Part – 10
FINAL PROJECT REPORT

i(a).	**Project code**	**PPA-3499**
i(b).	**Project title :**	**Evaluation Of Field Level Performance Of Vishala Mulberry Variety In Different Locations Under Irrigated Conditions In West Bengal**
ii.	**Names of the project investigators :** (including coordinator in case of collaborative projects)	**Executive Authority:** **K Trivedy (since 02-11-2015)** **S Nirmal Kumar** (22-04-2013 to 31-07-2015) **Project Co-ordinator:** M K Ghosh(upto 31-03-2016) **Principal Investigator:** **Gopal Chandra Das (from 01.04. 2015)** **S. K. Mandal (upto 31.03.2015)** ***Co-* Investigator** **M. S. Rahman (upto 30.08.2014)** **S. Rajaram (upto 01.12.2015)** **T. Datta Biswas (from 10.07 2014)** **Maloy Kumar Ghosh** **S. Roy Chowdhuri (from 01.08.2016)** **L. M. Saha (upto 30.06.2015)** **S. N. Bagchi (from 05.06.2017)** **Alok Kumar Dutta (upto 30.11.2015)** **P. K. Biswas (upto 28.02.2015)** **S. Chakraborty (from 02.08.2016)** **Mili Banerjee (upto 30.06.2015)** **Subrata Das (from 02.08 2015)** **S. N. Koley (upto 31.12.2014)** **Sudip Sen (upto 10.06.2014)**
iii.	**Duration**	April 2013 – March 2018
iv(a)	**Name of the institute and addresses**	Central Sericultural Research & Training Institute, Central Silk Board, Berhampore 742101, Dist: Murshidabad, W.B.
iv(b)	**Centre associated with this evaluation programme**	1. CSR&TI, Berhampore, Murshidabad, W.B. 2. SSPC, DBPUR, Uttar Dinajpur, W.B. 3. SSPC, Raiganj, Uttar Dinajpur, W.B. 4. SSPC, Berhampore, Murshidabad. W.B.

		5. P1 BSF., Banguria, Nadia, W.B. 6. REC, Kamnagar, Murshidabad (WB) 7. REC, Mothabari, Malda (WB) 8. DoT(Seri), Krishnagar, Nadia , WB 9. DoT(Seri), Suri, Birbhum , WB 10. DoT(Seri), Berhampore, Murshidabad, WB

v. OBJECTIVE / GOALS

- To find out the potentiality of Vishala mulberry variety under irrigated conditions in West Bengal.
- Evaluation of field performance of Vishala mulberry variety in different locations under irrigated conditions in West Bengal.

vi. INTRODUCTION

In India, large numbers of improved mulberry varieties have been evolved for commercial purpose in recent years. These varieties registered their superiority over traditional local varieties in exhibiting increased yield with good quality leaves, wide adaptability and resistance to stress condition. **Vishala** –the mulberry variety was developed (clonal selection) by Karnataka State Sericulture Research & Development Institute, (KSSRDI), at mulberry garden of Shidhaghatta Taluk, Kolar district of Karnataka. This variety has good sprouting and rooting ability with fast growth, suitable for 5-6 crops/year. Leaf yield is about 45-50 t/ha/year under irrigated conditions with recommended package of practices. Under All India Coordinated Experimental Trial for mulberry (AICEM), -Phase-II, Vishala shows highest leaf yielder. For evaluation of its performance in larger locations in farmers' field under irrigated conditions of West Bengal with check of **S1635** (the ruling high yielding variety of the state) for its suitability in large scale and popularization, Central Silk Board wants to do extensive large scale on farms trial in various agro-climatic condition before recommendation for cultivation across India. Presently, Vishala mulberry variety is considered as a **National Check.** Under this trial, plantation of Vishala mulberry variety along with check S1635 were made in 23 locations in 5 districts of irrigated zone of West Bengal.

vii. Methodology adopted:

a) Establishment of plantation: The experiment was conducted altogether in 23 locations in 11 region of 5 district in West Bengal. Saplings of test genotypes (Vishala) along with checks

(S1635) have been raised at the Institute (CSR&TI, Berhampore) with 500 plants/ location for each genotype. The five months old sapling were transplanted in the experimental plot in 23 location of 5 districts of West Bengal with 60 x 60 cm spacing along with the check variety. Transplantation of saplings in 23 location was completed during December 2014 (**Table 1**). The plantation was maintained through intercultural operations and application of recommended inorganic fertilizer dozes of N, P_2O_5 and K_2O at 360 kg ha^{-1},180 kg ha^{-1} and 112 kg $ha^{-1}y^{-1}$ in five split doses and FYM 20 t ha^{-1} y^{-1} in two split doses for irrigated gardens. Growth, leaf yield and physiological growth parameters data of vishala genotypes along with checks (S1635) was recorded for three years and analyzed results were presented below.

b) Experimental Details:

Districts (No.)	05 nos. districts in West Bengal i) Malda ii) Murshidabad iii) Birbhum iv) Nadia v) Uttar Dinajpur
Farmers (No.)/ Location	23 location under Irrigated condition
Spacing	60 x 60 cm
Mulberry variety	02 : Vishala and S-1635 (Check)
Area (ft^2 /farmer)	4000 (=5.56 katha)
Plants (no.)	500 / variety
Harvest data taken/ year	5 x 3 years

Table-1: District wise Plantation in different location

#	District	Plantation completed by December 2013	Plantation completed by December 2014	District wise Farmers covered
1.	Nadia	2	5	7
2.	Murshidabad	3 +1 (Institute)	4	8
3.	Birbhum	1	1	2
4.	Malda	1	1	2
5.	Uttar Dinajpur	4	-	4
	Total	11 + 1 (Institute)	11	23

Table-2: Farmers wise Plantation in different location

#	Name of the Farmers	Village	District	Date of Plantation
1.	Dinobondhu Mondal	Kanaipur	Birbhum	Plantation completed during Nov. 2013 in 12 location
2.	Tapash Biswas	Harekrishnapur	Nadia	
3.	Arman Mondal	Do-	Do-	
4.	Bapi Das Bairagya	Do-	Do-	
5.	Narayan Sarkar	Senpara	Do-	
6.	Nabakumar Sarkar	Do-	Do-	
7.	Suffian Ali	Alinagar	Malda	
8.	Nausad Ali	Panchgram	Murshidabad	
9.	Noor Mohammad	Do-	Do-	
10.	Jahiruddin Sk	Do-	Do-	
11.	Kiron Chowdhury	Kalitala	Do-	
12.	Sarbeswar Mondal	Akalipur/Bhadraur	Birbhum	Plantation completed during Nov. 2014 in 11 location
13.	Adhir Barman	Betar	Uttar Dinajpur	
14.	Hirendra Nath Goswami	Baghan	Do-	
15.	Jiten Deb Sharma	Hansua	Raiganj	
16.	Oben Deb Sharma	Monoharpur	Do-	
17.	Md. Saikul Sk.	Baroupara	Murshidabad	
18.	Nemai Baidya	Banguria	Nadia	
19.	Binod Bihari Roy	Durgapur	Do-	
20.	Haripada Mondal	Kalitala	Murshidabad	
21.	Srikanta Konai	Kumarpur	Do-	
22.	Rafik Sk	Dollugram	Malda	
23.	Control	Institute	Msd.	

viii): Observation & Result

a) Evaluation of mulberry variety under irrigated condition at 23 location of W. B.

The genotype Vishala showed survival percentage (96.70 %) at par with the control S-1635 (96.49%). After establishment of one year, the varieties were pruned and evaluated for leaf characters, growth traits and leaf yield along with yield attributing characters.

b) Leaf quality traits:

The growth of silkworm *(Bombyx mori* L.) and production of quality cocoons depends on timely feeding of good quality mulberry leaves to silkworm. Therefore, it is most imperative to analyze different leaf quality traits such as leaf moisture content (LMC), moisture retention capacity (MRC), total chlorophyll, nitrogen, protein, amino acids and carbohydrate contents. The leaf quality traits estimated in mulberry variety Vishala and control (S1635) and presented in the **(Table-3)**. LMC and MRC are two important factors in maintaining the nutrition level in mulberry leaves, which in turn improve its palatability for silkworm. These two traits are influenced by genetic and environmental factors (Vijayan *et al.,* 1997) and are also positively related with an increased growth of silkworm larvae (Paul *etal.,* 1992). In the present study, the test genotype Vishala exhibited low Inter-nodal distance (5.26 cm), higher number of leaves per unit length of shoot (22.7/m), 100 leaf weight (655.6 g) & Leaf yield/ plant (574.1 g) higher than check. LMC and MRC were observed 75.3% & 90.06% respectively in Vishala and were on par with control S1635 (74.6% and 90.48%).

Table-3: Mean values of growth, leaf yield and other attributes of Vishal and S-1635

Genotype	CC ($\mu g/mm^2$)	L A cm^2	LMC (%)	MRC %	100 LW (g)	NN/ m	IND (cm)	PS (No)	TSL (cm)	LLS (cm)	LY /P (g)
Vishala	15.9	294.9	75.3	90.06	655.6	22.7	5.26	12.0	894.4	133.3	574.1
S1635	16.1	274.9	74.6	90.48	598.0	21.8	6.39	10.7	845.7	138.0	520.0
p value of t- stat	0.81	0.53	0.49	0.37	0.03*	0.59	0.02*	0.04*	0.01*	0.89	0.03*

N.B.: L A- Leaf Area; CC- Chlorophyll content. LW- leaf weight; LMC- Leaf Moisture Content; MRC- Moisture Retention capacity; PS- Primary Shoots; TSL- Total Shoot Length; LLS- Length of the longest shoot; IND- Inter –nodal distance; NN- No. Of nodes; LY /P- Leaf Yield /plant;

c) Evaluation of leaf Biomass:

Table 4: Annual leaf yield of Vishala variety over checks S-1635 at farmers field

Genotypes	Leaf yield ($kg.ha^{-1}$)			
	Year-1	Year-2	Year-3	Mean of 3 years
Vishala	35914.8	43939.7	56555.2	45469.9
S-1635*	33125.1	39718.6	50067.8	40970.5
SEm±	307.5	645.55	1281.6	451.65
CD at 5% level	885.55	1859.1	3690	1300.8
Improvement %	8.42	10.63	12.96	10.98

**Check genotypes*

Table 5: Mean seasonal leaf yield potential of test genotypes and checks at farmers field

Genotypes	Seasonal leaf yield (kg ha^{-1})					Total yield (kg ha^{-1})
	February	April	July	September	November	
Vishala	5437.0	8414.4	9945.0	12316.4	8922.3	45469.9
S-1635*	5115.4	7783.8	8917.3	10577.6	8140.8	40970.5
Improvement %	6.29	8.10	11.52	16.44	9.60	10.98

**Check genotypes*

Table 6: Location effect on leaf yield potential of mulberry variety in different Districts of W. B.

Location	Location wise leaf yield potential (kg/crop/ha)			
	Year-1	Year-2	Year-3	Mean of 3 years
Birbhum	6712.35	7496.40	10774.64	8327.80
Nadia	7066.47	8310.30	11613.00	8996.59
Malda	6937.20	7940.98	10526.45	8468.21
Murshidabad	7127.90	8166.10	11207.35	8833.78
U. Dinajpur	6649.48	7114.85	9189.93	7651.42
SEm±	97.24	104.14	405.28	162.24
CD at 5% level	280.03	309.09	1167.14	405.04

The mulberry variety 'Vishala' exhibited maximum leaf yield potential (range: 5437.0 to 12316.4 kg ha^{-1} $crop^{-1}$) than control S1635 potential (range: 5115.4 to 10577.6 kg ha^{-1} $crop^{-1}$) (**Table-5**). The annual leaf yield recorded 10.98 % higher yield in Vishala (45469.9 kg ha^{-1} yr^{-1}) than S1635 (40970.5 kg ha^{-1} yr^{-1}) (**Table-4**). The yield potential of Nadia & Murshidabad district is more than other 3 districts (Birbhum, Malda & Uttar Dinajpur) (**Table-6**).

Pest incidence (Thrips & Mealy bugs) was maximum during Feb –May crop in all districts (8-12/ leaf) whereas white fly population was maximum during July to September crop (8-14/ leaf). Incidence of leaf spot (BLS & MLS) foliar disease prevailed during June –August and significantly higher in check (S-1635) over test variety (Vishala) mulberry variety.

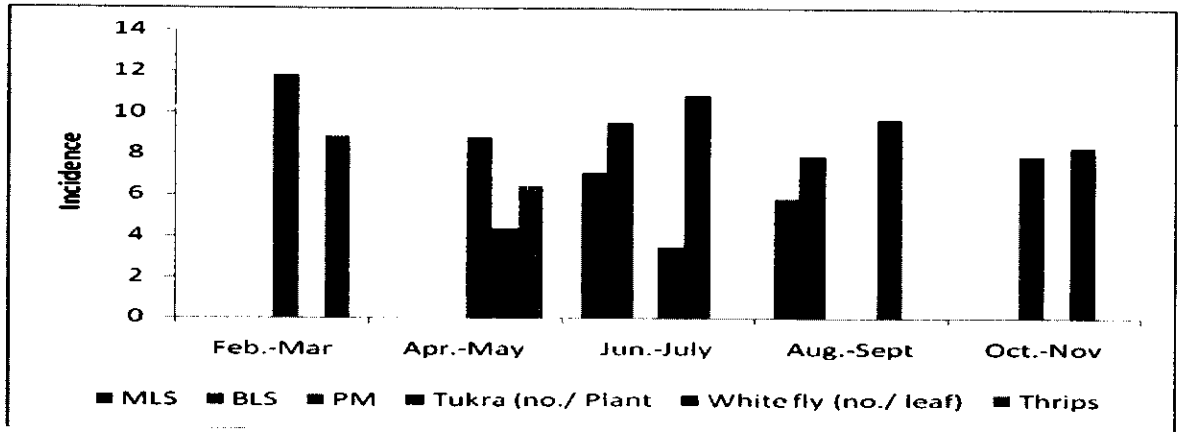

Fig. 1: Season wise folier disease incidence & Pest of mulberry

Table-7: Mean percentage of Disease index (PDI) of foliar disease & pest of mulberry

	Vishala	S-1635	p value of t stat	
MLS	5.90	8.27	0.02	*
BLS	8.53	10.47	0.04	*
PM	7.63	8.13	0.61	NS
Tukra (no./ Plant	12.00	11.67	0.86	NS
White fly (no./ leaf)	9.67	12.33	0.10	NS
Thrips	9.33	8.33	0.47	NS

*<0.05

MLS-Myrothecium leaf spot; BLS-Bacterial leaf spot; PM- Powdery Mildew

d) Bioassay performance at farmers field:

The bioassay were conducted in 23 location of farmers field to assess the quality & palatability of leaves for silkworm rearing. Leaf quality & nutritional status of the mulberry variety Vishala & its check S-1635 were studied at Institute level **through feed conversion efficiency.** Rearing performances of silkworm hybrid [N x (SK6 x SK7)] fed on Vishala mulberry variety to assess the leaf quality over its control S-1635 in different seasons at farmers' field. The average yield potentiality is summarized in **Table-8**. In general, no significant differences were observed in rearing parameters between Vishala & S1635 fed silkworm rearing over its control S1635. But locational effect observed (**Table-9**) that the yield potential of Malda, Murshidabad & Nadia is higher than Birbhum & Uttar Dinajpur.

Table 8: Potentiality of Vishala mulberry variety on cocoon production (kg/100 dfls) at farmers field of West Bengal over S-1635 variety [Hybrids N x (SK6 x SK7)]

	Year wise cocoon yield (kg/ 100 dfls)			
Mulberry variety	**Year-1**	**Year-2**	**Year-3**	**Mean of 3 years**
Vishala fed	39.7	37.19	40.78	39.22
S-1635 fed	40.2	36.93	40.48	39.20
SEm±	0.309	0.219	0.48	0.34
CD at 5% level	NA	NA	NA	NA

Table 9: Location effect on cocoon yield potentiality at farmers field of West Bengal [Hybrids: N x (SK6 x SK7)

Location	Location wise cocoon yield **(kg/100 dfls)**			
	Year-1	**Year-2**	**Year-3**	**Mean of 3 years**
Birbhum	38.60	34.86	37.81	37.09
Nadia	41.78	37.45	41.15	40.13
Malda	39.50	38.00	43.05	40.18
Murshidabad	41.20	38.38	42.68	40.75
U. Dinajpur	37.70	36.64	38.46	37.60
SEm±	0.47	0.34	0.76	0.52
CD at 5% level	1.33	1.01	2.23	1.52

e) Bioassay Performance at Institute level:

The bioassay study conducted to at CSRTI, Berhampore silkworm hybrid (B.Con.1 x B.Con.4/ SK6 x SK7) in different seasons to analyze the influence of varietal leaf quality on silkworm growth and cocoon characters. The average of three seasons (unfavorable season) rearing data recorded on silkworm growth and cocoon characters are summarized in **Table-10** and found no significant difference. The average rearing performance of two seasons (favorable season) rearing presented in **Table: 11**. In general, no significant differences were observed on yield parameters between Vishala & S1635 fed silkworm rearing during favourable Season.

Rearing Performance during **unfavourable Seasons** (April-September)

Table 10: Mean of 3 Seasons: Hybrids: N x (SK6 x SK7)

Mulberry Genotype	Silkworm Hybrids	Larval duration	Wt. of 10 mature larvae	ERR		SCW (g)	SSW (g)	SR%
				No.	wt. (kg)			
Vishala fed	M x B	24	34.73	8771.3	11.377	1.347	0.246	18.284
S1635 fed	Do	24	34.87	8807.7	11.413	1.351	0.247	18.312
p value of t stat		1.00	0.765	0.270	0.700	0.621	0.698	0.874

N.B> ERR: Effective rate of rearing; SCW- Single cocoon weight.; SSW- Single shell weight.

Rearing Performance during **favourable Seasons** (October to February)

Table 11: Mean of 2 Seasons: Hybrids: B.Con1.x.B.Con4

Mulberry Genotype	Silkworm Hybrids	Larval duration	Wt. of 10 mature larvae	ERR		SCW (g)	SSW (g)	SR%
				No.	wt. (kg)			
Vishala fed	Bi x Bi	26.6	37.47	9386	12.743	1.409	0.277	19.661
S1635 fed	Do	26.9	37.51	9484	12.879	1.418	0.279	19.686
p value of t stat		0.315	0.911	0.006**	0.116	0.521	0.548	0.008**

Mulberry leaf quality assessment through feed conversion efficiency: The bioassay study conducted at CSRTI, Berhampore through feed conversion efficiency during June –July 2016 with silkworm hybrid B.Con.1x B.Con.4. In the present study, **Vishala** mulberry variety was evaluated in respect of nutrition status through feed conversion efficiency over **S1635** mulberry variety. The growth and development of silkworm larvae and economical characteristics of cocoon is influenced largely by quality leaves of mulberry. Higher nutritional efficiency conversion of ingesta to cocoon and shell were presented in the **Table-12**.

Table-12: Assessment of mulberry leaf quality of Vishala & S-1635 variety through feed conversion efficiency.

Particulars	Vishala	S1635	p value of t-stat
Ingesta	6.42	6.82	0.85
Digesta	3.19	3.60	0.77
AD% [Approximate Digestibility]	49.65	52.73	0.80
ECI to larvae % [Efficiency Conversion of Ingesta]	10.93	9.41	0.52
ECD to larvae % [Efficiency Conversion of Digesta]	22.02	17.85	0.61
ECI cocoon	8.98	8.39	0.79
ECD cocoon	18.10	15.91	0.80
ECI shell	4.04	3.43	0.36

ECD shell	6.42	6.82	0.85
I/g cocoon [Ingesta per gram cocoon]	3.19	3.60	0.77
D/g cocoon [Digesta per gram cocoon]	49.65	52.73	0.80
I/g shell	10.93	9.41	0.52
D/g shell	22.02	17.85	0.61
Avg shell weight	8.98	8.39	0.79
Avg cocoon weight	18.10	15.91	0.80
Shell Ratio %	4.04	3.43	0.36

Efficiency conversion of Ingesta and Digesta to cocoon shell; the efficiency of conversion to cocoon was shown higher in Vishala (8.98) than S1635 (8.39) and efficiency conversion of Digesta to cocoon was higher in Vishala (18.10) than S1635 (15.91). The higher shell weight was found in feed with Vishala (0.26) mulberry leaves than S1635 (0.24). The average cocoon weight is found 0.57 in both cases. The higher SR% is found in Vishala (45.24) and lower SR% was recorded in S-1635 (42.10).Hence based on the above study, it can be concluded that the Vishala mulberry variety is qualitatively superior / on par with S-1635.

ix) Discussion:

The overall performance of Vishala test genotype showed 10.98% higher leaf yield potential (**45470** kg $ha^{-1}year^{-1}$) over check mulberry variety S-1635 (**40971** kg $ha^{-1}year^{-1}$) in the irrigated condition of West Bengal. The Vishala mulberry variety shows higer leaf yield potential in Nadia & Murshidabad district than other 3 districts (Birbhum, Malda & Uttar Dinajpur. The mean percentage of disease index (PDI) of foliar disease observed higher severity in check variety (S-1635) over test genotype Vishala. To assess the leaf quality and nutritional status bioassay conducted at farmers field as well as Institute level. Palatability of leaf, growth and larval duration observed no significant difference between S1635 & Vishala varieties. In respect of leaf quality both the variety are good enough and on par for rearing of silkworm & production of cocoons and its quality. So, both the varieties are suitable for silkworm rearing & very good in respect of nutritional quality. The improvement leaf biomass in Vishala over check –S1635, accommodate more dfls consumption per unit area which increase the cocoon yield as well as more earning.

x) Inference / Recommendations:

Overall performances of genotype Vishala indicated higher average annual leaf yield production (**45470** kg $ha^{-1}year^{-1}$) over check S-1635 (**40971** kg $ha^{-1}year^{-1}$) **in irrigated condition** and excelled by 10.98% higher yield. As dfls intake/consumption per unit area is more in Vishala due to higher biomass which increase the cocoon yield and enhance the income. So, the variety may be exploited at farmers field in irrigated condition of West Bengal.

xi) Applications made for patenting / commercialization if any : NA

xii) References

1. Benchamin,K.V. & Anantharaman,K.V. (1990). Standardization of moulting test to evaluate mulberry leaf quality under tropical conditions. *Indian J. Seric.*, 29(2) pp.255-262.
2. Bongale,U.D. & Chaluvachari. (1995). Evaluation of eight mulberry germplasm varieties by leaf biochemical and bio-assay moulting studies. *Sericologia*, 35 pp. 83-94.
3. Chaluvachari & Bongale, U.D. (1996). Bioassay moulting response of silkworm *Bombyx mori* L. in relation to leaf nutritive constituents in mulberry (Morus spp.) genotypes. *Indian J. Seric.*, 35(2) pp.160-162.
4. Krishnaswami,S. (1990). Improved method of rearing young age (chawki) silkworms. *Bulletin No.2*, Central Silk Board, Bangalore, India. pp.1-24.
5. Krishnaswami,S., Roy,D. & Mukherjee,S.K. (1970a). Yield and nutritive value of mulberry leaves as influenced by planting system, spacing and frequency of pruning. *Indian J. Seric.*, 9(1) pp.38-42
6. Krishnaswami,S., Noamani,K.R. & Asan,M. (1970b). Studies on the quality of mulberry leaves and silkworm cocoon crop production, Part I, Quality difference due to varieties. *Indian J. Seric.*, 9(1) pp.87-93.
7. Krishnaswami,S. (1978). New technology of silkworm rearing. *Bulletin No.2*, C.S.R.& T.I, Mysore, India. pp.1-20.
8. Sengupta,K., Singh,B.D. & Mustafi,J.C. (1972). Nutrition of silkworm, *Bombyx mori* L. I. Studies on the enrichment of mulberry leaf with various sugars, proteins, amino acids and vitamins for vigorous growth of the worm and increased cocoon crop protection. *Indian J. Seric.* 11 pp.11-27.
9. Sajad-Ul-Haq; S.S.Hasan; Anil Dhar and Vishal Mittal (2014): Nutrigenic Efficiency Change and cocoon crop loss due to assimilation of leaf spot diseased mulberry leaf in silkworm Bombyx mori L. Journal of Plant Pathology & Microbiology, Vol-5, issue-2, pp 1-7
10. Trivedy, K. and Nair, K.S. (1998): Dietary efficiency and silk productivity. Indian Silk, 36 (9): 5-7
11. Venugopala Pillai,S. & Jolly,M.S. (1985). An evaluation on the quality of mulberry varieties raised under hill conditions and the crop results of Bombyx mori L. *Indian J. Seric.*, 24(2) pp.48-52.

12. Choudhury P. C., Shuka P., Chosh B. and Sengupta K. (1991): Effect of spacing, crown height and method of pruning on mulberry leaf yield, quality of cocoon yield. Indian Journal of Sericulture, 30(1): 46-53
13. Raman K. V. A., Mala V. R., Magadum S. B. and Datta R. K. (1995): Effect of seasons and mulberry varieties on the feed conversion efficiencies of different silkworm hybrids of Bombyx mori L. Uttar Pradesh Journal of Zoology, 15(3):157-161.
14. Machii and Katagiri. (1990): Varietal differences in food value of mulberry leaves with special reference to production efficiency of cocoon shell. Journal of Sericultural Science, 59(1):34-42.
15. Machii K. and Katagiri K. (1991): Varietal differences in nutritive values of mulberry leaves for rearing silkworms. Japan Agricultural Research Quarterly, 5:23-27.
16. Doss, S.G., Rahman, M.S., Debnath, S., Ghosh, M.K., Sau, H., Ghosh, P.L. and Sarkar, A. 2006. Variability, heritability and genetic advance in nine germplasm lines of mulberry (*Morus* spp.). *Indian J. Genet.*,, **66**, 169-170.
17. Dudly, J.W. and Moll, H., 1969. Interpretation and Use of Estimates of Heritability and Genetic Variance in Plant Breeding. *Crop Sci.*,**9**, 257-267.
18. Rahman, M.S., Doss, S.G., Debnath, S., Roy Chowdhari, S., Ghosh, P.L and Sarkar, A. 2006. Genetic variability and correlation studies of leaf characters in some mulberry (Morus spp.) germplasm accessions. *Indian J. Genet.*,**66**(4): 359-360.

xiii) Paper published: Nil

xiv) Summery

- Filed trial conducted at 23 locations of 11 regions in 5 districts of W.B.
- Plant growth, yield potentiality, field performance and testing of bio-assay continue for ascertain the performance of varieties.
- Survivability of Vishala (96.61%) & S1635 (96.32%) recorded & found at par.
- Higher leaf yield potential in Vishala (**45470** kg $ha^{-1}year^{-1}$) over check mulberry variety S-1635 (**40971** kg $ha^{-1}year^{-1}$) **in the tune of 10.98 % higher yield.**
- Suitability of leaves for silkworm rearing studied. Palatability of leaf, growth and larval duration observed. No significant difference between S1635 & Vishala mulberry varieties.
- Plant growth, disease incidence and leaf harvest data collection, location wisc & district wise yield potentiality observed with bio-assay study conducted as per mile stone.
- Bio-assay data revealed that no significant difference between the varieties of S1635 & Vishala in respect of nutritional status.

xv) Budget utilized

Budget allocated by Central Silk Board:

Proposed Amount (Lakh)	Cost Sharing %		Actual Expenditure CSB (Rs. In Lakh)	Remarks
	Beneficiary (Rs. In Lakh)	CSB (Rs. In Lakh)		
12.217	6.457 (52.63%)	5.812 (47.37%)	1.098	The work completed within the budget provision

Expenditure Details (Central Silk Board):

Sl. no.	Particulars	Year wise expenditure (Rs.)					Total
		2013-14	2014-15	2015-16	2016-17	2017-18	
1.	**TA bill**	**33,099**	**34,466**	-	-	**8,507**	**76,072**
2.	**Organic Manure**	**1,420**	-	-	-	-	**1,420**
3.	**Mandays**	**4,185**	**4,900**	-	-	-	**9,085**
4.	**Stationery article**	**150**	**1,450**	-	-	-	**1600**
5.	**Chemical Fertilizer**	**4,180**	**5,283**	-	**6,059**	**6,059**	**21,581**
	Total	**43,034**	**46,099**	-	**6,059**	**14,566**	**1,09,758**

Photograph of Vishala Plantation:

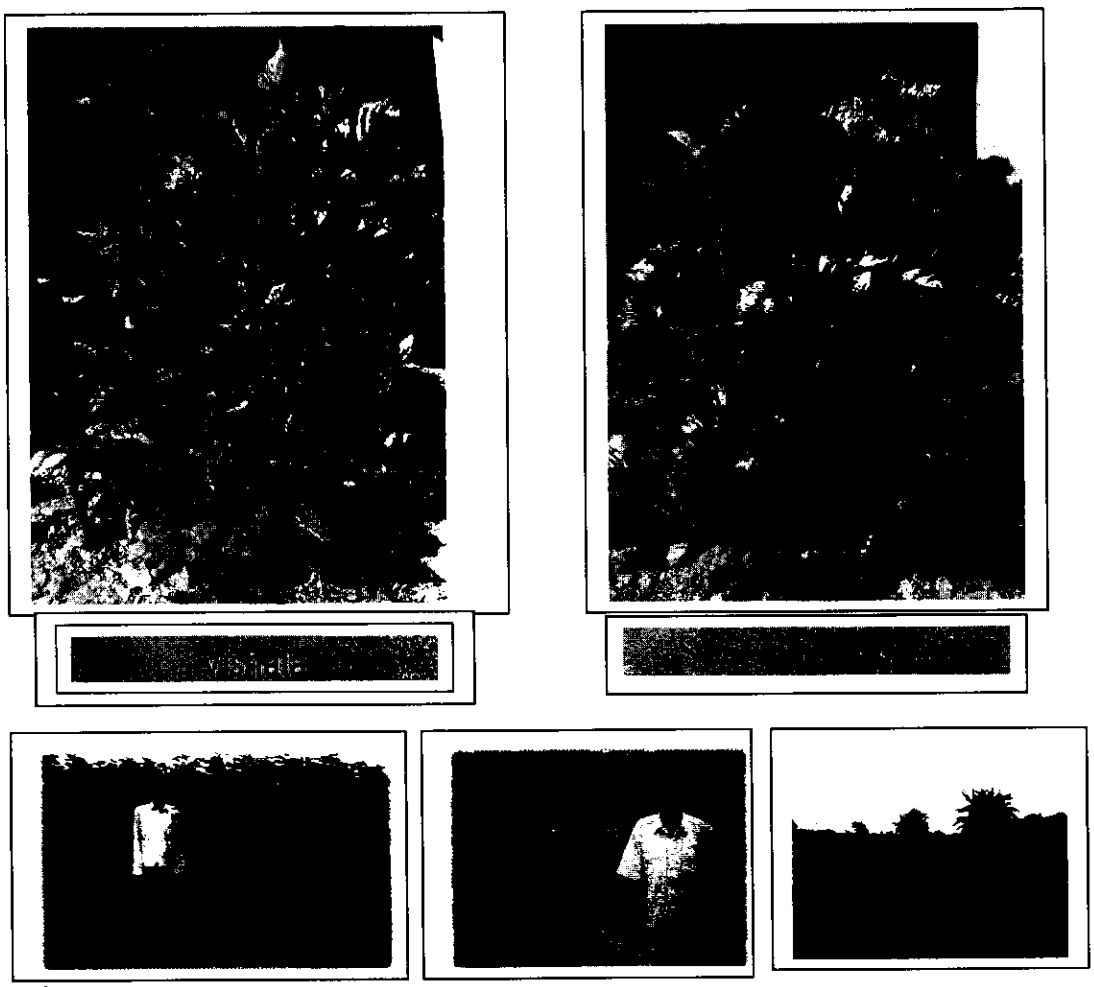

Fig.2: Photo of Vishala mulberry plantation in different location

Certified that the Project work has been carried out and financial expenditure incurred for executing the Project are in accordance with the declaration / certification submitted at the time of submission of the Project Proposal and sanction obtained from time to time thereafter as per the revision made.

xv) Signature of the Principal Investigator Co-Investigator	04/9/2018 **(GOPAL CHANDRA DAS)** **Scientist-D** **Bv Cell, Silkworm Physiology & RTI** Tapali Datta Biswas 4.9.18. **(T. DATTA BISWAS)** **Scientist-D** **REC, Kamnagar** **(S. ROY CHOWDHURI)** **Scientist-D** **SSPC, Raiganj** 12/09/18 **(MALOY KUMAR GHOSH)** **Scientist-D** **SSPC, DBPUR,** 04/9/18 **(S. N. BAGCHI)** **Scientist-D** **SSPC, Berhampore** 12/09/18 **(S. CHAKRABORTY)** **Scientist-D** **REC, Mothabari, Malda** 12/9/18 **Dy Director Of Textile (Seri)** **DoT (S), Berhampore, Murshidabad** **Dy Director Of Textile (Seri)** **DoT (S), Krishnagar, Nadia** 12/9/18 **Dy Director Of Textile (Seri)** **DoT (S), Suri, Birbhum**

14. Signature (with comments, if any) of Director / Co-ordinator	The project has been concluded without any deviation of milestones and obtained the results as per the objectives proposed. From the study, it was observed that the vishala mulberry variety shows 10.98% higher leaf yield potential over check –S1635 and accommodate more dfls consumption per unit area due to biomass improvement which increase the cocoon yield as well as more earning. **(Smt. Chandana Majhi)** **Director (I/C)** केन्द्रीय रेशम उत्पादन अनुसंधान एवं प्रशिक्षण संस्थान Central Sericultural Research & Training Institute केन्द्रीय रेशम बोर्ड/Central Silk Board बहरमपुर-742101/Berhampore-742101 मुर्शिदाबाद(प.बं.)/Murshidabad (W.B.)

Minutes of 48th Meeting of RAC of CSR&TI, Berhampore

#	Observations of RAC	Action taken
Action: G. C. Das., Scientist-D	The Project has been concluded as per milestones. Results should reflect increased cocoon yield resulting from higher dfls consumption per unit area due to the biomass improvement as presented	Concluded report of the project submitted as per format. (Part 10).