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## Research Article

# CLUSTER PROMOTION PROGRAMME (CPP)- A NOVEL METHOD FOR BIVOLTINE SERICULTURE DEVELOPMENT IN HINDUPUR, ANANTHAPUR DISTRICT OF ANDHRA PRADESH

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### ABSTRACT

To index an inspiring growth in regard to the production of quality and productivity of raw silk and to elevate India in to International market the Cluster Promotion Programme (CPP) was implemented at Hindupur, Ananthapuram District for 10 years i.e. from April, 2009 to March, 2019 under XI and XII five year plans. The Central Silk Board (CSB) and state sericulture departments, have jointly organised 174 clusters all over India i.e. 102 clusters in 5 states of Southern zone, 45 in 5 states of North-western zone, 11 in 3 states of Central Western Zone, 7 in 3 states of Eastern zone and 9 in 8 states of North Eastern Zone, respectively. Out of 102 clusters in Southern India 46 clusters were implemented in Karnataka, 28 clusters in Tamil Nadu, 17 clusters in Andhra Pradesh, 4 in Maharashtra whereas 2 in Kerala with an anticipated brushing of 167.06 lakh disease free layings (DFLs) and generate 1920MT of bivoltine raw silk. Out of the 17 clusters of Andhra Pradesh considered to organise under South nodal office of Regional Sericultural Research Station, Central Silk Board, Ananthapur, Andhra Pradesh, Hindupur has been recognised as one of the potential clusters to implement CPP.

The ten years efforts of CPP implementation at Hindupur cluster has yielded significantly increasing order of DFLs distribution from the bench mark level of 0.48 lakh (2008-09) to 1.27 lakh during 2009-10, 1.50 in 2010-11, 2.01 in 2011-12, 2.02 in 2012-13, 2.15 in 2013-14, 2.66 in 2014-15, 4.03 in 2015-16, in 6.88 in 2016-17, 10.15 in 2017-18 and 11.15 lakh in 2018-19, respectively with a thumping increase of DFLs distribution as against the bench mark status of 164.6% to 2222.9% and more than 52.9% increase against the targeted DFLs distribution. In regard to improvement of cocoon yield, 53.8 kg/100 dfls during 2009-10, 60.0 kg in 2010-11, 61.5 kg in 2011-12, 61.80 kg in 2012-13, 63.5 kg in 2013-14, 64.2 kg in 2014-15, 64.9 kg in 2015-16, 69.1 kg in 2016-17, 76.0 kg in 2017-18 and 75.9 kg/100 dfls during 2018-19 as against the bench mark level 42kg/100 DFLs (2008-09) followed by the initiation of CPP activity under the cluster area registering time after time in the growing order. Yield of cocoon was noticed from 41.0% to 76.0% increase over bench mark yield (42.0%). The CPP impact has also promoted in fetching the average market rate by the farming community ranging from Rs. 275.0 to 471.0 with a progressive increase of 1.82% to 44.64% responding very positively against efforts made in implementing the CPP activities by the state and central scientists and field functionaries.

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### INTRODUCTION

It is a known factor that production of gradable quality bivoltine silk has become the prime agenda of Indian sericulture industry. In recent years even though India has registered an impressive growth on the sericulture front, in terms of quality and productivity, yet it is often felt that there

exists a gap in the yields between what the technologies could fetch the farmer and what he is actually getting. India being the largest consumer of natural silk in the world and demand for quality raw silk production has been increasing in the country gradually 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.*,

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2018). As the demand-supply gap is widening in mulberry silk, there is urgent need to improve the production and productivity Indian Bivoltine raw silk for meeting the requirement for domestic market to become self-reliant and compete in the international market. Therefore, it is a major challenge to enact 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.

Jaishankar and Dandin (2005) emphasised on the 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 (Sreenivas *et al.*, 2010). Among them cluster development approach is one such approach, which is holistic, 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).

In recent years, the 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 has yielded encouraging results. Incoordination with Central Silk Board (CSB) and state sericulture departments have jointly organised 174 clusters all over India *i.e.*, 102 clusters in 5 states of Southern zone, 45 in 5 states of North-western zone, 11 in 3 states of Central Western Zone, 7 in 3 states of Eastern zone and 9 in 8 states of North Eastern zone, respectively. Out of 102 clusters in Southern India 46 clusters were implemented in Karnataka, 28 clusters in Tamil Nadu, 17 clusters in Andhra Pradesh, 4 in Maharashtra whereas 2 in Kerala with an anticipated 167.06 lakh DFLs brushing and generate 1920MT of bivoltine raw silk.

In Andhra Pradesh, 6 clusters such as Venkatagiri Kota, Madakasira, Palamaner, Hindupur, Bhimadole and Kalyanadurgam of the state, witnessed that the programme is instrumental in elevating the production, productivity and quality of Bivoltine silk to a considerable extent. Among 6 clusters of Andhra Pradesh, historically important Hindupur under the dynasty of Vijayanagara Kingdom during 1336-1646 and ruled by Sri Krishna Devaraya using Penukonda as his second capital in Andhra Pradesh. Hindupur is about 98 km away from Ananthapur district was considered to implement Cluster Promotion Programme (CPP) from April, 2008 to March, 2019 with the objectives to increase production and

productivity of bivoltine sericulture effectively in India. Hindupur located at the edge of Andhra and Karnataka borders located 100 km away from Bangalore the capital city of Karnataka and 98 km distance from Anantapur district, Andhra Pradesh. Hindupur is spread over an area of 38.16 square kilometres (14.73 sq mi) with a population of more than 151,835 and Geographically placed at a latitude of 13°83'N and longitude of 77°49'E on the banks of Penna River having an average elevation of 2,037 feet (621 metres). Demographically the present total population of Hindupur constitute 76,625 males and 75,210 females with a sex ratio of 982:1000 female and male population distribution. Further, 16,309 children of which 8,263 are boys and 8,046 are girls. The average literacy rate stands at 76.40% with 103,538 literates, significantly higher than the state average of 67.41%. The Rainfall is sparse and spasmodic. Hindupur, in general, has tropical climate, winters last from November to February, while summer last from March to June. Even in summers, the city experiences lower temperatures compared to rest of the state due to its high elevation. Average annual rainfall is 551mm and most of it received during the months of July to August. Borewells provide the ray of hope for drinking water purposes. Though there are rivers like Penna and Kumudwathi, they remain dry throughout the year. There are no perennial rivers in the vicinity of Hindupur which results in excess dependence on underground water. Over-exploitation of groundwater and indiscriminate drilling of bores for the past few years has caused depletion of the groundwater table and drying of bore wells in most cases. The poor, despite their low income, are left with no other option, but to purchase two or three pots for drinking purposes, or drink the same ground water with salinity and other impurities.

In the economic point of view Hindupur is a prominent and renowned commercial centre in Anantapur District and the Rayalaseema Region. Clothes and Retail are the most happening businesses in here and the various food products like jaggery, tamarind, chillies, ground nuts and pulses, etc., are widely traded. Besides these, procuring mulberry cocoons, production of silk threads, manufacturing silk saris has gained momentum from the past few decades as one of the important commercial activity in the city having three privately run spinning mills. Quite a few foreign teams from Switzerland and surrounding countries and a teams from World Bank have visited Muddireddipally a renowned area in the city, where most of the industries manufacturing silk saris are put up as the area is flourishing as a cottage industry and explored the possibilities of development in foreign trade of silk saris and fabrics. Hindupur serves as an outlet for marketing the agricultural and industrial products of the hinterland, which comprises about 80 villages. Keeping the above credentials of Hindupur in mind CPP was implemented meticulously and encouraging results were achieved during CPP implementation and presented in Table 1,2 and Fig. 1,2,3,4).

## **MATERIAL AND METHODS**

Cluster Promotion Programme (CPP) was implemented in Hindupur, Ananthapuram District under the South nodal office of Regional Sericultural Research Station, Central Silk Board, Ananthapur, Andhra Pradesh for 10 years *i.e.* from April, 2009 to March, 2019 under XI and XII five year plans. Hindupur is located at a latitude of 13°83'N and longitude of 77°49'E on

the banks of Penna River having an average elevation of 2,037 feet (621 meters). The area experiences temperatures ranging from 18°C in winter and a maximum of above 40°C during summer. Hindupur receives the bulk of its rainfall between August and October. The annual average rainfall approximates to 55 cm. Rainfall here is not only inadequate but also uncertain and is widely fluctuating from year to year. The Rainfall is sparse and spasmodic. The area consists with predominantly red alfisol soils (>70%) followed by rest with black soils dominating with sandy loamy in texture (Rukmani and Manjula, 2009). However, before the initiation of the CPP under Hindupur cluster bench mark survey was conducted meticulously and it has revealed that the area consists with 225 sericulturists brushing around 48,000 DFLs harvesting around 38,000 DF:LS with 42kg cocoon per 100 DFLs yield with an average market rate of Rs. 235/-.

With the above initial information of sericulture practice in Hindupur cluster CPP was implemented under XI and XII five plans during 2009-2019. In the CPP approach a cluster of villages and sericultural families located nearby were selected and adopted to have areas/mass effect of the improved technologies incorporated under the programme so that the activities are manageable easily with the limited technical (Scientist & Technical staff) and extension field functionaries jointly by the active involvement of local stake holders. Under this programme, contiguous villages within the radius of around 20-30 km are 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. One village or a cluster of villages located nearby is selected such way that as far as possible eligible farmers of villages/cluster of villages are covered under the CPP (Sathyannarayana 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), Hindupur 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 assistance is provided to the farmers through Catalytic Development Programme (CDP) to strengthen the facilities, encourage and motivate the bivoltine sericulture farming under the cluster. For effective implementation of cluster promotion activities modalities *viz.* **i).** Cluster was operated under the control of South nodal center Regional Sericultural Research Station (RSRS), Ananthapur Scientist as Cluster Development Facilitator (CDF) and Technical Staff of REC, Hindupur and with closed co-ordination of extension officer as another CDF and field functionaries of DOS, Hindupur, **ii).** For technology intervention, a localized Chawki Rearing Centre (CRC) was recognized followed by the proper training to the entrepreneur at CSRTI, Mysore and required financial assistance was extended under CDP to provide inputs support and service to the cluster farmers, **iii).** For each crop, the chawki worms were reared at CRC and healthy and robust chawki worms were supplied after joint quality Chawki certification by the co-ordinating Cluster Development Facilitators (CDFs) - Scientist and DOS official, **iv).** Both the CDFs, subject specialists as well as other Technical and field functionaries regularly visited

the farmers mulberry gardens and silkworm rearing crops and extended technical guidelines for quality mulberry leaf production and successful rearing crops, **v).** Time to time non-performing farmer garden soils were analyzed for their soil reaction (pH & EC) and nutrient (OC%, available. P & K) parameters, basing on the soil analysis amelioration recommendations were served so as to improve their garden soils for enhanced quality leaf production, **vi).** Also imparted INM through the supply of sunhemp (*Crotalaria Juncea*) green manure seeds (@ 8 kg/ac to sow during monsoon) under INM to enrich the soil nutrient status and biological control agents to control Tukra (with *Cryptolaemus montrouzieri*) and Leaf roller (with *Tricogramma chilonis*) as IPM components to minimize the leaf loss due to the above pests, **vii).** Biocontrol agents of *Nesolynx thymus* to control Uzi menace for silkworm crops, **viii).** The farmers were motivated for indenting and rearing bivoltine as well as improved double hybrid races in all the seasons in a year and rearing performance data were collected after each rearing crop, **ix).** The farmers were encouraged to undergo various kinds of trainings as imparted at the main institute as well as other training centers of state and central Govt., **x).** Besides, various kinds of ECPs as enlisted in the Table 2 were conducted under cluster villages to educate the farmers on various improved technologies for encouragement and boosting the confidence levels in rearing bivoltine silkworm crops., **xi).** The crop performance was monitored constantly and periodically at higher level meetings in regard to the achievements against the targets, **xii).** During the CPP progress review meetings the performance of the respective clusters as against the targets were assessed, depending on their performance necessary target alterations will be made, **xiii).** Study tours organized to understand the adoption levels of sericulture technologies and interaction with progressive formers at field level and **xiv).** The CPP implementation for 10 years under Hindupur cluster followed by impact study was conducted to analyze the impact of CPP on cocoon production, quality and economic benefit of the sericulturists were assessed and the results are presented in Table 1 and Fig. 1, 2, 3.

## RESULTS AND DISCUSSIONS

On the onset of Cluster Promotion Programme (CPP) initiation a bench mark survey was conducted very meticulously during 2008-09 to assess the initial status of sericulture practice such as quantum of disease free layings (DFLs) brushing, level of cocoon harvesting 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 Hindupur cluster. The appraisal revealed that both bivoltine and cross breed (CB) silkworm rearing was practiced in the cluster to a limited level i.e. 48,000DFLs were brushed by the 225 farmers harvesting a meager quantity of cocoons (42.5kg/ 100dfles) marketing with a minimal value of Rs. 226/- per kg indicating the uneconomic venture of sericulture practice by the farming community. After the judicious imparting of the CPP by involving all the modalities from 2009 to 2019 during XI & XII five year plans the sericulture has shoot up to the exuberant levels and proved to be a workable and economically viable venture for the socio economic upliftment of the sericultural farming community raising the hopes of their safety and security.

The ten years efforts of CPP implementation has yielded significantly progressive growth of DFLs distribution from the bench mark level of 0.48 lakh (2008-09) to ranging from 1.27 lakh (2009-10), 1.50 (2010-11), 2.01 (2011-12), 2.02 (2012-13), 2.15 (2013-14), 2.66 (2014-15), 4.03 (2015-16), 6.88 (2016-17) 10.15 (2017-18) and 11.15 lakh (2018-19), respectively with a thumping increase of DFLs distribution as against the bench mark status from 164.6% to 2222.9% and more than 52.9% increase against the targeted DFLs distribution during the period 2009-2019. Similar trend was noticed in case of harvesting of DFLs. Further, Bivoltine cocoon yield (kg) has shown increasing order for 100 DFLs brushed. It was noticed that during the initial period of CPP implementation the bench mark of yield was recorded 42kg/100 DFLs (2008-09). After initiation of CPP activity under the cluster it has shoot up consistently ranging from 53.8 kg/100 dfls in 2009-10, 60.0 kg in 2010-11, 61.5 kg in 2011-12, 61.80 kg in 2012-13, 63.5 kg in 2013-14, 64.2 kg in 2014-15, 64.9 kg in 2015-16, 69.1 kg in 2016-17, 76.0 kg in 2017-18 and 75.9 kg/100 dfls during 2018-19, respectively. Yield of cocoon was noticed from 41.0% to 76.0% increase over bench mark yield (42.0%). The average market rate too increased significantly ranging from Rs. 275.0 to Rs. 471.0 with a progressive percent of increase 1.82% to 44.64% (Table 1 & Fig. 1) responding very positively against efforts made in implementing the CPP activities by the state and central scientists and field functionaries. The increase DFLs brushing and cocoon yield/100DFLs is also outcome of the better adoption of critical technologies in imparting 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; Himantharaj *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; Himantharaj *et al.*, 2012; Sudhakar *et al.*, 2018 (Table 1, Fig.1,2).

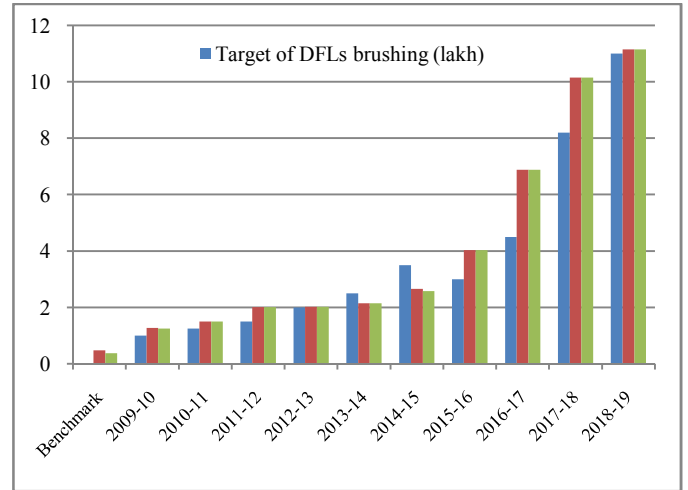


Fig 1 Achievement DFLs target and improvement of DFLs brushing and harvesting farmers under Hindupur cluster during CPP implementation.

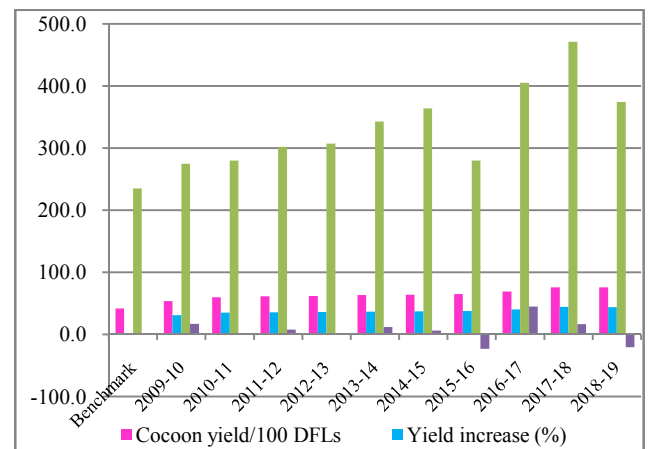


Fig 2 Increased cocoon yield (kg/100DFLs) and average market rate achieved by the farmers during CPP implementation period at Hindupur cluster.

Table 1 Improvement of bivoltine sericulture among farmers on various aspects under CPP programme at Hindupur.

Particulars	Bench Mark	During the period of CPP implementation									
		2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Target	--	1.00	1.25	1.50	2.00	2.50	3.50	3.00	4.50	8.20	11.00
No. of DFLs distributed	0.48	1.27	1.50	2.01	2.02	2.15	2.66	4.03	6.88	10.15	11.15
% of achievement	--	27.0	20.0	34.0	1.0	-14.0	-24	34.3	52.9	23.8	1.4
No. of Farmers	225	500	617	931	855	721	557	1599	2706	3711	4154
DFLs harvested	0.38	1.244	1.50	2.01	2.02	2.15	2.58	4.03	6.88	10.15	11.15
Actual Yield (Mt)	20.16	66.89	90.00	123.61	124.84	136.53	160.94	272.60	475.33	768.12	845.29
Yield/100 DFLs	42.00	53.76	60.00	61.50	61.80	63.50	64.17	64.86	69.09	75.99	75.85
Avg. Market Rate (Rs)	235.0	275.0	280.0	302.0	307.0	343.0	364.0	280.0	405.0	471.0	374.0
New plantation (acres)	--	--	--	--	55	47	48	28	130	227	669
Among No. of farmers	--	--	--	--	50	35	40	28	117	129	430

Table 2 Extension and communication programmes (ECPs) of various kind organized to disseminate the sericultural technologies and sensitized the sericultural farming community.

Particulars	During the period of CPP implementation										Total
	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	
GDs	10(288)	4(105)	9(212)	6(162)	6(160)	2(50)	8(200)	5(187)	6(256)	--	56(1620)
Field Days	--	2(95)	6(320)	4(208)	2(83)	2(80)	--	1(105)	--	--	17(891)
Awareness prog.	10(392)	2(110)	6(315)	4(228)	2(85)	2(84)	1(174)	2(175)	3(516)	--	32(2079)
Farmers Day	--	--	--	--	--	--	--	4(245)	--	1(96)	9(655)
Enlightenment prog.	1(115)	1(130)	1(125)	1(135)	1(123)	1(150)	1(15)	--	--	--	7(793)
Farmers training	10(150)	5(75)	9(165)	7(105)	4(60)	5(75)	--	2(30)	1(30)	1(15)	44(705)
Film Shows	--	--	--	6(162)	2(42)	2(50)	--	--	--	--	10(254)
Exhibitions	--	--	--	4(222)	1(105)	1(50)	--	--	--	--	6(377)
Farmers Study Tours	--	--	--	1(20)	--	1(24)	--	2(17)	--	--	4(61)
No. of ECPs organised	31	14	31	33	18	16	10	16	14	2	185
No. of farmers sensitised	945	515	1137	1242	658	563	389	759	1116	111	7435

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

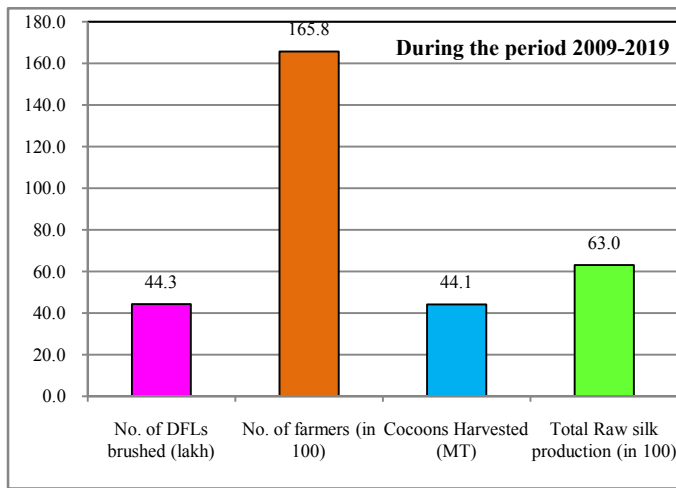


Fig 3 Annual DFLs brushing, cocoons harvesting and raw silk production among farmers.

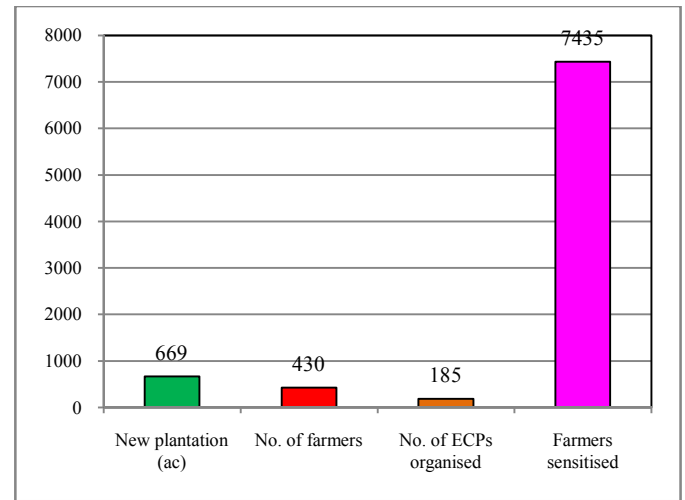


Fig 4 New mulberry plantation and ECPs organized among the sericulturists under CPP, Hindupur

During the CPP implementation period a total of 669 acres of new mulberry plantation was imparted among 430 farmers during the CPP implementation period of 2009-19. Also organised 185 extension and communication programmes such as Group discussions, Enlightenment, Awareness, Farmers days, Field days programmes, film show, farmers trainings, Exposure visits and farmers study tour etc., and sensitised 7435 farmers on the improved technologies such as mulberry plantation, green manuring, IPM & INM implementation modalities, rearing disinfection and maintenance of hygiene for successful harvesting and enhanced quality cocoon production (Table 2 and Fig. 3, 4, 5). The results of the study are in conformation with the study conducted by Singh *et al.* (1998) and Himantharaj *et al.* (2011, 2012). Due to intensive efforts such as imparting integrated nutrient management (INM) to improve farmers garden soils through green manuring by sowing sunhemp (*Crotalaria juncea*), dhaincha (*Sesbania bispinosa*), cowpea (*Vigna unguiculata*) and horse gram (*Macrotyloma uniflorus*) etc. in monsoon crops, use of 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 chiloins* 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 crops were played a major role in preventing the silkworm rearing crops failures and contributing in producing enhanced quality cocoon (Table 1 & Fig. 1,2,3,4). 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 Table 2 and training programmes in sensitizing and generating awareness among the sericultural farming community on sorting of infectious and ill healthy bivoltine silkworms as stated by Himantharai *et al.* (2012) and Sudhakar *et al.* (2018).

Further, the cluster promotion programme period under Hindupur was also supported with various financial support schemes and Govt. subsidized programmes such as Catalytic Development Programme (CDP), State Sericulture Development Programme (SSDP), Mahatma 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 in under taking new mulberry plantation, rearing house construction, infrastructural facilities of rearing and mulberry garden establishment. During the programme period 2009-2019 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 Hindupur area under Ananthapur District, Andhra Pradesh.

With all the above efforts under CPP programme significant improvement in socio-economic conditions of the seri-farming community was noticed. The programme supported the farmers in adoption of bivoltine sericulture, earning encouraging money, investing the same for sericulture up-liftment, purchasing land, vehicles, jewels, house hold articles, improved children education, conducting respectable rituals and becoming self sufficient in repayment of long pending borrowed loans. 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, Hindupur



and active participation of the sericultural fraternity (Fig. g) 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.*, 2018).

## CONCLUSION

Therefore, with the above results the study can be concluded that the improvement indicates the success of CPP programme during XI & XII- five year plan at Hindupur during 2009-19 is nothing but intensive adoption of integrated technology in cluster approach is one of the remedy for attaining sustainability of sericulture. This approach is with suitable refinement 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 thereby projecting India as one of the potential bivoltine silk producers at international market.



Fig 5 Sensitization of sericultural farmers on various improved technologies during ECPs organized under Hindupur cluster.

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