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IMPACT OF TRAINING ON KNOWLEDGE, ADOPTION AND REARING PERFORMANCE OF TRIBAL TASAR SILKWORM (ANTHERAEA MYLITTA.D) REARERS OF MAHARASHTRA

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ABSTRACT

Maharashtra is a traditional state of tasar silk production. The productivity of the state shows that the cocoons yield is hovering around 25-30 cocoons per dfls which might be due to lack of skills and training about the recommended package of practices. Thus, the investigation of impact of training on knowledge, adoption and rearing performance was undertaken with a random sample of 120 tasar silkworm rearers of Maharashtra. The study found that there was a significant impact on knowledge gain and adoption level (p<0.05) post training with the average difference of 34.30 per cent and 27.40 per cent, respectively. As far as the rearing performance was concerned, the hatching percentage and effective rate of rearing showed an improvement of 17.32 per cent and 36.66 per cent, respectively; whereas cocoon yield was improved by 1179 cocoons per 100 dfls. Similarly the annual income of tasar silkworm rearers was improved by Rs.2358/- per 100 dfls. The 't' test of significance showed that there was significant improvement in the hatching percentage, effective rate of rearing, cocoon yield per 100 dfls and annual income per 100 dfls (p<0.05) post training. Thus, study recommend that the frequent training programs about the improved tasar rearing technologies should be organized to achieve the human resource development objective of the state which in turn will help in expanding the Tasar silk industry in state of Maharashtra and in India as a whole.
Keywords: Impact, Training, Knowledge, Adoption, Tasar, Silkworm, Sericulture.
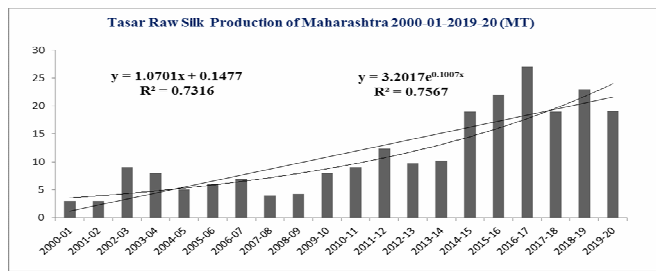
Introduction

Sericulture is one of the major agro-industries that play a significantly important role in uplifting rural economy. It provides income and employment opportunities to the rural masses especially, the tribal folks with small land-holding and marginalized and weaker sections of the society. It is an ideal programme for the upliftment of weaker section of the society because of low gestation period and higher returns of scale. Sericulture is one of the important sectors of economy in India and plays an important role in poverty alleviation (Babu and Manjunath, 2015). Sericulture is an integral part of tribal life, practiced by about 1.5 lakh tribalpopulace in the states of Jharkhand, Chhattisgarh, Orissa, Madhya Pradesh, Utter Pradesh, West Bengal, Bihar, Maharashtra and Andhra Pradesh (Shetty *et al*., 2007).

Indian silk industry occupies a predominant position across the globe; it contributes almost 15 per cent of world's total raw silk production (Yaseen, 2014). India is the second largest producer of silk in the world. India is bestowed with a variety of silks, *viz*., Mulberry, Tasar, Eri and Muga. Among these four varieties of silk produced, Mulberry accounted for major share of raw silk production in the country with almost three forth of total raw silk production (71.46 %), followed by Eri (19.48%), Tasar (08.40%) and Muga (0.66%). The Vanya sector, comprising Tasar, Eri & Muga silks, produced 10,581 MT of raw silk with 7204 MT of Eri, 3136 MT of Tasar and 241 MT of Mugaduring 2019-20 (Annual Report, CSB, 2020-21).

The tropical tasar culture is traditionally a agro-forestry practice to produce unique tasar silk by rearing a wild silk insect, *Antheraea mylitta* Drury (Lepidoptera : Saturniidae), which provides livelihood, employment and economic support to several aboriginal families of Andhra Pradesh, Bihar, Chhattisgarh, Jharkhand, Orissa, Maharashtra, Madhya Pradesh, Uttar Pradesh, West Bengal state of the country (Mohan Reddy, 2011).

Maharashtra is a non-traditional sericulture state for producing Mulberry silk however; the Tasar silk production is practiced by the tribal folk since the time immortal in the eastern vidarbha region of Maharashtra. In Maharashtra, tasar sericulture activities are confined to mainly four districts of eastern Vidarbha; Gadchiroli, Chandrapur, Bhandara and Gondia (Mathur *et al*., 2000). Tasar sericulture can offer supplementary gainful employment for tribal compare to other sericulture activities. The specialty of the state is that, it undertakes 98% of bivoltine sericulture and stood first among nontraditional states and one of the potential States in India for silk production.

The very purpose of the sericulture training is to enable the trainees to perform a particular practice or technology with certain standards so that the desired result can be achieved. Training must have positive impact on knowledge and skill of the trainees that subsequently results in adoption. Impact assessment of training will help us to analyze the extent to which trainees were benefitted from that training.

Source: Author's calculation; Annual Reports of Central Silk Board from 2000-01 to 2019-20

Fig. 1 : Trends in Tasar Raw Silk Production of Maharashtra

The Fig. 1 shows the trend of tasar silk production in Maharashtra from last twenty years. It can be seen from the fig. 1 that the total tasar raw silk production of Maharashtra has shown a linear trend with the $r^2 = 0.731$ with linear fitted curve and trend declined during 2019-20 to 19.1 MT. Similarly exponential fitter curve also shows the increasing trend with $r^2 = 0.756$. It also shows a dwindling trend in the raw silk production in the state. Also, as far as the average yield of cocoon production is concerned, it is hovering around 25-30 cocoons per disease free laying (dfl) which might be due to the lack of knowledge and adoption about the improved tasar sericulture practices among the tasar rearers. Sericulture technologies and practices are constantly changing over the period and new practices are coming up hence training plays a crucial role in keeping the farmers abreast with these advancements in the sericulture sector so that the production can be increased.

Farmers' training is 'an intensive learning activity for a group of selected farmers, assisted by competent trainers to understand and practice the skills required in the adoption of technology (Okwu and Ejembi, 2005).Lynton and Pareek (1990) stated that training consists largely of well-organized opportunities for participants to acquire necessary understanding and skill. Farmers' training is directed towards improving their job efficiency in tasar farming rearing. Training is an important paradigm of agricultural extension for the transfer of technology, skill, knowledge and attitude to farmers to develop their competency. In Tamil Nadu, it is noticed that the training of large number of women sericulturists accelerated the promotion of bivoltine sericulture, because women were involved in most of the sericulture activities (Qadri and Dandin, 2006). May be include to discussion section or delete

The success of any training programme depends greatly on the knowledge gain and subsequent use of this knowledge to improve the adoption of the trainees. Present study attempted to assess the impact of training in terms of adoption and knowledge gain of trainees after attending training at the two designated centers of Central Silk Board i.e. Regional Sericulture Research station, Bhandara and Basic Seed Multiplication and Training Center Bhandara. These both centers organized training program every year for the Tasar silkworm rearers of the Maharashtra state. The study has specific objectives (1) to assess knowledge gain of tasar farmers after attending the training (2) to find out post training adoption of different practices covered in the training program and to (3) find out the impact of training program on the performance of rearing.

Materials and Methods

To boost the tasar silk production in the state of Maharashtra, the Central Silk Board, Bangalore has given the mandate to the Basic Seed Production and Training Center (BSM&TC), Bhandara and Regional Sericulture Research Station (RSRS), Bhandara to conduct the CBT and Skill Enhancement training program every year for the tasar silkworm rearers of all the tasar growing districts of the Maharashtra state.

The study was carried out in Bhandara and Gadchiroli districts of Maharashtra. A total of 120 respondents were selected randomly who has undergone the training program from the two districts during last five years. An *ex-post facto* research design was adopted for the study. The dictionary meaning of the term impact is robust impression or effect. Operationally the impact was defined as the changes occurred at the respondents' behavior, knowledge gain and improvement in the rearing performance due to the training programmes. Thus, the impact of training program was assessed in terms of adoption, knowledge gain and improvement in the rearing performance of respondents. Data were collected through personal interview and structured questionnaire.

Adoption was conceptualized as extent to which the respondents apply the different tasar rearing practices learned at the training in their tasar silkworm rearing after the completion of training. For this study an adoption index was prepared based on the available tasar rearing practices. The adoption was measured on a two point continuum viz, adopted and not adopted with a score of 1 and 0, respectively. The overall adoption was then divided into five categories based on range divided by the number of classes. The impact of training on adoption was assessed by using the following modified formula of Srinivasa *et al.,* 2007 and Scott B. Parry 2005.

$$\text{Impact of training on adoption} = \frac{\text{Adopted post} - \text{training} - \text{Adopted pre} - \text{training}}{\text{Total number of trainee assessed}}$$

Similarly, knowledge gain was conceptualized as the degree to which respondents acquired knowledge on various improved technologies of tasar sericulture covered in the training. Similarly knowledge gain was also measured by knowledge index on a two point continuum viz., known and not known with a score of 1 and 0, respectively. The gain in overall knowledge was then divided into five categories based on range (Maximum score divided by the number of categories). The impact of training on knowledge was assessed by using the following formula of Srinivasa *et al.*, 2007 and Scott B. Parry, 2005.

$$\text{Impact of training on knowledeg} = \frac{\text{Known post} - \text{training} - \text{Known pre} - \text{training}}{\text{Total number of trainee assessed}}$$

Pre tests of adoption and knowledge tests were administered to the trainees before the starts of training. The post tests of adoption and knowledge were administered after a gap of year so that the actual field level impact assessment can be done. Wilcoxon signed rank test was used to determine knowledge gain of respondents by comparing before and after training knowledge scores.

Also the rearing performance was assessed by taking the four rearing indicators viz.; average hatching percentage (low-less than 60%, Medium-61-75% & High-more than 75%), Effective Rate of Rearing (low-less than 15%, Medium-16-25% & High-more than 25%), average cocoon yield per 100 Dfls (low yield-less than 1500 cocoons, Medium yield-1501 to 3000 cocoons & High yield-more than 3000 cocoons) and average income per 100 dfls (low income-less than Rs. 3000/-, Medium income-Rs. 3000-Rs.

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6000/-& High income-more than Rs. 6000/-). The data collected was subjected to the suitable statistical test .

Result and Discussion

The impact of training on knowledge gain and adoption of improved tasar rearing technologies of trained farmers along with their rearing performance is discussed as below:

1. **Impact of training on the knowledge level of the tasar silkworm rearers:**

The impact of training on the knowledge level of tasar silkworm rearers is presented in the Table 1 which shows that post training nearly 60 per cent change in knowledge level was seen in the use of L.S.M. or Tasar Rakshak (58.33%), followed by method of disposal of diseased/dead silkworms during rearing (57.50%), prophylactic measures and maintenance of hygienic conditions during rearing (51.67%) and time, doses and method of application of Manure/FYM/Vermi-compost/plant/year (50.83%) of tasar silkworm rearers. Nearly 50 per cent change in knowledge level was noticed in the use of chemicals and concentration required for disinfections of rearing field and rearing appliances post training

Whereas lowest change in knowledge level was observed in the practices such as selection of rearing sites and spacing to be adopted for transplanting of plants (13.33%) followed by pruning and pollarding time and methods for DTV & DBV races as per crops schedule (15.83%) and method of worm transfer & care to be taken during molting and spinning (15.83%), brushing methods and time and care to be taken during brushing (16.67%) and harvesting, grading and transportation of cocoons (16.67%). More than 40 per cent change in knowledge was seen in the

practices such as time, doses and method of application of fertilizers NPK/plant/year (45.84%), methods and time of disinfection of rearing field and rearing appliances (44.17%), chawki garden maintenance and chawki rearing under nylon net (42.50%) and time and concentration to be used of Urea as foliar spray (41.67%). The change in knowledge level post training in the range of 20-35 per cent was observed in the practices such as techniques of indoor rearing of silkworm (37.50%), application of secondary nutrients –SM-5 for enhancement of leaf yield (36.67%), diseases of tasar silkworm and its management (35.84%), use of green manuring crops as fertilizer (33.33%), Use of sticky traps for catching predator insect (28.33%) and Incubation of Dfls/Seeds/Eggs (25.83%). The average knowledge level pre training was 40.03% whereas the post training, the average knowledge level was 74.33 % with an improvement in the knowledge level by 34.30%. Thus, it can be concluded that the training had a significant impact on the improvement or change in knowledge level of tasar silkworm rearers of Maharashtra. The findings of the study are in conformity with study conducted by Reddy *et al*. (2014).

The perusal of the data from Table 2 clearly shows that the equal percentage of the respondents were falling in the categories of medium (31.67%) and low (31.67%) levels of knowledge of improved tasar silkworm rearing technologies followed by high (28.33%) level of knowledge. Similarly one tenth of the respondents had very low level of knowledge whereas more than 8 per cent of the respondents were falling in the category of very high level of knowledge during pre trainings with mean score of 12.23.

Table 1 : Impact of training on the knowledge level of improved tasar silkworm rearing technologies of the tasar silkworm rearers

Sl. No.	Improved Tasar Silkworm Rearing Technologies	Knowledge level of Trainees (n=120)				Impact on Knowledge level of the trainees
		Pre-Training		Post-Training		
		f	%	f	%	
1	Selection of Rearing sites and spacing to be adopted for transplanting of plants	102	85.00	118	98.33	13.33%
2	Tasar host plant nursery Raising Technique	37	30.83	64	53.33	22.50%
3	Integrated management of Leaf Gall disease of tasar host plants	08	06.67	57	47.50	40.83%
4	Time, doses and method of Application of Manure/FYM/Vermi-compost/plant/year	32	26.67	93	77.50	50.83%
5	Time, doses and method of Application of chemical fertilizers NPK/plant/year	37	30.83	92	76.67	45.84%
6	Techniques of indoor rearing of silkworm	56	46.67	101	84.17	37.50%
7	Time and concentration to be used of Urea as foliar spray	35	29.16	85	70.83	41.67%
8	Application of secondary nutrients –SM-5 for enhancement of leaf yield	05	04.16	49	40.83	36.67%
9	Pruning and pollarding Time and Methods for DTV & DBV races as per crops schedule	78	65.00	97	80.83	15.83%
10	Chawki Garden Maintenance and Chawki rearing under nylon net	52	43.33	103	85.83	42.50%
11	Chemicals and concentration required for disinfections	34	28.33	93	77.50	49.17 %
12	Methods and Time of disinfection of Rearing field and rearing appliances	38	31.67	91	75.83	44.17%
13	Use of Green Manuring crops as fertilizer	09	07.50	49	40.83	33.33%
14	Incubation of Dfls/Seeds/Eggs	65	54.17	96	80.00	25.83%
15	Brushing methods and time and care to be taken during brushing	85	70.83	105	87.50	16.67%
16	Diseases of tasar silkworm and its management	49	40.83	92	76.67	35.84%
17	Use of L.S.M. (Tasar Rakshak)	15	12.50	85	70.83	58.33%
18	Method of preparation, stage of silkworms and timing of application of Jeevan Sudha	59	49.16	83	69.17	20.00%
19	Concentration and Use of Sodium Hypochlorite solution for disease control	51	42.50	85	70.83	28.33%
20	Prophylactic measures and maintenance of hygienic condition during rearings	48	40.00	110	91.67	51.67%
21	Method of disposal of diseased/dead silkworms during rearing	46	38.33	115	95.83	57.50%
22	Method of worm transfer & Care to be taken during molting and spinning	98	81.67	117	97.50	15.83%
23	Management of silkworms' pests and predators	34	28.33	67	55.83	27.50%
24	Use of sticky traps for catching predator insect	35	29.17	69	57.50	28.33%
25	Harvesting, grading and transportation of cocoons	94	78.33	114	95.00	16.67%
	Average change in knowledge level in (%)		**40.03**		**74.33**	**34.30%**

Source: Author's calculation

As far as the post training knowledge levels is concerned, 2/5th of the tasar silkworm rearers had high (40.00%) level of knowledge of recommended technologies followed by medium (26.67%) and very high (15.83%) levels of knowledge. Low and very low levels of knowledge of the improved tasar silkworm rearing technologies after the post training were noticed in 13.33 per cent and 4.17 per cent of the respondents, respectively with the mean score of 16.03. The 't' test clearly reveals that there was a significant difference in the levels of knowledge of tasar rearing technologies (P<0.05) in pre and post trainings.

Table 2 : Distribution of tasar silkworm rearers according to their pre and post training knowledge levels

Knowledge level	Respondents/Trainees(n=120)				
	Post-Training		Pre-Training		Impact/Change
	ƒ	%	ƒ	%	Paired 't' test
Very Low (0-5)	05	4.17	12	10.00	't' value = 29.8644
Low (6-10)	16	13.33	38	31.67	SE = 0.127
Medium (11-15)	32	26.67	38	31.67	P = 0.0001
High (16-20)	48	40.00	22	18.33	df = 119
Very High(21-25)	19	15.83	10	08.33	't' test is significant (P<0.05)
Total	**120**	**100**	**120**	**100**	
Mean	**16.03**		**12.23**		
Standard Deviation	**5.17**		**4.97**		
Range	**4-25**		**3-24**		

Source: Author's calculation

The study concludes that there was medium to low level of knowledge before training whereas medium to very high knowledge was noticed post training. Also, there was a significant and positive impact of training programs on the knowledge level of the respondents about the improved tasar silkworm rearing technologies. Those training programs really gave them a lot of knowledge and help tasar silkworm rearers to develop their skill in their particular field. Through all these knowledge and skill they can now go and perform better in their own particular area (Scott B. Parry, 2005, Donald L. Kirtkpatrick and James D. Kirtkpatrick. 2006 and James D. Kirtkpatrick 2007). Jayaram and Indometi (2010) in their study reported while studying the awareness and attitude of farmers associated with sericulture observed a significant relationship between knowledge level and education, total land holding, extension contact, social participation and cocoon yield.

Impact of training on the adoption of improved tasar silkworm rearing technologies

The impact of training on the adoption level of the tasar silkworm rearers is presented in the Table 3 which depicts that maximum change in adoption of recommended package of practices post training was seen in the practices such as prophylactic measures and maintenance of hygienic condition during rearings (46.67%), method of disposal of diseased/dead silkworms during rearing (45.83%), use of L.S.M. or Tasar Rakshak (43.33%) and time, doses and method of Application of Manure/FYM/Vermi-compost/plant per year (42.50%) Chemicals and concentration required for disinfections (41.67%) and methods and time of disinfection of rearing field and rearing appliances (40.83%).

Table 3 : Impact of training on the adoption of improved tasar silkworm rearing technologies of the tasar silkworm rearers.

Sl. No.	Improved Tasar Silkworm Rearing Technologies	Adoption level of Trainees(n=120)				Impact on adoption level of the trainees
		Pre-Training		Post-Training		
		ƒ	%	F	%	
1	Selection of Rearing sites and spacing to be adopted for transplanting of plants	81	67.50	93	77.50	10.00%
2	Tasar host plant nursery Raising Technique	27	22.50	51	42.50	20.00%
3	Integrated management of Leaf Gall disease of tasar host plants	4	03.33	48	40.00	36.67%
4	Time, doses and method of Application of Manure/FYM/Vermi-compost/plant/year	26	21.67	77	64.17	42.50%
5	Time, doses and method of Application of chemical fertilizers NPK/plant/year	28	23.33	73	60.83	37.50%
6	Techniques of indoor rearing of silkworm	13	10.83	23	19.17	08.34%
7	Time and concentration to be used of Urea as foliar spray	26	21.67	67	55.83	34.17%
8	Application of secondary nutrients –SM-5 for enhancement of leaf yield	3	02.50	38	31.67	29.17%
9	Pruning and pollarding Time and Methods for DTV & DBV races as per crops schedule	59	49.17	79	65.83	16.67%
10	Chawki Garden Maintenance and Chawki rearing under nylon net	39	32.50	79	65.83	33.33%
11	Chemicals and concentration required for disinfections	21	17.50	71	59.17	41.67%
12	Methods and Time of disinfection of Rearing field and rearing appliances	23	19.17	72	60.00	40.83%
13	Use of Green Manuring crops as fertilizer	5	04.17	35	29.17	25.00%
14	Incubation of Dfls/Seeds/Eggs	52	43.33	76	63.33	20.00%
15	Brushing methods and time and care to be taken during brushing	69	57.50	86	71.67	14.17%
16	Diseases of tasar silkworm and its management	37	30.83	75	62.50	31.67%
17	Use of L.S.M. or Tasar Rakshak	11	09.17	63	52.50	43.33%
18	Method of preparation, stage of silkworms and timing of application of Jeevan Sudha	42	35.00	60	50.00	15.00%

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19	Concentration and Use of Sodium Hypochlorite solution for disease control	37	30.83	63	52.50	21.67%
20	Prophylactic measures and maintenance of hygienic condition during rearings	33	27.50	89	74.17	46.67%
21	Method of disposal of diseased/dead silkworms during rearing	38	31.67	93	77.50	45.83%
22	Method of worm transfer & Care to be taken during molting and spinning	75	62.50	90	75.00	12.50%
23	Management oftasarsilkworms' pests and predators	26	21.67	53	44.17	22.50%
24	Use of sticky traps for catching predator insect	22	18.33	51	42.50	24.17%
25	Harvesting, grading and transportation of cocoons	78	65.00	92	76.67	11.67%
	Average		**29.17**		**56.57**	**27.40%**

Source: Author's calculation

Whereas minimum change in the adoption of recommended package of practices oftasar silkworm rearing post training was depicted by the practices such as techniques of indoor rearing of silkworm (8.34%), selection of rearing sites and spacing to be adopted for transplanting of plants (10.00%), harvesting, grading and transportation of cocoons (11.67%), method of worm transfer and care to be taken during molting and spinning (12.50%) and brushing methods and time and care to be taken during brushing (14.17%), method of preparation, stage of silkworms and timing of application of Jeevan Sudha (15.00%) and pruning and pollarding time and methods for DTV & DBV races as per crops schedule (16.67%). More than 30 per cent change in adoption of recommended package of practices was observed in the practices such as time, doses and method of application of chemical fertilizers NPK/plant/year (37.50%), integrated management of Leaf Gall disease of tasar host plants (36.67%), time and concentration to be used of urea as foliar spray (34.17%), chawki garden maintenance and chawki rearing under nylon net (33.33%) and diseases of tasar silkworm and its management (31.67%). More than 20 per cent change in adoption of the recommended package of practices for tasar silkworm rearing was observed in the practices application of secondary nutrients –SM-5 for enhancement of leaf yield (29.17%), use of green manuring crops as fertilizer (25.00%), use of sticky traps for catching predator insect (24.17%), management of tasar silkworms'

pests and predators (22.50%), concentration and use of Sodium Hypochlorite solution for disease control (21.67%) and tasar host plant nursery raising technique (20.00%) and incubation of Dfls/Seeds/Eggs (20.00%). The average adoption percentage during pre training was 29.17 per cent and the same has been increase to 56.57 per cent with the improvement of 27.40 per cent. Thus, it can be concluded that the training had a significant impact on the adoption of recommended practices of tasar silkworm rearing on the tasar silkworm rearers of the region. The findings of the study are in the line with study conducted by Reddy *et al*. (2014). Similarly, Merat *et al*. (2018) in their study found that 76 per cent sericulturists attended the training courses; it can be acknowledged that these training courses were effective in the adoption of sericulture. Rahmathulla *et al*. (2010) reported in his comprehensive study on socio-economic characteristics, income and investment pattern of trained and untrained sericulturists concluded that socio-economic conditions, facilities available, technology adoption, land use pattern, income from sericulture and investment pattern were comparatively better for trained sericulturists. Kabi and Horwitz (2006) reported that, the aged farmers involved in agriculture are less likely to adopt new sustainable practices and often rely on their indigenous knowledge to manage their farms. That could be the reason that the adoption of improved tasar sericulture practices was not improved much in the study area.

Table 4 : Distribution of the tasar silkworm rearers according to their pre and post training adoption levels

Adoption level	Respondents/Trainees				
	Post Training		Pre Training		Impact/Change
	f	*%*	*f*	*%*	Paired 't' test
Very Low (0-5)	12	10.00	16	13.33	't' value = 18.0365
Low (6-10)	24	20.00	26	21.67	SE = 0.131
Medium (11-15)	29	24.17	34	28.33	P = 0.0001
High (16-20)	41	34.17	38	31.67	df = 119
Very High (21-25)	14	11.67	06	05.00	't' test is significant (P<0.05)
Total	**120**	**100.00**	**120**	**100.00**	
Mean	**14.23**		**11.86**		
S.D.	**5.73**		**5.22**		
Range	**4-25**		**3-23**		

Source: Author's calculation

The data presented in the Table 4 clearly depicts that the adoption level of tasar silkworm rearers was high (31.67%) followed by medium (28.33%) and low (21.67%). Also, more than 13 per cent of the tasar silkworm rearers had very low level of adoption whereas only 5 per cent of the respondents were falling in the category of very high level of adoption during pre trainings with mean score of 11.86. Whereas there was high (34.17%) level of adoption of recommended technologies were noticed after the post training followed by medium (24.17%) and low (20.00%) level of adoptions. Around 12 per cent of respondents were

found to have very high level of adoption and one tenth of the respondents were falling in very low adoption level of the improved tasar silkworm rearing technologies after the post training with the mean score of 14.23. The 't' test clearly reveals that there was a significant difference in the levels of adoption of tasar rearing technologies (P<0.05) in pre and post trainings. The study concludes that there was medium to low level of adoption before training whereas medium to high adoption was noticed post training. Also, there was a significant and positive impact of training programs on the

adoption level of improved tasar rearing technologies of tasar silkworm rearers.

It could be derived from the Table 5 that the post training more than 43 per cent change was noticed in average cocoon yield/100 Dfls/year (43.25%) compared to pre training with the improvement of 1179 cocoons/100 dfls/year. Similarly, the average total income from tasar sericulture/100 Dfls/ year showed the change of 41.35 per cent with the improvement of Rs.2358/- per 100dfls/year.

Moreover, the average effective rate of rearing (ERR %) and average hatching percentage (%) showed the change of 36.66 per cent and 17.32 percent respectively. The ERR percentage was improved to the tune of 7.25 per cent whereas the average hatching percentage was improved to the tune of 11.42 per cent. The t test showed that there was a significant improvement in the hatching percentage, effective rate of rearing, cocoon yield/100 dfls and total income per 100 dfls of the tasar silkworm rearers of the Maharashtra.

Table 5 : Impact of training on the rearing performance of tasar silkworm rearers/participant

Sl. No.	Rearing performance indicator	Rearing performance of participants/trainees (n= 120)		Difference	% Impact on rearing performance	SE	Calculated Paired 't' value	P value
		Post-training	Pre-training					
01	Average hatching percentage (%)	77.341	65.925	11.42	17.32 %	0.428	26.6849*	P = 0.0001
02	Average Effective Rate of Rearing (ERR %)	27.025	19.775	07.25	36.66 %	0.316	22.9547*	P = 0.0001
03	Average Cocoon Yield/100 Dfls / Year	3905	2726	1179	43.25 %	54.51	21.6288*	P = 0.0001
04	Average Total Income from Tasar Sericulture/ 100 Dfls / Year (Rs.)	8060	5702	2358	41.35 %	109.03	21.6288*	P = 0.0001

*Significant at 0.05 level,

The distribution of tasar silkworm rearer according to their impact of training on improvement of hatching percentage of silkworm eggs is presented in the Table No.6 which shows that in pre training the hatching percentage level was medium (43.33%) followed by low (36.37%) and high (20.00%) with the average hatching percentage of 65.93 %. However, the post training, the hatching percentage level was medium (48.33%) followed by high (42.50%) and low

(9.17%) with the average hatching percentage of 77.34%. Srinavasa *et al*. (2007) observed in his study that training programmes for extension personnel working in the field of sericulture and farmers practicing sericulture were found much essential for their capacity building in order to reduce the yield gaps that existed between the potential and actual yield in the field and also between the farmers.

Table 6 : Distribution of tasar silkworm rearer according to their impact of training on improvement of hatching percentage of silkworm eggs

Hatching % level	Respondents/Trainees n = 120				
	Post Training		Pre Training		Paired 't' test
	f	*%*	*f*	*%*	't' value = 26.6849
Low (<60 %)	11	09.17	44	36.67	SE= 0.428
Medium (61-75%)	58	48.33	52	43.33	P = 0.0001
High (> 75)	51	42.50	24	20.00	df = 119
Total	**120**	**100**	**120**	**100**	't' test is significant (P<0.05)
Mean	77.341		65.925		
Standard Deviation	10.766		9.473		
Range	53-95		48-82		

The 't' test clearly reveals that there was a significant difference in the hatching percentage (P<0.05) in pre and post trainings. The study concludes that there was medium to low level of hatching before training whereas medium to

high percentage of hatching was noticed post training. A significant and positive impact of training programs on the hatching percentage of silkworm seeds/dfls was noticed post training.

Table 7 : Distribution of tasar silkworm rearer according to their impact of training on Effective Rate of Rearing (ERR %)

Effective Rate of Rearing (ERR) level (%)	Respondents/Trainees n = 120				
	Post Training		Pre Training		Paired 't' test
	f	*%*	*f*	*%*	't' value =22.9547
Low (< 15 %)	30	25.00	49	40.33	SE= 0.316
Medium (16-25 %)	32	26.67	38	31.67	P = 0.0001
High (> 25)	58	48.33	33	27.50	df = 119
Total	**120**	**100**	**120**	**100**	't' test is significant (P<0.05)
Mean	27.03		19.78		
Standard Deviation	6.06		5.22		
Range	15-45		10-36		

The distribution of tasar silkworm rearers according to their impact of training on effective rate of rearing (ERR) is

depicted in the Table No 7 which shows that in pre training the effective rate of rearing (ERR) percentage level was low

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(*Antheraea mylitta*. D) rearers of Maharashtra

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(40.33%) followed by medium (31.67%) and high (27.50%) with the average effective rate of rearing (ERR) percentage of 19.78%. However, the post training, the effective rate of rearing (ERR) level was high (48.33%) followed by medium (26.67%) and low (25.0%) with the average effective rate of rearing (ERR) percentage of 27.03%. The study concludes that there was low to medium level of effective rate of rearing (ERR) before training whereas high to medium percentage of effective rate of rearing (ERR) was noticed post training.

The 't' test clearly divulges that there was a significant difference in the effective rate of rearing (ERR) percentage (P<0.05) in pre and post trainings. A significant and positive impact of training programs on the effective rate of rearing (ERR) percentage of tasar silkworm rearing was noticed post training.

The distribution of tasar silkworm rearer according to their impact of training on cocoon yield/100 dfls of tasar silkworm cocoons production is presented in the Table No 8. The perusal of the data of Table No.8 divulges that in pre training the cocoon yield/100 dfls level was medium (45.83%) followed by low (31.67%) and high (25.50%) with the average cocoon yield/100 dfls of 2726 numbers of cocoons per 100 dfls. However, the post training, the cocoon yield/100 dfls level was high (62.50%) followed by medium (30.00%) and low (07.50%) with the average cocoon yield/100dfls of 3905 numbers of cocoons per 100 dfls. The study concludes that there was medium to low level of cocoon yield/100dfls before training whereas high to medium cocoon yield/100dfls was noticed post training. The quality of good tasar cocoon depends on nutritive value of their food plants (Sahay *et al*., 2001 and Singhvi, 2014). Hence it can be concluded that training could cause to improve the adoption of host plant improvement practices which ultimately results in the increase of cocoon yields per 100 dfls.

Table 8 : Distribution of tasar silkworm rearer according to their impact of training on cocoon yield/100 DFLS

Cocoon Yield/100 Dflslevel	Respondents/Trainees n = 120				
	Post Training		Pre Training		Paired 't' test
	f	*%*	*f*	*%*	't' value =21.6288
Low (<2000)	09	07.50	38	31.67	SE= 54.51
Medium (2000 -3500)	36	30.00	55	45.83	P =0.0001
High (> 3501)	75	62.50	27	22.50	df = 119
Total	**120**	**100**	**120**	**100**	't' test is significant (P<0.05)
Mean	**3905.0**		**2726.0**		
Standard Deviation	**1223.66**		**972.80**		
Range	**1205-4520**		**1825-7056**		

There was an improvement of 1179 numbers of cocoons per 100 dfls post training. The't' test clearly shows that there was a significant difference in cocoon yield/100dfls (P<0.05) in pre and post trainings. A significant and positive impact of training programs on the improvement of cocoon yield/100dfls of tasar silkworm was noticed post training. Reddy *et al*. (2010) in their study found that cocoon yield & seed quality of A. mylitha is dependent on variety and nutritional status of host plant. With the intensive training, knowledge and adoption of the improved tasar host plant technologies could increase which in turn result in the improvement of the cocoon yield per 100 dfls. The findings of the study are in line with the study conducted by Meenal and Rajan (2007) which states that the training undergone by the sericulturits had a positive significant influence on cocoon production.

Table 9 : Distribution of tasar silkworm rearer according to their impact on average annual income per 100 dfls of tasar silkworm rearing

Average Annual Income/100 Dfls	Respondents/Trainees n = 120				
	Post Training		Pre Training		Paired 't' test
	f	*%*	*f*	*%*	't' value = 21.6288
Low (< Rs. 5000/-)	13	10.83	48	40.00	SE= 109.03
Medium (Rs.5001-Rs.8000/-)	58	48.34	61	50.83	P = 0.0001
High (>Rs.8001/-)	49	40.83	11	09.67	df = 119
Total	**120**	**100**	**120**	**100**	't' test is significant (P<0.05)
Mean	**8060.00**		**5702.00**		
Standard Deviation	**2450.44**		**1945.61**		
Range	**3856-14212**		**2510-9420**		

The distribution of tasar silkworm rearer according to their impact of training on average annual income per 100 dfls is presented in the Table No.09. The perusal of the data Table No.9 shows that in pre training the average annual income per 100 dfls, more than half of the respondents or tasar silkworm rearers had medium (50.83%) level of average annual income (Rs.5001-Rs.8000/-) per 100 dfls whereas two-fifth of the respondents had low average annual income(<Rs.5000/-) per 100 dfls and around one-tenth of the tasar silkworm rearers had high (09.67%) average annual income (>Rs.8001/-) per 100 dfls with the average annual income per 100 dfls of Rs. 5702/-. As far as the post training average annual income per 100 dfls is concerned, most of the tasar silkworm rearers (48.34%) had medium annual income (Rs.5001-Rs.8000/-) per 100 dfls. More than 2/5th of the tasar silkworm rearers had high annual income (>Rs.8001/-) whereas more than 1/10th of the tasar silkworm rearer had

low annual income (<Rs.5000/-) per 100 dfls with the average annual income of Rs.8060/- per 100 dfls.

The study concludes that the average annual income per 100dfls was medium to low before training whereas medium to high post training. There was an improvement in the annual income of Rs.2358/- per 100 dfls post training. The 't' test clearly shows that there was a significant difference in the improvement in the average annual income per 100Dfls (P<0.05) in pre and post trainings. A significant and positive impact of training programs on the improvement average annual income/100Dfls of tasar silkworm rearers was noticed post training. Narain (1991) has observed in his study, 'Tasar culture- a trial in Maharashtra' and reported that tasar culture is a good mean for the tribals to utilise the natural wealth of tasar food plants, i.e., Asan, Arjuna and Sal, which are available in abundance in the tribal areas. The study revealed that a family can earn Rs. 2.000 to Rs. 4000 in a period of about 40-50 days. The tasar culture can provide gainful employment at door and additional income to the tribal people in the state. Hugar *et al.* (2013) in their study of "Revitalization of Tribal Economy through Sustainable Tasar Culture in Maharashtra" reported that the most of the tasar rearers take up rearing without technical packages and earn income in the range of Rs. 3000 to Rs. 4000/-, against income potential of over Rs. 10000/-.Efforts made through continuous orientation, training, demonstration, and exposure along with supportive activities helped participants to get an incremental annual income of over Rs. 8000- 10000/- per crop from tasar silkworm rearing. Meenal and Rajan (2007) which states that the training undergone by the sericiturits had a positive significant influence on cocoon production thus, it can be concluded that training could have the positive effect on the income generation of the tasar silkworm rearers since the production of cocoons had been increased.

Conclusion

The present investigation was carried out to study the impact of training program on knowledge, adoption, hatching percentage, effective rate of rearing, cocoon yield and annual income of the tasar silkworm rearers of the Maharashtra. Based on the results of the investigation it can be concluded that the training had a significant impact on the enhancement of knowledge level, adoption level and skill enhancement of the participants. Similarly, it had a great impact on the rearing performance of the tasar silkworm rearers which eventually has increased the cocoon yield and annual income of the participants. It also infused the confidence among all the tasar silkworm rearers of the region that they can undertake tasar silkworm rearing by adopting the needed improved technologies on their own, which in turn will provide them self employment and livelihood opportunities which eventually increasing their annual income through Tasar culture. It will also help them to raise their standard of living. Moreover, this will definitely help in expanding the Tasar silk industry in state of Maharashtra and in India as a whole. Rahmathulla *et al.* (2009) while observing the influence of training elements on knowledge, skill and attitude of sericulture trainees have recommended that programmes with more training facilities under good training environment have to be arranged for efficient and result oriented outcome and upliftment in terms of knowledge, skill

and attitude of beneficiaries. The results indicated the necessity of arranging more extensive human resource development activities and transfer of technologies to upgrade farming community.

Thus, intensive training and resources should be allotted to the centers to organize more numbers of trainings about the newly developed tasar silkworm rearing technologies to all the tasar silkworm rearers of the state with the objective of achieving the Human Resource Developments (HRD) which is the need of the hour in Tasar culture.

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