Evaluation of constraints responsible for yield gap in expected cocoon production under potential bivoltine area of Rajouri district of Jammu and Kashmir

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Abstract: Sericulture is one of the most important agro-enterprise commonly operated in rural area for generation of additional income along with other primary occupation. Jammu and Kashmir being the potential region generally experiences considerably low yield records. The reason for low productivity can be attributed as lack of awareness among the farmers on improved sericulture technologies. Udhampur is one of the most potential districts of Union Territory (UT) Jammu and Kashmir with remarkable yield records for the recent past years. Thus an attempt has been made to analyze the potential and strengths of sericulture among the marginal farmers of Udhampur district. Study revealed that sericulture being an agro-enterprise is mostly practiced by rural and marginal farmers having less land, irrigation, mulberry garden and adequate rearing facilities which hinder the progress of sericulture in the UT. On the same hand, majority of the farmers were reported to be associated with sericulture on subsidiary basis and yielded good crop yield. Therefore, it can be concluded that sericulture when adopted with appropriate rearing practices can contribute significantly for strengthening socio-economic conditions of the farmers.

Key Words: Sericulture, bivoltine, potential, marginal, socio-economic

Introduction:

Sericulture industry has occupied a prominent place in the industrial development of in Jammu and Kashmir as it is the only region to produces the best quality bivoltine silk which is regarded as one of the finest fabric in the world. This industry attained a unique importance among all other sectors and provides an excellent and unique opportunity for socio- economic progress in the developing countries. There is an immense potential for the development of this agro industry in Jammu and Kashmir UT, because of favourable environmental conditions that offers tremendous scope for the cultivation of mulberry and the development of good quality raw silk, as well as opportunity to uplift the status of economically poor in the rural Kashmir in particular (Chouhan *et al.,* 2016 and Chanotra *et al.,* 2019). In Jammu & Kashmir sericulture is practiced in 20 districts and major producer districts includes Anantnag, Udhampur, Kathua, Baramulla, Pulwama, Gandarbal, Rajouri and Reasi (Chouhan *et al.,* 2019). Although Rajouri district is having high cocoon production potential because of the availability of favourable environmental conditions and in Rajouri district about 89.33 per cent silkworm rearing is conducted during spring season (Sharma *et al.,* 2019).

Analysis of trends of sericulture industry in Jammu and Kashmir revealed that basic objectives of promoting silk industry in the region by various extension activities is to realize the increased cocoon production, high income generation and increased number of silkworm rearers so as to meet the target of progressive development for strengthening the status of sericulture in the UT. Sericulture in Rajouri district plays important role in cocoon production, but 70 per cent farm household adopted silkworm rearing as a subsidiary business in a village of 574 households. In Rajouri district 80-100 kg cocoons/annum produced by the sericulture farmers and the average silk rearing families earn Rs.20,000/annum in year 2012-13 (Anonymous 2013). Inspite of these strengths there are still problems in development of sericulture industry in Rajouri district of Jammu and Kashmir including insufficient supply of quality mulberry leaf, lack of awareness and skills, mismanagement and lack of proper rearing practices etc. (Chouhan *et al.,* 2016).

No doubt Rajouri district is having the potential to emerge as one of the major cocoon producer district in the UT as the environmental conditions prevailing here as quite congenial for mulberry cultivation and silkworm rearing as well. Even though the current scenario represents the picture with huge gap in expected and obtained cocoon production. This yield gap attributed to a large number of circumstances. Therefore considering the significance of bivoltine silk in international silk market and potential of Rajouri district to emerge as a leading producer, an attempt was made to understand the facts responsible for yield gap in expected cocoon production and to figure out preliminarily suggestive measures so as to cope the drawbacks.

MATERIALS AND METHODS

The survey was carried out during the year 2019-20 in Udhampur district of Jammu and Kashmir for generating data on various aspects of sericulture and its relation with the associated farmers. The methodology adopted for the present study was framed in the form of questionnaire and data was collected by personal interview of the selected farmers (25 in number) as presented under results section.

RESULTS AND DISCUSSION

General Information of the Farmers: The details on various aspects of sericulture and personal information of the farmers are given below (Table-1 to 3). In rural and semi-urban areas of India sericulture offers employment to approximately 7.56 million persons as reported by Lakshmanan, 2008. Jammu and Kashmir is the potential region to emerge as leader produce of quality bivoltine silk of international grade experiences considerably low yield records due to various reasons including low literacy rate, lack of proper irrigation facilities and many more as recorded in the present study and earlier also reported by Chouhan *et al.,* 2016, Ali *et al.,* 2016, Ali *et al.,* 2017 and Sharma *et al.,* 2020.

Table-1: General Information of the farmer

Sl. No.	Category	Criteria	No. of Farmers	Percentage (%)
1. Age (in years)				
a	Young	< 35	0	0
b	Middle	35-50	20	80
c	Old	>50	05	20
2. Education (in standards)				
a	Illiterate		05	20
b	Below 10^{th}		20	80
c	12^{th}		0	0
d	Graduate		0	0
e	Post-graduate		0	0
3. Family size (No.)				
a	Small	>4	01	4
b	Medium	4-6	22	88
c	Big	<6	02	8
6. Any Govt. employee from family				
	Yes		0	0
	No		25	100
7. Number of members involved in sericulture				
	>4		14	56
	4-6		11	44
	<6		0	0
8. Main occupation				
a	Agriculture	-	25	100
b	Agriculture with Sericulture	-	25	100
c	Service	-	0	0
9. Average income generated from sericulture				
	>5000		02	8
	5000-10000		08	32
	<10000		15	60
10. Annual income				
	>10000		0	0
	10000-30000		08	32
	<300000		17	68
11. Adopted sericulture as				
	Integrated crop		25	100
	Main crop		0	0
12. Having own land				
	Yes		25	100
	No		0	0
13. Total land				
	>5 Kanals		0	0
	5-10 Kanals		24	96
	<10 Kanals		01	4
14. Type of land				
	Irrigated		0	0
	Rainfed		25	100
	Under cultivation		25	100

	Bared land	0	0
15. Source of irrigation			
	Canal irrigation	Na	-
	micro irrigation	Na	-
	Sprinkler irrigation	Na	-
	Drip irrigation	Na	-

Dhane V.P & Dhane A.V. (2004), reported that farmers experiences constraints in mulberry cultivation such as high labour wages (94%), inadequate labour (98%), inadequate irrigation facilities (78%), lack of guidance and lack of knowledge about mulberry disease and pests (67%). They also reported constraints in silkworm rearing viz. high cost of rearing house (98%) and equipment (93%), non-availability of subsidies for rearing silkworms (93%), lack of knowledge regarding physical condition in rearing house (68%), grading of cocoons (65%), long distance of trading units for sale of cocoons (93%) and non-remunerative price for cocoons (73%). The current study revealed that all the respondents were recorded lack of irrigation facilities for agriculture and sericulture practices and could be utilized for improving the productivity status as earlier reported by Ganie *et al*., 2019.

Table-2: Information about Sericulture

• **Mulberry Production Practices**				
1. Experience in Agriculture (in years)			**No. of farmers**	**Percentage (%)**
a	Less	>20	08	32
b	Medium	20-30	12	48
c	More	<30	05	20
2. Experience in Sericulture (in years)				
a	Less	>10	08	32
b	Medium	10-20	12	48
c	More	<20	05	20
3. Practice mulberry cultivation				
a.	Yes		20	80
b.	No		05	20
4. Area Under Cultivation				
a	Irrigated		0	0
b	Rainfed		25	100
5. Type of mulberry cultivation				
a	As well managed mulberry garden		12	48
b	Mulberry trees grown on side bunds of field		03	12
c	Mulberry grown as wild tree		05	20
d.	Don't have own mulberry tree		05	20
6. Having separate Chawki Garden				
a	Yes		0	0
b	No		25	100
7. Fertilizer Input added				
a	Yes		03	12
b	No		22	88
8. Type of mulberry cultivation				

a	Separate mulberry fields	12	48
b	Integrated farming or mix farming	13	52
	• **Silkworm Rearing Practices**		
9.Type of rearing house			
a.	Mud type of rearing house	01	4
b.	Concrete or cemented rearing house	0	0
c.	Don't have a separate rearing house	0	0
d.	Separate room in dwelling house	24	96
10. Source of procurement of silkworm seed			
a.	State Sericulture Development Department	25	100
b.	Central Silk Board	0	0
c.	Progressive farmers	0	0
11. Name of Silkworm breed			
a.	FC1 X FC2	25	100
b.	Any other	0	0
12. Procure Eggs or Chawki worms			
a.	Silkworm Eggs	0	0
b.	Chawki worms	25	100
13.	**Quantity of dfls procured**		
a.	>1dfl	20	80
b.	<1dfl	05	20
14. Distance from procurement station (kms)			
a.	>15	25	100
b.	15-20	0	0
c.	<20	0	0
15. Mode of Transport			
a.	Bus	0	0
b.	Auto	25	100
16. Timing of seed transportation			
a.	Early morning	18	72
b.	During Day time	02	8
c.	Evening	05	20
17. Commencement of Disinfection			
a	Yes	25	100
b	No	0	0
18. Disinfection performed ___days prior to rearing			
a	>2	0	0
b	2-5	0	0
c	<5	25	100
19. Type of disinfection			
a.	Chemical drenching	0	0
b.	Chemical spraying	25	100
c.	Fumigation	0	0
d.	Any other	0	0
20. Rearing conducted per year			
a.	Once	24	96
b.	Twice	01	8

21. Type of rearing			
a	Tray rearing	05	20
b	Floor rearing	18	72
c	Shelf rearing	02	8
d	Box rearing	0	0
22. Frequency of feeding			
a	Twice a day	0	0
b	Three times per day	24	96
c	Four times per day	01	4
23. Frequency of cleaning			
a	Twice in a instar	0	0
b	Ones after each moult	25	100
24. Frequency of application of bed disinfectant			
a	Twice in a instar	0	0
b	Ones after each moult	25	100
25. Types of mountages used			
a	Plastic collapsible mountages	0	0
b	Rotary mountages	0	0
c	Bottle brush mountages	0	0
d	Local mountages material	25	100
26. Method of cocoon harvesting			
a	Machine oriented	0	0
b	Manual	25	100
27. Method of cocoon stifling			
a	Under bright sunshine	25	100
b	Hot air oven	0	0
• **COCON MARKETING**			
28. Is there any cocoon market available			
a	Yes	25	100
b	No	0	0
29. Distance from the nearby cocoon market			
a	>30	0	0
b	30-40	25	100
c	<40	0	0
30. Mode of Transport			
a	Bus	25	100
b	Auto	0	0
31. Cost of labour and transport to reach the cocoon market			
a	>150	0	0
b	150-250	25	100
c	<250	0	0
32. Type of marketing system			
a	Open bidding system	25	100
b	Digital bidding system	0	0
c	Direct sale and purchase	0	0

Table-3: Details of sericulture appliances possessed

S.No	Particulars	No. of farmers	Percentage
•	**Possession of rearing appliances**		
1	Rearing house	0	0
2	Rearing stand	25	100
3	Rearing tray	15	60
4	Feeding stand	0	0
5	Chopping board	0	0
6	Chopping knife	0	0
7	Chop sticks	0	0
8	Cleaning nets	0	0
9	Hygro/thermometer	25	100
10	Mountages	0	0
11	Foam pad/ paraffin paper	0	0
12	Singries	0	0
13	Ant wells	0	0
14	Gunny clothes	0	0

Mass media exposure to the farmers

Among various means of mass media exposure majority of the farmers were reported to be associated with radio on regular basis as100 per cent and 60 per cent of the respondents were recorded to have exposure to radio followed by Television (T.V.) on regular and 40 per cent on occasional basis, none of the respondents (100%) were recorded to have exposure to newspaper and 80 per cent of the respondents were reported to have interaction with extension workers on occasional basis only. None of the respondents were reported to have any exposure to agricultural magazines, pamphlets and not even any interaction with scientists of (Krishi Vighan Kindera) KVK (Fig. 1). Similar results have been also reported by Khan *et al.*, 2016, who studied sericulture expansion factors in Bandipora district of Jammu and Kashmir.

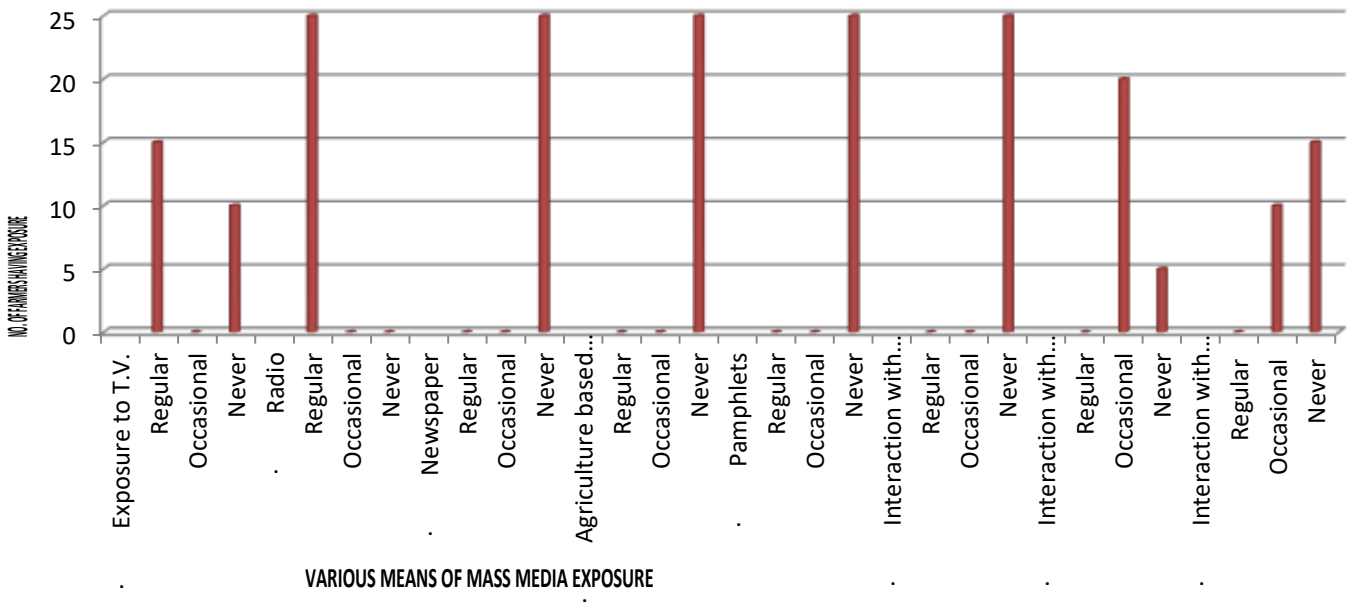

Fig.-1: Percentage off respondents having exposure to various means of mass media.

Sericulture oriented exposure / Participation in Sericulture oriented programmes

Among the respondents under survey 12 farmers (40%) were reported to have attended traning programmes of 15 days duration on sericulture technologies, 5 (20%) farmers were recorded to have attended /kissan melas and 8 farmers (32%) were found to have participated in exposure visits of seven days duration as presented in (Table-4 and Fig.-2). The detail regarding knowledge of the farmers on sericulture and rearing technology was recorded to be low. On the same hand, the farmers were reported to have less interaction with the experts of State Sericulture Department and Central Silk Board. Moreover, the SSD and CSB also recorded to arrange training, awareness and extension programmes etc. for promotion of sericulture but unfortunately very less number of farmers were reported to attend such programmes. None among the studied respondents was reported to have attended any training programmes and or to have attended the Kissan Mela or field trips etc. which revealed lack of awareness among the farmers on importance of such programmes. Similar results have been also reported by Khan *et al.*, 2018 and Khan *et al.*, 2019, who demonstrated impact of cluster promotion programme in Bandipora district of Jammu and Kashmir which resulted in improvement of the socio-economic conditions of farmers and also strengthened the long production chain of sericulture through improvement in cocoon productivity, productivity and quality.

Table-4: Sericulture oriented exposure / Participation in Sericulture oriented programmes

S.no.	Category	No. of farmers participated	Duration (Days)	No. of programmes attended	Percentage
1.	Trainings	12	05	01	48
2.	Workshops	0	0	0	0
3.	Exhibitions	0	0	0	0
4.	Seminars	0	0	0	0
5.	Conferences	0	0	0	0
6.	Kissan mela	05	03	0	20
8.	Exposure visits	0	0	0	0
9.	Field days/ trips	08	0		32
10.	Any other	-	-	-	-

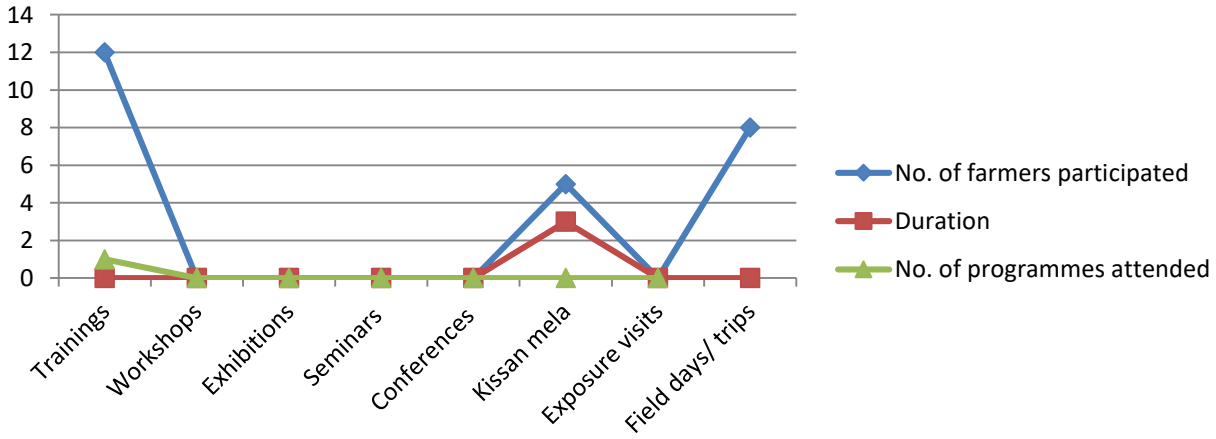

Fig.2: Sericulture oriented exposure / Participation in Sericulture oriented programmes

Support of Govt. under various schemes for development of Sericulture.

Among the studied respondent (n-25) majority for the farmers were reported to have awareness on the basic schemes extended by State Sericulture Development Department and percentage obtained on the basis of awareness and benefit availed by the farmers for different schemes were recorded as 100 per cent awareness among the farmers. In case of support on raising mulberry no farmer was recorded to have awareness about this scheme, thus none of them availed benefit from this scheme. All the farmers were reported to have enough awareness on the scheme of Supply of saplings/ cuttings and 40 per cent of them have availed benefit out of it same is the case with Supply of rearing appliances. Maximum farmers have knowledge of the Support for construction of rearing house but only 72 per cent farmers availed this scheme. Knowledge on Installment of hot air oven, Establishment of reeling unit, Incentives on silk yarn and Health insurance, Schemes of women empowerment and Agricultural Technology Management Agency (ATMA) was negligible as only 50 per cent farmers were recorded to have awareness on CDP and 15 of them were recorded to have availed benefit from this scheme. Rests of the schemes were recorded with no respondents as they either don't have awareness about these schemes or don't have availed benefit out of these as presented in the table-16. Similar results were obtained in case of awareness and benefit availed by the farmers on various schemes rendered by the Central Silk Board. Farmers were recorded to have awareness about various schemes of CSB but negligible number of farmers was reported to be associated with them (Table-5 & 6).

Table-5: Support provided by State Sericulture Development Department (SSDD) in different aspects of sericulture.

Sl. No.	Category	No. of farmers			Benefit availed		
		Aware	Unaware	Percentage (%)	Yes	No	Percentage (%)
1	Support for raising mulberry	25	0	100	25	0	100
2	Supply of saplings/ cuttings	25	0	100	25	0	100
3	Supply of rearing appliances	25	0	100	15	0	60
4	Support for construction of rearing house	25	0	100	15	10	40
5	Installment of hot air oven	0	25	0	0	25	0

6	Establishment of reeling unit	0	25	0	0	25	0
7	Incentives on silk yarn	0	25	0	0	25	0
8	Health insurance	0	25	0	0	25	0
9	Catalytic Development Programme (CDP)	10	15	40	10	15	40
10	Schemes of women empowerment	25	0	100	0	25	0
11	Agricultural Technology Management Agency (ATMA)	0	25	0	0	25	0

Table-6: Support provided by Central Silk Board in different aspects of sericulture

Sl. No.	Category	No. of farmers			Benefit availed		
		Aware	Unaware	Percentage (%)	Yes	No	Percentage (%)
1	Support for raising mulberry	20	0	80	25	0	100
2	Supply of saplings/ cuttings	25	0	100	25	0	100
3	Supply of rearing appliances	25	0	100	0	0	0
4	Support for construction of rearing house	03	22		0	25	0
5	Installment of hot air oven	0	25	0	0	25	0
6	Establishment of reeling units	0	25	0	0	25	0
7	Incentives on silk yarn	0	25	0	0	25	0
8	Health insurance	0	25	0	0	25	0
9	Schemes for women empowerment	5	0	20	0	25	0

10	Tribal Sub-Plan (TSB)	15	10	40	15	10	40
11	Schedule Cast Sub-Plan (SCSB)	15	10	40	15	10	40
12	Mahatma Gandhi Rural Empowerment Guarantee Act (MGNREGA)	0	25	0	0	25	0

Major Constraints hindering the progress of Sericulture and remarkable demands of sericultural farmers

Major constraints in different aspects hindering the progress of sericulture among the studied tribes of sericultural farmers have been tabulated in table-19. Some of the major constraints recorded in mulberry cultivation sector involved poor quality of saplings, poor roots of saplings, roots without any polybags and over matured saplings. All these constraints were reported to cause failure in success of plant establishment. In silkworm rearing sector major constraints were recorded as improper timing of supply of worms, poor hygienic conditions, improper means of transportation and fluctuation in environmental conditions while distribution and transport from station to the main field which results in poor hatching and reduced health of the worms. In industrial aspects, long distance from cocoon market, non availability of reeling units, low price for cocoons and heavy fluctuations in cocoon price and irregular market system were recorded as serious constraints. Under the category of general constraints, d lack of interaction with experts, lack of interaction with extension workers, lack of awareness on latest sericulture technologies, lack of adoption of sericulture on commercial scale and lack of awareness among the farmers on various incentives and support schemes provided by SSDD and CSB were found to be the major constraints (Table-7) hindering the development of sericulture among the tribal folk of Rajouri district. All the studied respondents suggested taking serious measures on immediate basis so as to overcome these obstacles and to promote sericulture among the farmers of the tribal folk of the district Rajouri.

Quadri *et al.,* 2010, Fatima, K. 2013and Dar *et al.,* 2017, who made attempts to examine the performance of silk industry in Jammu and Kashmir, reported the same cause for low cocoon productivity in J & K. More recently, Sharma *et al.,* (2019) carried out a study to understand the major constraints responsible for low yield particularly in Jammu division of Jammu and Kashmir. The major constraints observed included unavailability of sufficient mulberry leaves ($\chi 2=29.13$, $p<0.01$), lack of season specific hybrids ($\chi 2=05.39$, $p<0.05$) and lack of awareness to manage harsh conditions ($\chi 2=08.17$, $p<0.01$) which has direct impact on cocoon productivity, which strongly supported the observations of present survey.

Table-7: Major Constraints hindering the progress of Sericulture and remarkable demands of sericultural farmers

Sector	S.No.	Constraints	Remarks/ suggestion
1. Mulberry cultivation	1.	Delay in timely supply of mulberry saplings	Needed to be improved
	2.	Poor quality of saplings	Do
	3.	Poor roots of saplings	Do
	4.	Roots without any polybags	Do
	5.	Lack of awareness on chawki gardens	Do
2. Silkworm Rearing	1.	Improper timing supply of worms	Do
	2.	Less frequent trainings and awareness camps	Do
	3.	Poor hygienic conditions	Do
	4.	Improper means of transportation	Do
	5.	Lack of sufficient rearing appliances	Do
3. Industrial aspects	1.	Long distance from cocoon market	Do
	2.	Non availability of reeling units	Do
	3.	Low price for cocoons	Do
	4.	Heavy fluctuations in cocoon price	Do
	5.	Irregular market system	Do
4. General constraints	1.	Lack of interaction with experts	Do
	2.	Lack of interaction with extension workers	Do
	3.	Lack of awareness on latest sericulture technologies	Do
	4.	Lack of adoption of sericulture on commercial scale	Do
	5.	Lack of awareness among the farmers on various incentives and support provided by SSDD and CSB.	Do

CONCLUSION

Respondents under survey also reported to face problems like lack of technological knowledge and insufficient rearing appliances with almost negligible number of proper rearing sheds. Even under such circumstances the production level was recorded to be high in the Udhampur district which indicated the potential of the area and extent of hard work of the farmers making Udhampur to be the largest producer among all other silk producing districts of Jammu and Kashmir UT. It is quite clear from the current survey that no doubt district Rajouri has the potential to contribute significantly in total cocoon crop productivity of the UT but it can also be realized to its full potential if provided with enough support by SSDD and CSB in terms of exposure and turnings on latest technologies and by convincing them to adopt sericulture on large scale with maximum exposure on expert advices. Overall improvement of production scenario demands maximum interaction between farmers and extension system. Therefore, it has been suggested to pay attention towards strengthening of sericulture extension system by active participation of extension workers so as to enhance the knowledge and skills of sericulture farmers in order to minimize the yield gap with the

support of SSDD and CSB with future prospective of improved cocoon yield and overall development of sericulture industry in Jammu and Kashmir.

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