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Role of capacity building, extension and services in tasar sector

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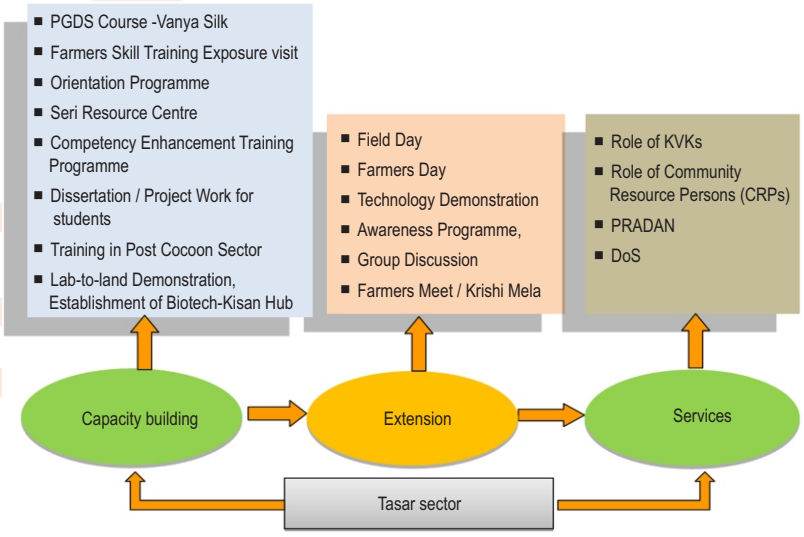
Abstract

Aim: To train manpower for disseminating the technologies to the grassroots level stakeholders and facilitate to replicate the successful model of sericulture practice developed in tasar sector.

Methodology: Central Tasar Research and Training Institute (CTRTI), Ranchi organizes different training programmes for the benefit of various stakeholders of the industry. These programmes are tailor-made to meet the specific needs of each sector and of immense help in updating the knowledge and skills of the extension personnel and sericulturists, through Field Day, Farmers Day, Technology Demonstration, Awareness Programme, Group Discussion and Farmers Meet / Krishi Mela, etc., which are the major platforms of ECPs providing technical support and transfer of technologies developed by CTRTI.

Results: For the purpose, different training programmes were organized in last five years (2017-2022) from time to time by CTRTI and approximately 6753 persons were trained in different subsectors of sericulture through training programmes like: Structured Training Course (PGDS-Vanya Silk), Farmers Skill Training, Exposure visit for Technology Awareness, Technology Orientation Programme for the frontline officers / officials of DOS/NGO/ Lead farmers /student / project work on microbiology/biotechnology, etc., Seri Resource Centre (SRC),Competency Enhancement Training Programme (CETP), Training under Post Cocoon Sector, Lab-to-land demonstration, Establishment of BIOTECH-KISAN Hub. Skilling the farmers involving KVKs for expansion of tasar through training of the KVK Scientists under ICAR & nurtured Community Resource Persons (CRPs) under aegis of Producer Institutions.



Interpretation: With the new developments taking place in the field of sericulture, the training and development activity is considered as a necessity by all forward-looking organizations both national and international for updating the knowledge and skill, and hence training needs will continue to perpetuate at all levels of silk industry world wide. To achieve the potential productivity levels, strategies are suggested for a viable effective extension system in the country in general and orthwest region, in particular.

Key words: Alternate extension organizations, Capacity building and training and silk production, Extension, Productivity potential, Tasar culture

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Introduction

Indian sericulture is predominantly rural based agro-forest industry, with low investment and potential of high returns. It is not only a tradition, but also a way of life for weaker sections of the society with marginal or no land holdings, especially, women. It has multi-tier earning potential to support rural enterprises/ entrepreneurs, especially in the area of silkworm seed production, commercial cocoon production, yarn and fabric making and diversified products at the level of cocoon, yarn, fabric and wastes. Sericulture provides direct or indirect employment to about 8.73 million persons in rural and semi-urban areas. India is the homeland for different varieties of silkworms viz., the mulberry (*Bombyx mori*) and non-mulberry such as, Eri (*Samia Cynthia ricini*), tropical tasar (*Antheraea mylitta*), muga (*A. assamensis*) and temperate tasar (*A. proylei*), which are commercially exploited for silk production. (Savithri *et al.*, 2013; Sathyanarayana, 2022; Rai and Sathyanarayana, 2022). In the last decade, Indian silk industry has recorded a remarkable growth in raw silk production from 23,060 MT (2011-12) to 34903 MT (2021-22), which is 3.4% higher than the production achieved during previous year (33,770 MT) and approximately 88.4% of the annual targeted production for the year 2021-22 (Table 1). Of this, Vanya silk production contributes about 26.03% (9085 MT) with tasar silk comprising 4.2% (1466 MT) of the total raw silk production. (Annual Report, Central Silk Board, Bangalore, 2017-18, 2018-19, 2019-20, 2020-21, 2021-22 and Halagundegowda *et al.*, 2022).

Capacity building is to develop institutional capacity to meet a defined goal. A lack of capability would result in inability to meet the goals. The capacity building has two components – explicit which is clearly expressed like number of human resources needed to complete a task, and another is implicit which implies the capability of resources to complete a given task. The capacity building consists of improving human resource capability, improving technology, providing finances to access the provide needed resource, administrative and management capacity – range of skills needed in current staff or new staff, attitudes and motivation, statistical capability to monitor trend, periodic assessment relational skills (cooperate with others).

The capacity building may be required at two levels like institutional *viz.,* to meet organization goals and local *viz.,* to meet local goals. Knowledge management is a discipline that promotes an integrated approach in identifying, capturing, evaluating, retrieving, and sharing all enterprise's information assets. These assets may include databases, documents, policies, procedures, and previously un-captured expertise and experience of individual workers. Knowledge management efforts overlap with organizational learning and may be distinguished by a greater focus on the management of knowledge as a strategic asset and focus on encouraging the sharing of knowledge. It enables organizational learning (Rahmathulla *et al.*, 2006). For long, the productivity at the level of cocoon yield remained stagnated at 20 cocoons/dfl and yarn production to a maximum of 100 gm raw silk /man day with traditional practices. With the Research & Development interventions by CTRTI, a large number of technologies (both on-farm and off-farm) have been developed. These technologies have been found to possess an edge over the traditional practices and in improving the production and productivity levels in the field. Though with extension efforts of the Institute and its units, majority of these have reached to field, but still there exists scope for furthering the production through technology transfer. With the advent of technological interventions by the Institute, constant increase in tasar raw silk production has lead to increase in tasar silk production from 237 MT to 2689 MT in the last two decades, besides interventions across the tasar silk value chain. A thrust was given by the institute with support from Departments of Sericulture of tasar growing states for a massive technology transfer among the beneficiaries along with the DOS support. As a result, a steep rise in silk production was observed at national level. This directly speaks of the strength of the technologies developed by the Institute (Mittal *et al.*, 2022) (Table 1).

Materials and Methods

Central Tasar Research and Training Institute (CTRTI), Ranchi organizes different training programmes for the benefit of various stakeholders of the industry. These programmes are tailor-made to meet the specific needs of each sector and are of immense help in updating the knowledge and skills of the extension personnel and sericulturists, as well through Field Day, Farmers Day, Technology Demonstration, Awareness Programme, Group Discussion and Farmers Meet / Krishi Mela etc; the major platforms of ECPs providing technical support and transfer of technologies developed by CTRTI.

Results and Discussion

The training programmes organized by CTRTI are of immense help in updating the knowledge and skills of the extension personnel and sericulturists, as well. This exercise has dual advantage of developing of essential human resource for the industry and complementing the efforts for the effective transfer of technologies. Besides, the acquired knowledge would improve their skill thereby enhance the livelihood income from sericulture practice. Trained candidates can evolve as trainers to disseminate the technologies to the grassroots level stakeholders. Training would facilitate to replicate the successful model of sericulture practice developed in India. Training programmes ranging from three days to one week were planned and imparted to different stakeholders working in the field of sericulture for their capacity building in order to reduce the yield gaps that currently exist between the potential and actual yield in the field and also among the farmers. For the purpose, different training programmes have been organized in last five years (2017-2022) from time to time by CTRTI and approximately 6753 persons were trained in different subsectors of sericulture through training programmes like Structured Training Course (PGDS-Vanya Silk), Farmers Skill Training, Exposure Visit for

Technology Awareness, Technology Orientation Programme for DOS /NGO, farmers/student/DOS staff and training/project work on microbiology /biotechnology etc., Seri Resource Centre (SRC), Competency Enhancement Training Programme (CETP), Training under Post Cocoon Sector, Training under SAMARTH scheme, Lab-to-Land Demonstration, Establishment of Biotech-Kisan Hub and skills exposure visits. CSB units train the front-line workers, Pilot Project Centers (PPC) under Directorate of Sericulture (DoS) help in training the stakeholders at field level. In view of the shortage of manpower in public extension system, efforts are being made to skill the farmers involved KVKs for expansion of tasar sericulture through training of KVK scientists under ICAR and to nurture Community Resource Persons (CRPs) under aegis of Producer Institutions, who are playing major role in expansion, seed production, training and extension in tasar sericulture (Mittal *et al.,* 2022; Jayaram *et al.*, 2022) (Table 2).

Transfer of technologies and Human resources development: To achieve the benefits of the technologies, it is essential to make them available at the door steps of the stake holders. Massive extension drives in conjunction with the State's field functionaries is essential. Proper training to stake holders for implementation of the technologies and the timely required input supply are also essential for productivity improvement and realization of full benefits of the technologies. To create complete awareness among the farmers, motivational and demonstration programmes have contributed immensely. Results indicate that adopting of improved technologies increased after training, thereby leading to increase in cocoon production levels. The above account on the status of the technological interventions by the Institute clearly indicates that there is ample scope of increasing the tasar raw silk production in the country through adopting strategies discussed. It is expected that amalgamation of conventional and biotechnological approaches for technological interventions supported with massive extension and training drives would help in achieving the desired targets.

Role of extension in vanya sector: Extension is an informal education and services to the clientele group who are directly and indirectly engaged in farm production, to enable them to adopt

Table 1: Total Silk Production in India (2011-22)

Year	Raw Silk Production (MT)						Total Silk Production (%)	
	Mulberry	Tasar	Eri	Muga	Vanya	Total	Mulberry	Vanya
2011-12	18272	1590	3072	126	4788	23060	79.24	20.76
2012-13	18715	1729	3116	119	4964	23679	79.04	20.96
2013-14	19476	2619	4237	148	7004	26480	73.55	26.45
2014-15	21390	2434	4726	158	7318	28708	74.51	25.49
2015-16	20478	2819	5060	166	8045	28523	71.79	28.21
2016-17	21273	3268	5637	170	9075	30348	70.10	29.90
2017-18	22066	2988	6661	192	9841	31907	69.16	30.84
2018-19	25344	2981	6910	233	10124	35468	71.46	28.54
2019-20	25239	3136	7204	241	10581	35820	70.46	29.54
2020-21	23896	2689	6946	239	9874	33770	70.76	29.24
2021-22	25818	1466	7364	255	9085	34903	73.97	26.03

Table 2: Persons trained under different training programmes/projects/ schemes

Training Programmes	2017-18	2018- 2019	2019-20	2020-21	2021-22
Structured Training Course-PGDS, Vanya Silk (15 months course, Affiliated to Ranchi University)	15	15	18	10	16
Farmers Skill Training	725	519	450	617	525
Exposure Visit for Technology Awareness	100	60	102	120	60
Technology Orientation Programme for DOS /NGO	106	191	38	-	39
Farmers /Student / DOS staff Training/Project work on Microbiology/Biotechnology etc.	201	261	191	66	77
Seri Resource Centre (SRC)	-	300	300	300	300
Competency Enhancement Training Programme (CETP)			16	15	142
Training under Post Cocoon Sector			40	325	-
Training under SAMARTH Scheme (Vanya Silk Reeling & Spinning Manufacturer and Handloom Weaver (Frame Loom)	-	-	-	113	122
TOTAL	**1147**	**1346**	**1155**	**1566**	**1539**

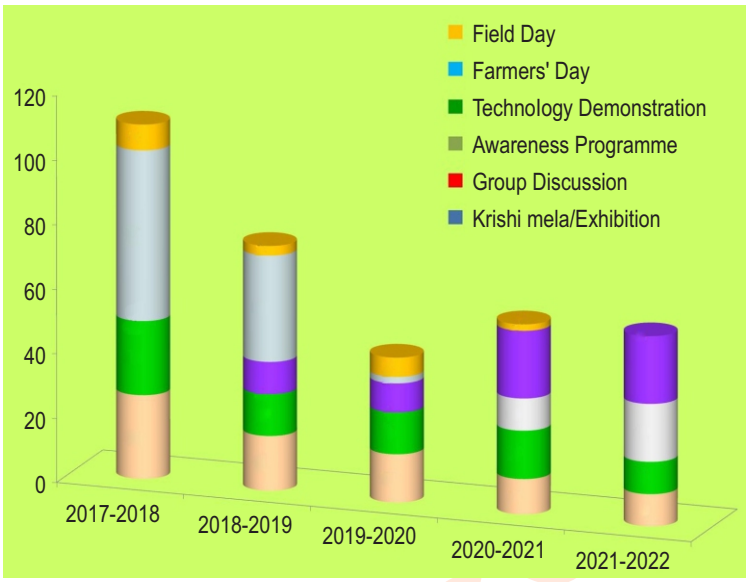

Fig. 1: Status of number of Extension Communication Programmes organized during last five years.

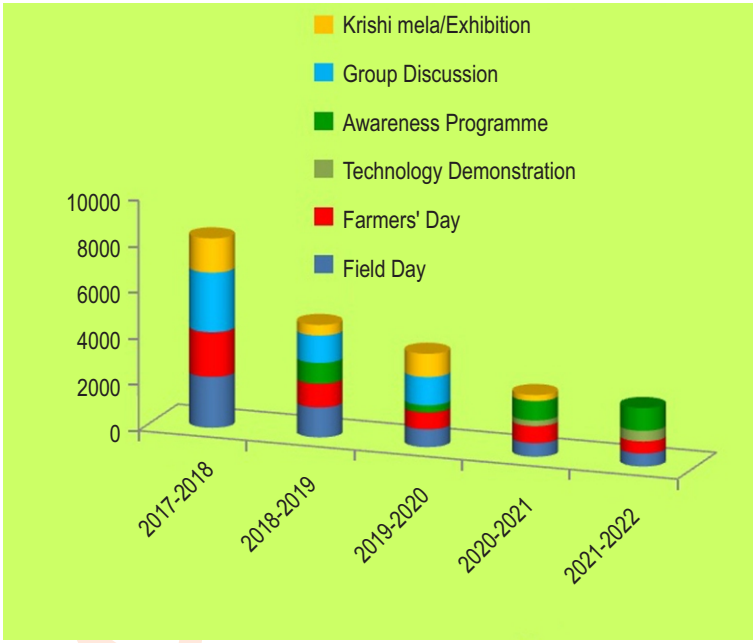

Fig. 2: Status of number of stake holders benefitted from ECP's organized during last five years.

improved practices in production, management, conservation and marketing through bringing change in their perception, attitude, skill and practices. Among all farm enterprises, sericulture is known for its short gestation period, high employment generation and remunerative returns. Massive investments in the last three decades has pushed Indian sericulture into the most dynamic period through various developmental projects that has resulted in horizontal expansion, followed by reduction and consolidation with steady increase in productivity. Horizontal growth of sericulture in future may not be possible due to rapid industrialization, competition from other agricultural/ horticultural crops in the country and very small land

Fig. 3: Demonstration cum training for tasar cocoon cooking method to farmers.

Fig. 4: DoS officials during technology orientation training programme.

Fig. 5: Community Resource Persons (CRPs) under aegis of Producer Institutions.

Fig. 6: Convergence with Krishi Vigyan Kendras for Technology Demonstration through training.

holding per family in North-west region. Hence, the vertical growth becomes inevitable for the exploitation of productivity potentials of the country. Responding to this need, the traditional sericulture system has undergone extraordinary transformation due to remarkable R&D output in the form of technologies generated by the Sericulture Research Institutes in the country and collaborative initiatives. This resulted in widening of the knowledge base, requirement of many production inputs, substantial investment and market sensitive nature of the enterprise. In order to enable the farmers to adopt these changes, at their own pace, suitable learning opportunities have to be created as a part of the sericulture extension effort (Jagadajyoti *et al.*, 2022). Extension Communication Programmes (ECPs) are essential and need of the hour for tasar sericulture because these programmes not only motivate the sericulturists but also play an important role in introducing tasar sericulture in non-traditional areas. Keeping these points in view, the following extension communication programmes *viz.,* Field day, Farmers day, Technology Demonstration, awareness programme, group discussion and farmers meet/ Krishimela have been designed for benefit of silkworm rearer's. CTRTI is a pioneer institute that continues to provide technical support to tropical tasar sector, a tribal based rural enterprise in the country. It is engaged in generating useful technologies through Research & Development and its effective transfer in the field through ECPs. During last five years, *i.e.,* 2017-18 to 2021-22, CTRTI, Ranchi has transferred many technologies (Out of which 09 proven technologies) through 349 different types of Extension Communication Programmes (ECPs) to 22382 new farmers in tasar growing areas. Silk production trend indicates that tasar silk production has witnessed its average production of 2948 metric ton during the year 2017-18 to 2020-21 owed to effective ToTs through various ECPs programmes. However, during the year 2021-22,a decline in tasar silk production (1466 MT) was reported which can be due to the cumulative effect of prevailing Covid-19 restrictions and climate change on increase in pest and diseases infestation (Fig. 1, 2).

Objectives of sericulture extension: In view of low literacy of sericulturists, it is necessary to use effective non-formal mass

communication methods to educate sericulturists on new technologies to improve the production and quality of the products. The primary goal of sericulture extension is to assist farming families to adopt production and marketing strategies in tune with rapidly changing social, political and economic conditions, so that they can, in the long run, shape their livelihood as per their preferences and those of the community. Sericulture extension promotes development of farming community by providing information, training and support for adopting improved production technologies evolved by the research institutes, both in host plant cultivation and silkworm rearing. The task of extension is to improve interactions among various players within the Sericultural Knowledge System so that farmers have optimum access to any information that could help them enhance their economic and social situation. Extension efforts need to address group formation and motivating the clientele groups towards efficient use of resources, conservation of soil, water and bio-diversity, growth with equity and sustainable growth (Sathyanarayana *et al.,* 2006).

Role of extension organization: Providing knowledge and skills in sericulture enterprise gives a much higher rate of returns than providing subsidies. For extending these extension services, Extension or Change Agents are required, who can influence the development of food plant foliage and silkworm cocoon yields, allocate resources optimally for various activities of sericulture enterprise and develop Sericulturists' Organizations. Basically, an extension organization is knowledge based and is involved in the transfer/dissemination of knowledge. Hence, the success of this organization depends to a large extent on knowledge management. An efficient extension organization and its personnel should ensure that - They acquire relevant knowledge wherever it is produced; They use their creativity to acquire/develop new knowledge; The entire team has access to the knowledge/ information available in the organization; They learn from experience on how to refine and develop more effective extension methods and Social climate in the organization, which stimulates sharing of knowledge and a critical analysis of the knowledge developed or used by the team members.

Status of sericulture extension: At present conventional extension services are being offered mostly by the government agencies creating awareness through discussions, visits and study tours as the first step. Second step involves training of farmers who have inclination to adopt new practices, both in knowledge and skills. The final step will be trial-adoption phase, under guidance of extension personnel, resulting in sericulturists gaining confidence and proficiency. Another most important consideration in sericulture development is spreading the new technologies, in proper combination, for wider adoption, which is termed as 'scaling up the adoption'. In the process, many a time, sericulture extension agency may get satisfied with the elite segment of the farming community, *i.e.,* progressive farmers adopting new practices to an expected level. However, it is an established fact that adoption categories in a farming community are found in the shape of a pyramid. Progressive farmers will always be a small part of the potential adopters at the tip of the pyramid. Hence, the task of proper extension education cannot be considered accomplished till at least majority of the middle level farmers have adopted new technologies with efficiency. Adoptive research, which relies on research-farmer-extension interaction through 'on farm trials' and 'field demonstrations' has proved effective and can be used to promote improved technology packages. The largest percentage of adoption of technologies was found with big farmers group and decreased with the marginal farmers, followed by poor, due to various reasons. Following problems are encountered in the present public extension system, in the sericulture sector.

Public extension services are widely viewed as supply driven rather than demand driven; Public extension deals with large area, large population and diverse cropping pattern; In spite of technology flow from the Research Institutes located in the respective regions, it is felt extension services provided are general in nature rather than specific and intensive; Commercialization of sericulture gave rise to specialized client and demand for location specific extension services which are not catered by public extension system; High cost, low impact of extension programmes, growing conflicts between farmer's interest and policy goals, poor motivation of staff and conflicting roles are observed in public extension; Insufficient face-to-face contact between extension worker and farmer; Inadequate technical qualifications, lack of opportunities for professional career development and burden of non-extension tasks of Village Level Extension Worker and limited funds for mobility/ operational purpose and Number of extension workers is drastically reduced due to structural adjustment measures and during the process of decentralization, extension services are marginalized and downgraded. Sericulture extension is entering a period of renewal after being overshadowed by sericultural research involving a great deal of experimentation. There is a need to promote reforms in the field of sericulture extension. Reforms in the system envisage an extension service more broad-based and holistic in content and scope, thus beyond sericultural technology transfers. Extension agencies, services and workers would need to exercise a more proactive and participatory role, serve as knowledge/ information agents, initiating and facilitating mutually meaningful and equitable knowledge based transactions among sericultural researchers, trainers and primary producers. All this needs to be done in an effective and cost efficient manner.

A sea change is observed in the area of sericulture extension, which is conducted in a methodical and scientific way and as an agent of social change. Though sericulture is in dynamic transformation mode in most parts of Southern India, its penetration is still low in eastern, northern and north-west parts of the country. In spite of efforts of Central Silk Board (CSB) and Departments of State Governments (DoSs) in the field of extension, a large gap still exists between the research recommendations and adoption resulting in considerable yield gap between laboratory and field, as well as potential and actual yield levels. Further, resource constraints, imbalance between

the farm holding and available manpower, multiple crop pattern and the relative preferences, ready market, etc., are influencing sericulture development in North and Northwest region of the country. Based on the experience in South India and in agriculture extension following extension approaches are being suggested for the development of sericulture in North-west India.

Self help groups: Extension efforts will be effective, when voluntary groups of farmers are chosen for extension contacts and technology validation. This approach will not only serve in rendering new practices more acceptable to the potential adopters as locally validated ones, but also in evolving local spokespersons who volunteer to champion new practices on their own. This goes a long way for the autonomous spread of new technologies.

Cluster approach: Instead of spreading the extension effort too thinly over a wider area, it is better to focus the attention on a cluster of contiguous, interacting villages to begin with. When new practices are introduced in these villages, the word about them will get quickly circulated among the communities, through normal social interactions and local communication networks, which are already in position. The new practices will get observed, debated and assessed for their usefulness to them. This is indeed a healthy process by which people should judge new ideas before accepting them (Dwarakinath, 2006).

Participatory extension: Research-extension-farmer linkages coupled with development of participatory tools like Participatory Rural Appraisal (PRA) and Knowledge, Attitude and Practice survey (KAP). Highly motivated small farmers can be grouped to take decisions in matters related to group cash savings, quality seed, fertilizer, water management, cultural practices, farm machinery, income diversification activities and marketing.

Private extension: Observations on private extension worldwide indicate that it reduces the economic burden of governments, increases the efficiency of extension services provided to the satisfaction of farmers, economic interest (due to crop sharing) of the private extension agents (especially Non-Governmental Organizations) due to their involvement in providing extension services and the competency of research system and the accountability of extension agent due to contract system. Following agencies can serve as private extension agents in sericulture. Community Based Organizations (Non-Governmental Organizations, Sericulturists' Organizations like Quality Clubs, Tasar Vikas Samitis, Mutual Benefit Trusts, Self Help Groups etc.); Para Extension Workers (Progressive farmers, Contact farmers etc.); Sericulture Input Suppliers/ Dealers and Seri Polyclinics (Farm Implements, Rearing Equipments, Silkworm Seeds, Disinfectants, Nutrients, Pesticides, etc.).

Pluralistic extension system: Technical capabilities of public extension system and group-organizing and human resource development skills of private extension agencies should actively complement/ supplement each other and work in a mutually reinforcing fashion for better results.

Unified extension service: Integration of sericulture and agro-forestry or handloom-sericulture, sericulture-post cocoon processing, etc., makes extension approach multi-disciplinary. For the purpose a multi-disciplinary team of Subject Matter Specialists needs to be drawn at district level.

Inter-institution linkages: Inter-institution linkages are required between sericultural extension and farm input suppliers, rural credit agencies, marketing channels, transport companies, storage facilities, sericultural institutions, weather forecast offices, rural development agencies, etc., so that extension agents have ready access to information needed for sericulturists for better extension services. These linkages could be through periodic meetings, regular exchange of information and through electronic information technology.

Integrated extension services: Extension agency should see beyond technology dissemination, *i.e.,* problem solving, decision making, management, accounting, group dynamics, leadership, participation, gender sensitiveness, rural youth development, comprehension on market forces, good governance, citizenship, initiative and self help, nutrition, programme planning, monitoring and evaluation, applicable information technology, importance of education for children, especially girl education and networking.

Use of information technology: Extension data bases should be created with prices of cocoons, silk yarn, fabrics and projection for the near future, record of meteorological data with forecasting, important sericulture technologies, e-mail ID, telephone numbers and addresses of Subject Matter Specialists, input suppliers etc. Unemployed educated youth should be encouraged to install computer with Internet facilities and maintain required data base and service the sericulturists in the area on nominal cost basis.

Assessment of impact of extension: Sericulture extension services have to prove their worth to farmers so that the latter constitute a strong lobby for extension workers during the time of austerity measures like budget cuts or staff reduction. There is a need to work out appropriate methodologies and tools for measuring the impact of sericulture extension efforts. Positive impact of extension advice in improvement in decision making capability of farmers needs to be evaluated based on satisfaction of women farmers' extension needs, active participation of farmers in extension programme development, constructive programmes for rural youth, introduction of off-season income generating activities for rural women and men, readily available advice on marketing and demonstrated increase in farmer's income and overall reduction in rural poverty (Rahmathulla *et al.,* 2006; Gedam *et al.*, 2022).

Future strategies for sericulture extension: As sericulture extension deals working with rural people, it will be more effective to combine extensively employed agriculture extension system with the Participatory Rural Appraisal (PRA) technologies.

Keeping in view the status of present system of sericulture extension, problems encountered by extension agencies and possible alternate extension approaches following strategies are suggested to cater the needs of sericulturists in the country in general in particular the North-west region.

Enrolling participation of innovative farmers in technology development; Environment and society concern are to be addressed in development of technologies; Research and resultant recommendations should primarily be oriented towards solving the problems of farmers; Technology recommendations should be comprehensive in covering all aspects of the industry, including disposal of final product and economic feasibility. In fact, the formulation of research and developmental projects should originate from market survey, consumer preference, etc.; Separate recommendations should be made for different target groups or the recommendations should have a broad base to cover varied groups of farmers; A dichotomous approach is essential, one to support subsistence farmers where employment and livelihood creation are the prime objectives and other for affluent farmers where business oriented high quality silk production is the main objective (Beera Saratchandra, 2000); Language or literacy should not be a barrier for transfer of technology. Result demonstration and audio-visual methods should be the medium of transfer of know-how; Close coordination among the scientist, the extension worker and the farmer can only ensure development of a technology that is really needed for the client, which can percolate fast into the field.

Promoting farmers' groups/ women sericulture groups like quality clubs, so that extension agent can contact larger number and use them as catalysts of change; Organic input like FYM are usually of short supply and research should concentrate on biomass production; Extensive use of information technology like Interactive Voice Response System (IVRS) and Seri Information Kiosks to give on-line solutions/ suggestions to save cost and time and to reach more number of farmers that to in remote locations where extension staff cannot service on a regular basis; Extension agencies should have a consultation space at marketing places (cocoon and silk) for dissemination of information; Outsourcing some of the activities like disinfection, chawki rearing including dfl supply on cost basis through professional agencies needs attention; Adoption of proven new extension techniques/ technologies of agricultural field, for sericulture development; A liberal credit policy and intensified extension contact between farmers and extension personnel; Rational selection of the target group, appropriate training and frequent field demonstrations.

Technology dissemination and extension management: While CTRTI provide scientific and technological support for enhancing production and productivity for sustainable sericulture through innovative approaches, Regional Sericulture Research Stations (RSRS) functions for the development of region-specific technology package and dissemination of research findings as per regional needs along with the network of Research Extension Centre (RECs) that provides extension support to sericulturists (Fig. 3). This set up support in technology development, validation/ refinement, commercialization and popularization various technologies to increase the productivity and improve quality. While CSB units train the front-line workers, Pilot Project Centers (PPC) under Directorate of Sericulture (DoS) helps in training the stakeholders at field level (Fig. 4). In view of the shortage of manpower in public extension system, efforts are made to nurture Community Resource Persons (CRPs) under aegis of Producer Institutions (Fig. 5), who play a major role in expansion, seed production, training and extension in tasar sericulture. Further, various development partners are associated in tasar sericulture including corporates under Corporate Social Responsibility in tasar silk promotion (Sathyanarayana, 2022).

A formal forum is required for certain types of interaction, including training, joint planning of research and extension agenda, and joint management agreements for soil, water and eco-conservation. The task for the coming decade will be to develop these in ways which are non-threatening both to the public and private organizations involved in sericulture extension and, as a prior requirement, to develop mutual trust and awareness of each other's activities. Also fostering multi-institute research collaboration in executing eco-race conservation and identification of different wild eco-races through biotechnological approach; easy and faster multiplication of high yielding tasar host plant varieties; pest incidence due to seasonal shifts and early/ easy detection of diseases; refinement and popularization of technologies at field level; accreditation of CRPs in coordination with NGOs and universities; convergence with Krishi Vigyan Kendras for Technology Demonstration, training and extension; customized mechanization and by-product utilization besides inter cropping and integration with other complementing avocations would not only help making tasar sericulture more remunerative but also sustainable (Fig. 6). Extension will continue to act a vessel for transferring knowledge to the sericulturists, educating them and improving their living conditions. How efficiently and speedily this is achieved at lower cost will continue to be the focus. Tasar sericulture in India is on a growing path with Research and Development aiming to improve the tasar ecosystem as a whole rather than focusing on the elements of tasar sericulture individually.

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