

Impact of Bivoltine Sericulture in Improving Socio Economic Conditions of Sericulture Farmers of Madakasira Cluster Through Cluster Promotion Programme (CPP)

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Abstract

Efforts of more than one decade of Cluster Promotion Programme (CPP) implementation at Madakasira has yielded marked improvement in the development of Bivoltine sericulture and production of gradable bivoltine raw silk. It was noticed that DFLs distribution was recorded 0.58 lakh in 2008-09, 1.40 lakh (2009-10), 1.43 (2010-11), 1.82 (2011-12), 2.25 (2012-13), 3.55 (2013-14) 4.83 (2014-15), 6.92 (2015-16), 10.06 (2016-17), 15.82 (2017-18) and 16.02 lakh in 2018-19, respectively with a pounding increase of DFLs distribution as against the bench mark level brushing of 0.42 lakh DFLs before 2008. Growth rate of DFLs distribution was ranged from 94.79 to 138.7% in case of target and 38.1 to 3714.3 % over bench mark. Similar trend was noticed with regard to number of DFLs harvested among the farmers. CPP implementation under the cluster also prejudiced the cocoon yield per 100 DFLs ranging from 61.67 to 73.55 kg during the CPP period (2008-2018) resulting in 40.16 to 67.16% increase as compared to bench mark yield (44.0%). Due to CPP implementation under Madakasira during the CPP period a total of 64.26 lakh DFLs were distributed as against 55.10 lakh target generating 618.73MT raw silk among 24,000 sericulturists. The average market rate too increased significantly ranging from Rs. 279.0-506.0 with 24.0-124.9% increase. Further the Bivoltine sericulture practice has not only transformed the living standards of sericulturists but also refining their socio economic standards. Bivoltine sericulture practice offered the farming community in clearing their long standing monetary dues, civilizing their children education standards, increasing immovable properties and increasing the horizontal growth of sericulture and procure sophisticated gadgets.

1. Introduction

Being the largest consumer of various kinds of natural raw silks in the world, India's demand is for quality raw silk production and putting all efforts to increase the production of the same over the years. As a matter of fact India has to import 5,870 MT of raw silk and 3,780 MT silk fabrics for fulfilling our own requirement (Himantharaj *et al.*, 2012, Sudhakar *et al.*, 2018). As the demand-supply gap is widening in India for mulberry silk, there is an urgent need to improve the production and productivity of Bivoltine raw silk for meeting the requirement of domestic market to become self-reliant and compete in the international market. Therefore, it is a major challenge to endorse in this direction, that being over 90% of our production has upgradable quality. Ultimately to overcome with the present situation judicious efforts for increasing the bivoltine silk production in the country is the ultimate solution.

Effective extension communication mechanisms, percolation of cost-effective technologies that fit well into the region and followed by the better interaction and involvement of Scientists, extension and field functionaries towards the end users to identify, assess and find a solution to a problem. These kind of participatory approaches will definitely results in achieving the anticipated targets. In this direction many extension approaches such as Catalytic Development Programmes (CDP), Institute Village Linkage Programmes (IVLP) and Technology Validation and Development Programmes (TVDP) have adopted by the Central Sericultural Research and Training Institute (CSR&TI), Mysore as ideal concepts in sericulture for the transfer of technologies to the farmers from time to time with the support of State Sericulture Department and the results were encouraging (Jaishankar and Dandin, 2005; Sreenivas *et al.*, 2010). Among them cluster development approach is one such approach, which is holistic,

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information based and participatory extension mode with Research-Extension-Farmer (R-E-F) linkage. This approach was effectively implemented in the XII five year plans during 2008-12 for large scale promotion of bivoltine sericulture in India particularly in Southern major silk producing regions and the results was encouraging (Himantharaj *et al.*, 2012, Qadri, 2012, Sudhakar *et al.*, 2018).

Cluster Promotion Programme (CPP) implemented during XI and XII five year plans during 2008-2019 in major silk producing southern states viz. Karnataka, Andhra Pradesh and Tamil Nadu and in few parts of Kerala has yielded encouraging results. In coordination with Central Silk Board (CSB) and state sericulture departments have jointly organised 178 clusters all over India. Out of 106 clusters in Southern India 46 clusters were implemented in Karnataka, 28 clusters in Tamil Nadu, 13 clusters in Andhra Pradesh, 4 in Telangana, 9 in Maharashtra whereas 4 in Madhya Pradesh whereas 2 clusters in Kerala with an anticipated 167.06 lakh DFLs brushing and generate 1920MT of bivoltine raw silk. In Andhra Pradesh out of 13 clusters, Madakasira one of the biggest Mandal Ananthapur district located at the edge of Andhra and Karnataka borders was considered to implement CPP from April, 2008 to March, 2019 with the objectives to increase production and productivity of bivoltine sericulture effectively in India.

Madakasira is spread over 38.16 square kilometres (14.73 sq mi) area with a population of >73,222 in 15,413 Households. Madakasira covers a total of 20 villages having more potentiality of practicing sericulture with the influence of border villages of Karnataka. Madakasira is geographically placed at a latitude of 13°94'N and longitude of 77°27'E on the banks of Penna River having an average elevation of 2221 feet (676 metres). Madakasira area is cooler compared to the climate of elsewhere in Anantapur District, hence pertinently known as Ooty of Anantapur District favouring Bivoltine sericulture practice. The Rainfall is spasmodic prevailing with tropical climate, winter last from November to February, while summer lasts from March to June. Even in summers, the city experiences lower temperatures compared to the rest of the state due to its high elevation. Average annual rainfall is above 532 mm and most of it received during the months of July to August. Keeping the above credentials in mind anticipating a bright future for Bivoltine sericulture in the vicinity, CPP was implemented among the sericultural farming community very judiciously under Madakasira and achieved encouraging results.

2. Materials and Methods

For the bivoltine sericulture development Cluster Promotion Programme (CPP) was implemented in Madakasira, Ananthapuram District under the South nodal office of Regional Sericultural Research Station, Central Silk Board, Ananthapur, Andhra Pradesh for more than 10 years i.e. from April, 2008 to March, 2019 under XI and XII five year plans. The Rainfall is sparse and spasmodic. The area consists of red alfisol soils (>70%) predominantly followed by rest with black soils dominating with sandy loamy in texture. However, before

the initiation of the CPP under Madakasira cluster bench mark survey was conducted meticulously and it has revealed that the area consists with 235 sericulturists brushing around 42,000 DFLs harvesting around 38,000 DFLs with 44kg cocoon per 100 DFLs yield with an average market rate of Rs. 225/-.

With the above background information of sericulture practice in Madakasira cluster, CPP was implemented under XI and XII five plans during 2009-2019. With the onset of initiating CPP approach a cluster of villages and sericultural families located contiguous range of 20-30 km distance were selected to save time and money on transport and to facilitate closer monitoring and interactions of scientist as well as field functionaries with cluster farmers and to ensure good and anticipated results under the programme so that the activities are manageable easily with the limited technical and extension field functionaries jointly through the active involvement of local stake holders. One village or a cluster of villages located nearby is selected in such a way that as far as possible eligible farmers of villages/cluster of villages are covered under the CPP (Sathyanarayana Raju *et al.*, 2014; Sudhakar *et al.*, 2018). Basing on the preliminary bench mark survey conducted jointly by the Scientist and Dept. of Sericulture (DOS), Madakasira to understand the status of mulberry area, variety, spacing, rearing house and rearing facilities to quantify the requirement of farmers and also funds to meet the farmers requirements. Basing on the survey the critical assistance is provided to the farmers through various Govt. schemes to strengthen the facilities, encourage and motivate the bivoltine sericulture farming under the cluster. For effective implementation of cluster promotion activities all essential modalities as described by Sudhakar *et al.*, 2019 were meticulously imparted for 11 years under Madakasira cluster followed by impact study which was conducted to analyze the impact of CPP on cocoon production, quality and economic benefit of the sericulturists which were assessed and the results are presented in Table 1, 2 and Figure 1.

3. Results and Discussion

Cluster Promotion Programme (CPP) was initiated conducting a bench mark survey meticulously with the onset of CPP implementation under XI and XII five year plans during 2008-19 to assess the initial status of sericulture practice such as quantum of disease free layings (DFLs) brushing, level of DFLs harvesting, cocoon yield/100 DFLs and existence of mulberry acreage followed by the authentication of bivoltine sericulture and technical knowhow level of the mulberry and sericulture farming in and around the Madakasira cluster. The survey revealed that sericulture is an ageold practice of the cluster area, both bivoltine and cross breed (CB) silkworm rearing were practiced in the vicinity to a limited level i.e. 42,000 DFLs were brushed by the 235 farmers harvesting a meager quantity of cocoons 18.48mt with a cocoon yield of 44.0 kg per 100 DFLs with a marketing value of Rs. 225/- per kg indicating the uneconomic level of sericulture practice by the Madakasira sericulturists (Table 1). After imparting the CPP in a meticulous way by involving all the modalities from 2008

Table 1: Improvement of bivoltine sericulture among farmers on various aspects under CPP programme at Madakasira

Particulars	Bench mark	During the period of CPP implementation										
		2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Target of DFLs brushing (lakh)	--	0.50	1.00	1.25	1.50	2.00	3.50	4.00	5.20	7.25	12.00	16.90
No. of DFLs brushed (lakh)	0.42	0.58	1.40	1.43	1.82	2.25	3.55	4.83	6.92	10.06	15.82	16.02
% achievement in brushing	--	116.4	140.0	113.8	121.1	112.5	101.4	120.8	133.0	138.7	131.8	94.79
% increase on benchmark	--	38.1	233.3	240.5	333.3	435.7	745.2	1050.0	1547.6	2295.2	3666.7	3714.3
No. of Farmers	235	305	650	738	876	930	1051	1933	2521	3792	5804	5399
DFLs harvested (lakh)	0.38	0.58	1.40	1.43	1.82	2.25	3.55	4.83	6.92	10.06	15.82	16.02
Actual Yield (Mt)	18.48	35.87	88.98	90.9	117.6	146.9	233.6	314.4	469.2	2729.4	1159.6	1178.9
Yield/100 DFLs brushed	44.00	61.67	63.56	63.60	64.70	65.30	65.79	66.1	71.37	72.54	73.20	73.55
% increase over benchmark	--	40.16	44.45	44.55	47.05	48.41	49.52	50.23	62.20	64.86	66.36	67.16
Average market rate (Rs)	225.0	279.0	285.0	298.0	298.0	338	348	367.0	286.0	419.0	506.0	334.0
% increase over benchmark	--	24.00	26.67	32.44	32.44	50.22	54.67	63.11	27.11	86.22	124.89	48.44
New plantation (acres)	--	54	125	555	601	438	830	180	90	414	735	1378
Among farmers (no)	--	45	102	505	515	408	705	160	58	228	406	728

BM= Initial DFLs distribution @ 42,000 on the onset of CPP initiation among 235 farmers; BM= DFLs harvested 38,000; BM= Cocoon yield @ 2.70MT; BM= Cocoon yield @ 44kg/100 DFLs; BM = Average market rate @ Rs.225/- per kg.

to 2019 the sericulture has shot up to the exuberant levels and proved to be feasible and economically doable venture

During the CPP period 2008-2019 under madakasira cluster

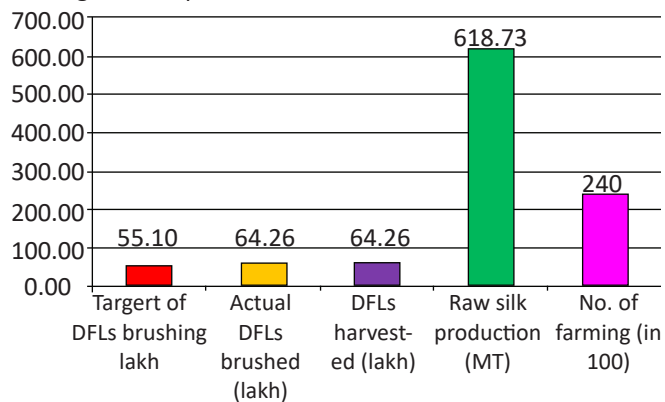


Figure 1: DFLs brushing, harvesting, raw silk production among the farmers under Madakasira cluster during the CPP period (2008-19).

for the socio economic upliftment of the sericultural farming community raising the hopes of their safety and security.

CPP implementation for more than one decade under Madakasira cluster has resulted significantly enhanced level of growth in all levels such as DFLs distribution, harvesting, yield and encouraging market value raising hope among the Bivoltine sericultural farming community. It was recorded that the DFLs distribution was raised with a study progress ranging from 0.58 lakh as against 0.50 (2008-09), 1.40 against 1.00 lakh target (2009-10), 1.43 against 1.25 (2010-11), 1.82 against 1.50 (2011-12), 2.25 against 2.00 (2012-13), 3.55 against 3.50 (2013-14) 4.83 against 4.00 (2014-15), 6.92 against 5.20 (2015-16), 10.06 against 7.25 (2016-17), 15.82 against 12.00 (2017-18) and 16.02 lakh as against 16.90 (2018-19), respectively with a pounding increase of DFLs distribution as against the bench mark level of 0.42 lakh before 2008. When observed the percent of increase of DFLs it was noticed that 94.79% to 138.7% in case of target, 1.43% to 40.0% in case of over target and 38.1% to 3714.3 % over bench mark. Similar

Table 2: Extension communication programmes (ECPs) of various kinds organized to disseminate the sericultural technologies and sensitizing the sericulturists under CPP, Madakasira.

ECPs particulars	During the period of CPP implementation											Total
	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	
Group Discussions (GDs)	24 (600)	19 (475)	14 (350)	9 (225)	8 (200)	3 (75)	2 (45)	9 (278)	6 (285)	6 (297)	7 (332)	107 (3,162)
Field Days	5 (250)	6 (330)	4 (220)	6 (330)	4 (240)	2 (130)	2 (120)	--	1 (106)	--	3 (231)	33 (1,957)
Awareness prog.	1 (110)	20 (2000)	15 (1275)	5 (500)	6 (660)	4 (440)	2 (113)	1 (158)	2 (212)	3 (977)	1 (132)	60 (6,577)
Farmers Day	--	--	--	--	--	--	--	--	5 (345)	4 (295)	--	9 (640)
Enlightenment prog.	1 (45)	1 (55)	1 (65)	1 (45)	1 (50)	--	--	--	--	3 (30)	--	8 (290)
Farmers training	--	--	16 (230)	9 (135)	8 (120)	--	5 (75)	1 (15)	2 (30)	--	1 (15)	42 (620)
Film Shows	--	--	--	--	6 (150)	2 (70)	2 (25)	--	--	--	--	10 (245)
Exhibitions	--	--	--	--	4 (100)	1 (25)	1 (16)	--	--	--	--	6 (141)
Farmers Study Tours	--	--	2 (30)	--	1 (15)	--	--	--	2 (75)	1 (22)	--	6 (142)
No. of ECPs organised	31	46	52	30	38	12	14	11	18	17	12	281
No. of farmers sensitised	1,005	2,860	2,170	1,235	1,535	740	394	451	1,053	1,621	710	13,774

*ECPs= Extension Communication Programmes; Figures in parenthesis indicates number of farmers sensitised

trend was noticed in regard to no. of farmers brushed and DFLs harvested among the farmers. CPP implementation under the cluster also influenced the yield of cocoon per 100 DFLs which increased consistently ranging from 61.67 kg/100 dfls in 2008-09, 63.56 kg in 2009-10, 63.60 kg in 2010-11, 64.70 kg in 2011-12, 65.30kg in 2012-13, 65.79 kg in 2013-14, 66.10 kg in 2014-15, 71.37 kg in 2015-16, 72.54 kg in 2016-17, 73.20 kg in 2017-18 and 73.55 kg/ 100 dfls during 2018-19, respectively.

Yield of cocoon was noticed from 40.16% to 67.16% increase over bench mark yield (44.0%) (Table 1 and Figure 1). Due to CPP implementation under Madakasira during the period of 2008 to 2019 a total of 64.26 lakh DFLs were distributed as against 55.10 lakh generating 618.73MT raw silk among 24,000 sericulturists (Figure 2).

The average market rate too increased significantly ranging



Figure 2: Ramakrishna Reddy with his supporting wife in their established mulberry garden and silkworm rearing house

from Rs. 279.0 to Rs. 506.0 with a progressive percent of increase 24.0% to 124.9% except during 2018-19 where it was recorded Rs. 334.0/- per kg due to excess production of Bivoltine cocoon and lacking silk conversion facilities indicating the need of Automatic Reeling Machines (ARMs) for quick conversion of cocoon into raw silk. The above results were the indications of the efforts made in implementing the CPP by the state and central sericultural scientists and field functionaries. The increase of DFLs brushing and cocoon yield/100DFLs is also outcome of the better adoption of critical technologies in following recommended manure and fertilizer applications and adopting soil analysis based amelioration of their mulberry gardens and effective disinfection of silkworm rearing houses by the use of improved disinfectants such as Asthra & Serifit followed by the personal hygiene and better rearing management and the results are in agreement with the earlier studies conducted (Jaishankar and Dandin, 2005; Himanatharaj *et al.*, 2007; Sreenivas *et al.*, 2009,). This study is also corroborated with the similar study conducted by other Scientists in various clusters (Sreenivas *et al.*, 2010; Himanatharaj *et al.*, 2012; Sudhakar *et al.*, 2018, 2019).

During the CPP implementation period a total of 1378 acres of new mulberry plantation was established among 728 farmers during the CPP implementation period of 2008-19 under Madakasira cluster. Further CPP implementation also continued by way of organising 281 extension and communication programmes (ECPs) such as Group discussions, Enlightenment, Awareness/Enlightenment programmes, Krishimelas, Farmers days, Field day programmes, Film show, Farmers trainings, Exposure visits and Farmers study tour etc., and sensitised more than 13,774 farmers on the improved technologies like undertaking new mulberry plantation, green manuring, IPM & INM implementation modalities, rearing disinfection and maintenance of hygiene for successful harvesting and enhanced quality cocoon production (Table 2). The results of the study are in conformation with the other clusters as established by the other scientists (Himanatharaj *et al.* 2012; Sudhakar *et al.*, 2018, 2019). The positive results are also due to intensive efforts of imparting integrated nutrient management (INM) to improve the fertility status of farmers garden soils through green manuring with various leguminous crops like sunhemp (*Crotalaria juncea*), dhaincha (*Sesbania bispinosa*), cowpea (*Vigna unguiculata*) and horse gram (*Macrotyloma uniflorus*) etc. in monsoon crops. Also popularising integrated pest management (IPM) through the supply of biological control agents such as lady bird beetles (*Scymnus coccivora* and *Cryptolaemus montrouzieri*) for tukra and *Trichogramma chilonis* for leaf roller to enhance quality mulberry leaf production. Whereas, biocontrol agents of *Nesolynx thymus* to control Uzi menace during silkworm rearing and Asthra and Serifit as effective rearing bed disinfectants for newly evolved silkworm rearing hybrid crops were played a major role in preventing the silkworm rearing crop failures and contributing

in producing enhanced quality cocoon. The improved rearing technologies popularized among the farming group also resulted in minimizing the cocoon melting percentage. Again it is proved that the prevention of silkworm rearing crops and reduction of defective cocoon percentage is also due to the result of the intensive efforts made by way of organizing several kinds of extension and communication programmes (ECPs) as detailed in Table 2 and training programmes in sensitizing and generating awareness among the sericultural farming community on segregation and rejection sorting out of infectious and ill healthy bivoltine silkworms as stated by Himanatharaj *et al.* (2012) and Sudhakar *et al.* (2018, 2019).

Further, the cluster promotion programme period under Madakasira was also supported with various financial support schemes and Govt. subsidized programmes such as Catalytic Development Programme (CDP), State Sericulture Development Programme (SSDP), Mahathma Gandhi National Rural Employment Generation Programme (MGNREGA), Rashtriya Krishi Vicas Yojana (RKVY) and Prime Minister Krishi Sichayee Yojana (PMKSY) and several central Sector Schemes (CSS) etc. the sericultural farming community were motivated to under take new mulberry plantation, rearing house construction, infrastructural facilities of rearing and mulberry garden establishment. During the programme period 2008-2019 the farmers were motivated in undertaking new mulberry plantation with high yielding mulberry varieties like V1 and G4 in varied geometries such as paired row [(3'x2')5'], 3'x3' and 4'x4' in low bush form and wider spacing like 6'x3', 8'x4' and as 10'x10' spacing in tree form with partial irrigation or micro irrigation (drip irrigation) conditions to not only combat with the prevailing drought stricken conditions but also contributing in horizontal growth of sericulture in Madakasira area under Ananthapur District, Andhra Pradesh.

3. Impact of Bivoltine Sericulture on the Socio Economic Status of the Sericulture Farmers

3.1. Success story of Sri. T. Ramakrishna Reddy

Sri. T. Ramakrishna Reddy, Akkampalli, Madakasira being an Agriculturist use to cultivate Ragi, Maize, Groundnut etc framings' since 1996 in his 3 acres of farming land. But due to inadequate monsoon rains, scant water, low yield levels and unexpected & meager market rates made him a disappointed farmer with an annual income of Rs. 25,000/- to 1,00,000/- per year and struggling to lead his domestic life. Under the circumstances Ramakrishna Reddy has been adopted under CPP during 2014 and supported with the critical supplies such as subsidized rearing house construction, rearing implements, disinfection equipments, supporting in mulberry garden plantation, establishment with drip supply making him self reliant in initiating Bivoltine sericulture. Due to adoption of Bivoltine sericulture the farmers net annual income increased above 7.88 lakh. With the support of Bivoltine sericulture practice, he could pay all his pending financial debts, built a new house by investing more than Rs.13,00,000/- and could

afford his two children education in corporate school/ colleges by affording Rs. 2,00,000 per year. Today Ramakrishna Reddy has become a model farmer for other farmers in taking up sericulture and improve their socio economic conditions of the many farmers.

3.2. Success Story of Shri. B. Malleswarappa

Shri. B. Malleswarappa, Agali village under Madakasira being matriculate began his farming in 4.0 acres of land with sufficient water facility cultivating Sugarcane, Paddy, Maize and Aracknut. But disappointed with poor yields and low income generation (Rs. 25,000-1,00,000/- per year) and fraught to lead his domestic life. Though he could initiated the sericulture in the year 1984 planting poor yielding mulberry varieties rearing with crossbreed silkworms rearing in his own dwelling house could not make much income to support his family, due to lack of improved technical knowhow. Under the circumstances the farmer was adopted as a Bivoltine sericulturist under CPP, Madakasira and supported in constructing rearing house, plantation and other critical supplies and initiated Bivoltine sericulture. By imparting Bivoltine sericulture he raised his annual income from Rs. 1,00,000/- to Rs. 12,60,000/- fetching highest market rates. Through Bivoltine sericulture he not only improved his socio economic conditions but also leading a respectable life as sericulture farmer in the village.

Ultimately with all the above efforts under CPP programme significant improvement in socio-economic conditions of the seri-farming community was noticed as detailed above. Thus, the success of the programme can be attributed to co-ordinated and close working of different organizations involved in sericulture development such as REC, CSRTI,

Mysore, National Silkworm Seed Organization (NSSO), Central Silk Technological Research Institute (CSTRI), Bangalore and State Sericulture Department at gross root level as well as higher level for common cause. Further, the cluster approach helped in succeeding in pooling the resources such as man power, money, and infrastructural facilities etc., for conducting extension programmes effectively. The CPP offered how best the limited resources could be effectively utilized for promotion of bivoltine sericulture. Intensive ECPs undertaken under CPP, Madakasira and active participation of the sericultural fraternity are helped the farmers to accept and adopt the improved technologies and achieve the anticipated and encouraging results in improving bivoltine cocoon yield levels significantly (Himantharaj et al. 2012; Vindhya et al., 2012; Sathyanarayana Raju, et al., 2014; Sudhakar et al., 2019). With the above results the study can be concluded that the improvement indicates the success of CPP programme during XI & XII five year plans at Madakasira during 2008-19 is nothing but intensive adoption of integrated technology in cluster approach which is one of the remedies for attaining sustainability of sericulture. This approach is with suitable refinement which can be adopted elsewhere in the sericulture areas of the country to ensure higher rate of adoption of technologies, higher returns from sericulture and promotion of bivoltine sericulture during future course of five year plans. Further, it is essential to continue the intensive bivoltine promotion programmes of this kind in future in the new clusters established under CPP so as to make our country self sufficient and self reliable in quality bivoltine silk production (Figure 3).



Figure 3: Shri B. Malleswarappa demonstrating his mulberry garden & silkworm rearing.

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