc.	1987	Zoology - Physiology and biochemistry	I

8.Awards:
[Not required for in-house personnel]

Year	Award	Agency	Purpose	Nature
Not applicable				

9. Positions Held / Research Experience in various institutions:
[Not required for in-house personnel]

Employer	Designation of the post held	Date of Joining	Date of leaving
Not applicable			

10. Members / Fellowships: Not applicable
[Not required for in-house personnel]
11. Patents: Not applicable
[Not required for in-house personnel]
12. Publications (Numbers only): 06
13. Project(s) submitted/being pursued/ carried out by Investigator:

Sl. No.	Title of the Project	Funding Agency	Duration		No. of Scientists/ under the project	Total cost
			From	To		
01	Evaluation of mulberry varieties suitable for low input soils	CSB	2013	2017	10	4.95
02	Assessment of fertility status of mulberry growing soils in selected Seri-villages of Koraput for appropriate fertilizer management	CSB	2011	2013	01	0.53

03	**CSS-2107** Forewarning of mulberry diseases of Eastern and North Eastern India	CSB	2012	2017	14	7.72

14. Highlights of outcome / progress of the project(s) handled during the past 10 years, their outcome and utilization (in 200 words).

PPS 3435:

Cationic micronutrients, critical for mulberry productivity, have been diagnosed for Odisha. Optimum foliar requirement of the same along with critical level of soil availability have further been estimated. Concentration of foliar spray for individual micronutrient has also been derived.

INVESTIGATOR-III

1. Name : GHAN SHYAM SINGH
2. Designation : Scientist-D
3. Department/Institute/ University : Research Extension Centre, Bhandra, Lohardaga, Jharkhand
4. Address for Communication : Research Extension Centre, Bhandra, Lohardaga, Jharkhand
5. Date of birth : 01-04-1962
6. Sex : Male

7. **EDUCATIONAL QUALIFICATION:**

Name of the University	**Degree Passed**	**Year of Passing**	**Subjects taken with Specialization**	**Class / Dvn.**
G.B.Pant University of Agricuture & Technology Pantnagar	M.Sc.Ag.	1986	Plant Pathology	I
G.B.Pant University of Agricuture & Technology Pantnagar	Ph.D	1991	Major subject –Plant Pathology, Minor-Entomology and Plant Breeding Specialization-Seed technology	

8. Awards:

[Not required for in-house personnel]

Year	Award	Agency	Purpose	Nature
Not applicable				

9. Positions Held / Research Experience in Various Institutions:

[Not required for in-house personnel]

Employer	Designation of the post held	Date of Joining	Date of Leaving
Not applicable			

10. Membership / Fellowship [Not required for in-house personnel]: Not applicable
11. Patents: [Not required for in-house personnel]: Not applicable
12. Publications (numbers only): 35
13. Project(s) submitted / being perused / carried out by the investigator:

Sl. No.	**Title of the project**	**Funding agency**	**Duration From To**	**No. of Scientists/Associates working under the project**	**Total approved cost of the project (In Lakh)**
1	All India Coordinated Experimental Trial on mulberry, Phase-III	CSB	2011-16	06	8.64
2	Evaluation of mulberry varieties suitable for low input soils	CSB	2013-17	10	4.95
3	Assessment of fertility status of mulberry growing soils in selected Seri-villages of Ranchi for appropriate fertilizer management	CSB	2012-13	01	0.53

14. Highlights of outcome / progress of the project (s) handled during the past 10 years, their outcome and utilization (in 200 words) :

Sl. No.	Title of the project/ Programme	Outcome	Utilization
1	APR-4661: Standardisation of suitable indoor rearing techniques of tasar silkworm (Principal Investigator)	Standardize indoor rearing technique of tasar silkworm *A.mylitta* D. Developed Shoot preservation Technique and indoor rearing frame for indoor rearing of Tasar silkworm.	Technique is useful for conducting various physiological & pathological experiment on tasar silkworm in indoor condition
2	APR-4652: Studies on determination of development and accumulative temperature for synchronization of emergence and hatching in *A.* mylitta D. **[Co-investigator]**	Developed accumulative temperature for moth emergence & hatching of eggs	Developed temperature is useful for synchronization of moth emergence & hatching of tasar silkworm eggs.

INVESTIGATOR-IV

1. Full name : Dr. S. N. GOGOI
2. Designation : Scientist-D
3. Department/Institute/University : Moriculture Division, RSRS, Jorhat, Assam
4. Address for communication : Regional Sericultural Research Station
   Central Silk Board, Rowriah, Jorhat, Assam
5. Date of birth : 01.11.1958
6. Sex : Male
7. Education (Post graduation onwards and professional career)

Highest degree	Degree passed	University	Country	Subjects
M.Sc.	1981	Dibrugarh University	India	Life Science –Botany (Cytogentics and Plant breeding)
Ph. D.	1992	-do-	-do-	Weed Ecology

8. Awards (Not required for in-house personnel)

Year	Award	Agency	Purpose	Nature
Not applicable				

9. Positions held/Research experience in various institutions(Not required for in-house personnel)

Employer	Designation	Date of joining	Date of leaving
Not applicable			

10. Memberships/Fellowships (Not required for in-house personnel): Not applicable
11. Patents: (Not required for in-house personnel): Not applicable
12. Publications (Numbers only): 44
13. Projects submitted/being pursued/carried out by Investigator:

Sl. No.	Title of the project	Funding agency	Duration	No. of Scientists	Total cost of the project (laks)
01	All India Coordinated Experimental Trial on mulberry, Phase-III	CSB	2011-16	06	8.64
02	Evaluation of mulberry varieties suitable for low input soils	CSB	2013-17	10	4.95
03	Assessment of fertility status of mulberry growing soils in selected Seri-villages of Jorhat for appropriate fertilizer management	CSB	2012-14	01	1.94

14. Highlights of outcome/progress of the project (s) handled during the past 10 years, their outcome and utilization (in 200 words).

PIB-4637:

- Four tetraploids som genotype (*viz*, PB009, PB010, PB011, and PB012) had been developed and registered in NBPGR, New Delhi under IC number *w.e.f.* IC-556923, IC-556924, IC-556925 & IC-556926 respectively
- Among the tetraploids, PB011 revealed maximum leaf yield (2.85 kg) than all other genotypes.
- Accession, PB012 showed less larval period (23 days), higher cocoon (6.70 g) and shell weight (0.61 g) and ERR (88%) over other tetraploid and diploids.
- Accession, PB012 showed higher crude protein (12.59%), less fiber (18.33%), higher soluble sugar (6.63%) and moisture (64.40%) content over other tetraploid and diploids.
- Accession, PB012 is selected as superior in terms of leaf quality and muga silkworm rearing performance and recommended by Research Advisory Committee (RAC) of CMER&TI held on 13-14th March 2007 for commercial exploitation.

NATP

Establishment of Non mulberry Field Gene Bank

One hundred fourty six (146) genetic materials of Muga and Eri silkworms' host plants were collected from different geographical locations of NE region and introduced into field gene bank of GCC of CMER&TI, Lahdoigarh , Jorhat, Assam . Genetic resources are Som (51), Soalu (30), Dighloti (16), Mejankari (2), Bhagnola (2), Castor (72), Kesseru (17), Payem (2) and Borpat (2).

PIB5838:

- Thirty nine (39) plus trees of som, *Persea bombycina* Kost. have been identified in NE region of India (Assam, Nagaland, Meghalaya and Arunachal Pradesh) by comparison tree method which were collected and introduced into GPB from accession PB0013 to PB051.
- Thirty nine Som plus trees were registered in NBPGR, New Delhi under IC number from 73237 to IC 73275 respectively.
- Six accessions *viz* PB-023, PB-028, PB-049, PB-029, PB-050 and PB-039 have been selected as superior variety of Som for mass multiplication in field.

PPS 3435:

Cationic micronutrients, critical for mulberry productivity, have been diagnosed for North-Eastern states. Optimum foliar requirement of the same along with critical level of soil availability have further been estimated. Concentration of foliar spray for individual micronutrient has also been derived.

PART VIII: DECLARATION / CERTIFICATION

It is certified that

a) The research work proposed in the programme does not in any way duplicate the work already done or being carried out elsewhere on the subject.
b) The same programme has not been submitted to any other agencies for financial support.
c) The emoluments for the manpower proposed are those admissible to persons of corresponding status employed in the Institute/University or as per the Ministry of Science & Technology guidelines.
d) Necessary provision for the programme will be made in the Institute in anticipation of the sanction of the scheme.
e) If the programme involves the utilization of genetically engineered organism, it is agreed that we will ensure that an application will be submitted through our institutional bio-

safety committee and we will declare that while conducting experiments, the bio-safety guidelines of the Department of Biotechnology would be followed *in toto*.

f) If the programme involves field trials / experiments / exchange of specimens etc we will ensure that ethical clearances would be taken from the concerned ethical committees/ competent authorities and the same would be conveyed to the Department of Biotechnology before implementing the project.

g) It is agreed by us that any research outcome or intellectual property right(s) on the invention(s) arising out of the programme shall be taken in accordance with the instructions issued with the approval of the Ministry of Finance, Department of Expenditure.

h) We agree to accept the terms and conditions as enclosed in Annexure-IV. The same is signed and enclosed.

i) The institute agrees that the equipment, the basic facilities and such other administrative facilities as per terms and conditions of the grant will be extended to investigators through out the duration of the programme.

j) The institute assumes to undertake the financial and other management responsibilities of the programme.

1. Signature of Programme Coordinator

Date:

2. Signature of Executive Authority of Institute with Seal

Date:

3. Signature of Principal Investigator

Date:

4. Signature of Co-Investigator

Date:

S. Chatterjee –

S. K. Misro –

G. S. Singh –

S. N. Gogoi –

SPECIFICATION

WILLY GRINDER (LAB MODEL)

- ✓ ¼ HP Motor with V-belt
- ✓ Stationery Blades & Rotor with cutting edges
- ✓ Removable glass plate
- ✓ Around 900 RPM Motor Speed
- ✓ Feed Funnel
- ✓ Mesh 20, 40 & 60
- ✓ To work on 220/ 230 V, single phase

MUFFLE FURNACE (LAB MODEL)

- ✓ Maximum temperature 1000 ^{O}C
- ✓ Digitally controlled
- ✓ High grade heating elements
- ✓ Venting system
- ✓ Light weight ceramic insulation
- ✓ Outer body is double walled thick C.R.C. sheet duly powder coated
- ✓ Ceramic pot size $6^{//}$ x $6^{//}$ x $12^{//}$
- ✓ 220/ 230 V

Testing of carbon capturing potential of mulberry in different locations PPS 3559

RSRS	Season	Sample	Leaf/ shoot yield (kg/ha)		Moisture%		Carbon capturing potential (kg/ ha))	
			Treatment	Control	Treatment	Control	Treatment	Control
Koraput	Aug-Sep, 15	Leaf	4315	4231	75.33	75.71	483.82	453.22
	Oct-Nov, 15	Leaf	3571	3492	69.24	69.73	499.79	471.43
	Dec, 15	Shoot	1357	1295	69.41	70.34	201.33	182.83
	March, 16	Leaf	2580	2450	72.98	74.02	310.22	281.97

RSRS	Season	Sample	Leaf/ shoot yield (kg/ha)		Moisture%		Carbon capturing potential (kg/ ha))	
			Treatment	Control	Treatment	Control	Treatment	Control
Kalimpong	Aug, 15	Leaf	6320	5880	71.88	73.74	791.74	669.36
	Dec, 15	Shoot	6075	5850	67.90	69.23	940.91	846.92
	April, 16	Leaf	5760	5020	74.25	74.59	652.61	553.60
	June, 16	Shoot	6480	5980	69.78	70.50	920.38	820.31

RSRS	Season	Sample	Leaf/ Shoot yield (kg/ha)		Moisture%		Carbon capturing potential (kg/ ha))	
			Treatment	Control	Treatment	Control	Treatment	Control
Ranchi	Aug, 15	Leaf	4582	4452	74.00	74.49	516.44	484.38
	Oct, 15	Leaf	4231	4014	70.15	71.25	551.91	495.08
	Dec, 15	Shoot	2061	1986	69.56	70.21	304.27	278.07
	March, 16	Leaf	3198	3127	69.25	69.96	429.74	403.92

RSRS	Season	Sample	Leaf/ Shoot yield (kg/ha)		Moisture%		Carbon capturing potential (kg/ ha))	
			Treatment	Control	Treatment	Control	Treatment	Control
Jorhat	Oct, 15	Leaf	4390	4200	70.94	72.62	579.18	512.88
	Nov-Dec, 15	Shoot	2160	1840	68.00	68.70	336.61	275.00
	April, 16	Leaf	5886	5600	75.84	76.60	647.04	587.06