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Extent of Adoption of Drought Management Technologies in Mulberry Sericulture in Southern Dry Zone of Tamil Nadu

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Abstract: *Mulberry cultivation and Silk worm rearing in several Sericultural clusters in the South India are severely affected by drought. Drought besides reducing mulberry yield also leads to silkworm partial or total crop losses quantitatively and also qualitatively. Study was conducted with the sericulture farmers of southern dry agro climatic zone of Tamil Nadu to find out the extent of adoption of drought management technologies in the mulberry garden and silkworm rearing. The farmer's wise adoption index was calculated for 30 identified drought management technologies. The study revealed that 92 percent of the farmers were low adopters and 8 percent of the farmers were medium adopters. The age and experience of the sericulturists were positively correlated with the adoption index but the size of the land holding was negatively correlated. The adoption index was also positively correlated with the number of silkworm layings reared and the average silk cocoon yield obtained by the farmers. Among the 30 technologies selected for the study, 60 percent of technologies have low level of adoption, 3.3 percent have medium level of adoption and 36.67 percent of technologies have high level of adoption. The technologies in silkworm feeding, hanging of wet gunny cloths, increasing feeding frequency, mulberry leaf harvest and preservation were highly adopted by the farmers.Adoption gap for individual technologies is also worked out. Even though water shortage is the main constraint in these areas farmers do not take up any steps to cope up the situation. Hence the study suggests for taking suitable efforts to increase the awareness and bridge the adoption gaps to increase the quality linked silk production in the drought areas also.*

Keywords : *Adoption index, Drought management, Mulberry cultivation, Silkworm rearing.*

INTRODUCTION

Drought is the silent threat to rural economy as agriculture is the immediate victim of drought disaster impacting crop area, crop production and farm employment. In South India large part of Sericultural area comes under dry semi-arid tropics. Naidu and Singh [14] informed that sericulture is the most beneficial income generating activity in drought prone areas. Rathnam and Narasaiah [18] stated that sericulture is considered as a boon to many marginal and small farmers in the drought-prone areas and informed that mulberry cultivation and silkworm rearing are more lucrative to the farmers in the district on comparing with the food and other commercial crops. Munikrishnappa *et al.*, [13] stated that the farmers are interested to rear silkworms throughout the year even though they face severe water shortage during summer period. Mulberry cultivation and silk worm rearing in several Sericultural clusters in the South India are severely affected by drought. The crisis of drought besides reducing mulberry yield it also leads to silkworm partial or total crop losses. The cocoon produced during the drought period is also inferior in qualities Rajaram *et al.,* [16]. The ill effects of drought, to a considerable extent, can be alleviated by adopting integrated drought management technologies as described by Mahimasanthi *et al.,*

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[6]. Drought management is not an independent task, but it is a combined management task. Yadav *et. al.,* [21] recommended that the full adoption of crop production technologies is very important in achieving the desired level of productivity in dry land crops. In a drought crisis management study at Andhra Pradesh Praveena *et. al.,* [15] reported different level of adoption with respect to scientific practices of crisis management of drought. Choudhary *et al.,* [1]and Mishra[13] also reported that majority of the farmers of Gujarat had medium level of crisis management adoption with respect to drought. Das [3] observed that packages of practices were developed through intensive and location specific research efforts to mitigate the drought. However, except for improved crop varieties, other components of the technology- particularly those aimed at conservation of natural resources (soil and water) have not been adopted by the farmers. Presently scientific and technological resources are available in the field to reduce the risk which are used fully, partially or never used by the farmers. From the review of the past research it is understood that the ill effects of drought are need to be managed properly and the farmers should be educated properly to mitigate the drought. The adoption studies in mitigating the drought in sericulture are hardly reported in the literatures. Hence this study was conducted in southern dry agro climatic zone of Tamil Nadu to find out the extent of adoption of drought management technologies in the mulberry garden and silkworm rearing to mitigate the drought.

2. METHODOLOGY

The study is conducted in the sericulture clustes of southern dry agro climatic zone of Tamil Nadu. In summer the maximum temperature is 39°C and minimum temperature is 29°C. The average rainfall of these clusters is 750 mm. The hydrometric division of India Meteorological Department reports that the rainfalls received in these areas are not uniform and highly uneven. Recurrence of drought is a common phenomenon in this area. From this zone two major sericulture clusters were selected based on crisis vulnerability. Two Samples of 50 farmers were selected randomly from these clusters by simple random sampling design to avoid biasness thus constituting a sample size of 100 farmers. The data were collected with the structured interview schedule.

2.1 Development of interview schedule

An interview schedule was designed based on the objectives of the study for data collection. Socioeconomic characteristics and drought management technologies recommended by the central sericultural research institute, Mysore were included in the schedule. The schedule was pre-tested and necessary modifications were made. Data were collected through personal interviews of the sericulture farmers. Adoption of thirty identified technologies such as propagation of drought resistant host plant varieties, Water conservation and moisture management technologies, In-situ rainwater harvesting and conservation methods for mulberry plantations, Management of pruning schedule to avoid rearing in peak summer, rearing of temperature tolerant silkworm hybrids, Rearing practices to be followed during drought conditions such as planning of silkworm rearing schedule, maintenance of rearing shed, Silkworm egg transportation, young age silkworm rearing, Late age rearing and Leaf/shoot harvesting and preservation technologies were studied.

2.2 Measurement of Extent of Adoption

The farmers were found to adopt the technologies at different levels, which were delineated as, nil adoption; a situation where the farmer never adopted the technology, partial adoption; where the adoption of technology was found to be partial or on a limited basis and in another situation, where the farmers were found to adopt the technology in full, as recommended. The adoption behaviour of the selected farmers was computed using the adoption score. The scores were assigned as per the level of adoption.

For complete adoption of a technological practice a score of 2 was given and for partial adoption of the same a score of 1 was given, while for non-adoption a score of 0 was given. In all, 30 technologies were considered for the study and given equal weightage. Each technology was given score and summed up for calculating farmer's wise adoption index. Further the farmers were classified into low, medium and high groups based on their adoption score. The adoption index was computed for each farmer as below :

$$\text{Adoption index} = \frac{\text{Farmer's total score}}{\text{Total possible score}} \times 100$$

2.3 Measurement of Technological gap index

The technological gap in selected recommended practices was measured with the help of technological gap index.

$$\text{Technological gap index} = \frac{R - A}{R} \times 100$$

Where

R = Total Recommended technology

A = Total number of technology actually adopted by the farmer

2.4 Measurement of Adoption gap

The adoption gap (AG) of farmer wise drought management technologies and technology wise adoption gap were computed. The AG for each farmer was defined as the proportion of technology not adopted to total recommended technology of drought management expressed in percentage. The following formula was used to compute AG.

$$AG = (\Sigma X_i / X_m) \times 100$$

Where, X_i = The total number of technology not adopted by the individual farmer i = 1 to 30 items

X_m = The selected recommended technology (30)

The technology wise adoption gap (PAG) was the proportion of respondents, who had not adopted the particular technology to the total number of respondents expressed in percentage.

$$\text{Technologywise } AG = (\Sigma Y_i / X_m) \times 100$$

Where, ΣY_i = The total No. of respondents, who had not adopted the particular technology i = 1 to 100

X_m = Total selected respondents = 100

3. RESULTS AND DISCUSSIONS

3.1 Socio Economic Profile of Sericulturists

In order to know the background of the sericulturists in the area the socio-economic characteristics of the sericulture farmers were surveyed. Ten socio-economic variables were selected for the study (Table 1). The analysed data showed that the mean age of the sericulturists surveyed were 46 years,

Table 1
Profile of Sericulturists N = 100

Sl. No.	*Variables*	*No.*	*%*	*Mean*	*Std. deviation*
1.	Age (yrs)			46.86	9.74
	Young (less than 35)	10	10.0		
	Middle (35-55 years)	72	72.0		
	Old (more than 55 years)	18	18.0		
2.	Education level			9.97	3.30
	Illiterate	4	4.0		
	Primary	6	6.0		
	High	52	52.0		
	Higher Secondary	22	22.0		
	College	16	16.0		
3.	Experience in sericulture (yrs)			9.96	7.91
	Less than mean	54	54.0		
	More than mean	46	46.0		
4.	Total land holding (ac)			6.18	3.99
	Less than mean	66	66.0		
	More than mean	34	34.0		
5.	Mulberry Acreage (ac)			2.30	0.79
	Less than 2.3 acres	60	60.0		
	More than 2.3 acre	40	40.0		
6.	Water Availability				
	Sufficient	16	16.0		
	Insufficient	84	84.0		
7.	No. of rearing /annum			8.54	2.16
	Less than 9 rearings	34	34.0		
	More than 9 rearings	66	66.0		
8.	Total DFLs brushed/ annum		679.61		320.81
	Less than 679 dfls	50	36.0		
	More than 679 dfls	50	64.0		
9.	Average Yield (Kg/100 dfls)			78.23	6.40
	Less than mean	32	32.0		
	More than mean	68	68.0		
10.	Gross returns/Crop (Rs)			41026.79	13407.75
	Less than mean	46	46.0		
	More than mean	54	54.0		

72 per cent of the respondents were middle aged (35-55 years) group. This findings were in conformity with Chouhan *et. al.*, [2]. The highest proportions of the respondents (52%), were educated upto high school *i.e.* X standard, 22% upto XII Std, 16% upto degree whereas 6% upto primary and 4% illiterates. The Mean experience of the sericulturists was 10 years. 46 percent of the respondents were above the mean level and 54% were below Mean (10 years). The Mean land holding of the respondents were 6.18 acre and mean mulberry acreage was 2.3 acre. 84% of the respondents reported the water availability is insufficient for their agricultural activities.

The sericulturists did 5 to 12 rearings per annum recording a mean of 8.54 rearings per annum. The average number of disease free silkworm layings (Dfls) reared by a farmer is recorded as 679 with the Standard Deviation of 320. The rearing capacity of the farmers ranged from 150 to 200 dfls per batch. The average silk cocoon yield of the farmers is 78.23 kg per 100 dfls, with only 6.4 Standard Deviation. The gross returns from cocoon per farmers per batch is Rs. 41,026 ± 13,407/- and 54% of the respondents were above mean.

3.2 Farmerwise Extent of Adoption

Adoption level of individual farmers were collected for 30 identified technologies which help farmers to mitigate the drought (Table 2). 92% of the farmers had low extent of adoption of drought management technologies *i.e.*, the extent of adoption of 92% of the farmers falls below 30% level of adoption. 8% of the farmers are medium adoptors *i.e.*, between 30 to 60 level of adoption. None of the farmers have high level of adoption. Praveena *et. al.*, [15] reported that half of the respondants had medium level, 28.33 percent had low level of adoption and 21.67 percent had high level of adoption respect to scientific management of drought in Agriculture farmers of Ananthapur dist. Krishnamoorthy and Radhakrishnan [4], reported that special attention is needed to increase the adoption of technologies in mulberry cultivation.

Table 2
Farmer wise extent of Adoption of drought management techniques

Category	Level(%)	Number	%
Low	< 30	92	92
Medium	30 - 60	8	8
High	> 60	0	0

3.3 Technology Gap index

The frequency of technology gap index falls between 36.67 to 66.67. This shows 36 to 66 percent of the technologies is not adopted by the farmers. Mallikajuna *et al.*, [7] while reporting the constraints of adoption of technologies reported the low level adoption by the farmers. Singh Bhagavan [18] reported that 53.7% variation in the technological gap and predicted knowledge of the farmers was the most important factor

3.4 Technologywise Extent of Adoption

To find out the technology gap, the adoption of drought mangement technology by the farmers were studied for all the 30 technologies recommended by the research Institute (Table 3).

3.4.1 Technology adoption in mulberry cultivation

Selection of drought resistant mulberry plant varieties 50% of the farmers have partial adoption. 56% of farmers of have full adoption and 14% of farmers have partial adoption in management of pruning schedule. The maximum of 82% of farmers have full adoption of drip irrigation which was in conformity with the report of Krishnamoorthy and Radhakrishnan [4]. The soil moisture conservation technologies like trenching, mulching and green manuring have 8% of full adoption and 2% of full adoption respectively. 84% of the farmers are having nil adoption of these technologies; Summer ploughing, opening trenches and planting across the slope had very low level of adoption (0 to 2% only). The rain water harvesting in mulberry garden also have very low level of adoption. 92 to 98% of farmers have nil adoption of these technologies.

Praveena *et al.*, [15] reported that construction of farm ponds and other rain water harvesting structures should be encouraged in drought prone areas to mitigate water shortage.

Table 3
Technology wise extent of Adoption by the farmers

Sl. No.	Technologies	Extent of adoption (%) Full	Partial	Nil	Adoption Score	Adoption Index	Adoption Gap
1.	Drought resistant host plant varieties.	0	50	50	50	25	50
2.	Management of pruning schedule	56	14	30	126	63	30
3.	Drip irrigation/Micro Irrigation Technique	82	10	8	174	87	8
4.	Trenching & mulching,	8	8	84	24	12	84
5.	Green manuring /green leaf manuring	2	18	80	22	11	80
6.	Sub-soiling,	0	10	90	10	5	90
7.	Summer ploughing,	2	24	74	28	14	74
8.	Opening trenches,	0	4	96	4	2	96
9.	Planting across the slope,	0	0	100	0	0	100
10.	Impounding rainwater in the garden,	2	26	72	30	15	72
11.	Run off collection pits, farm ponds	4	4	92	12	6	92
12.	Bore well recharging.	2	0	98	4	2	98
13.	Providing false ceiling	10	12	78	32	16	78
14.	Covering the roof	10	8	82	28	14	82
15.	Painting with cool guard / lime solution	2	0	98	4	2	98
16.	Hanging filled earthen pots	16	0	84	32	16	84
17.	Providing drip line on the roof	4	2	94	10	5	94
18.	Hanging wet curtains to windows and doors	82	4	14	168	84	14
19.	Raising trees around rearing house	14	32	54	60	30	54
20.	Awareness on new hybrid suitable for drought	0	6	94	6	3	94
21.	Early brushing in summer season	6	18	76	30	15	76
22.	Increase frequency of feeding if required	74	18	8	166	83	8
23.	Sprinkle clean water on the floor and walls	70	6	24	146	73	24
24.	Covering the rearing bed	6	8	86	20	10	86
25.	Providing required aeration	94	4	2	192	96	2
26.	Harvesting during cooler hours of the day	100	0	0	200	100	0
27.	Chawki& after moult worms resuming feeding with leaves harvest after irrigation	100	0	0	200	100	0
28.	Preserving shoots in upright position	100	0	0	200	100	0
29.	Sprinkling water & cover with wet cloth	100	0	0	200	100	0
30.	Avoiding long transportation	100	0	0	200	100	0

Drought management technologies in silkworm rearing

The silkworm rearing shed is very important for maintaining required temperature and humidity for the healthy growth of silkworms. The important technologies in rearing shed such as false ceiling inside the rearing house, covering the roof, painting with cool guard, hanging water filled earthen pots, providing dripline on roof, raising trees around rearing house have very low adoption ranging from 2 to 16%. Only hanging wet curtains to increase the humidity is having 82% of adoption. The low level of adoption leads to inferior quality of cocoons in these seasons.

94 percent of farmers have nil adoption of rearing drought tolerant silkworm hybrids and 76% of have no adoption of early brushing of silkworm eggs. But 74% of farmers have full level of adoption on increasing the feeding times during drought months. 86% of farmers have nil adoption of covering the leaves after feeding in drought period. The harvesting of mulberry leaves, transportation of harvested leaves and preservation of shoots have 100% of adoption. Higher adoption of technologies in rearing technologies is reported by Meenal and Rajan [10].

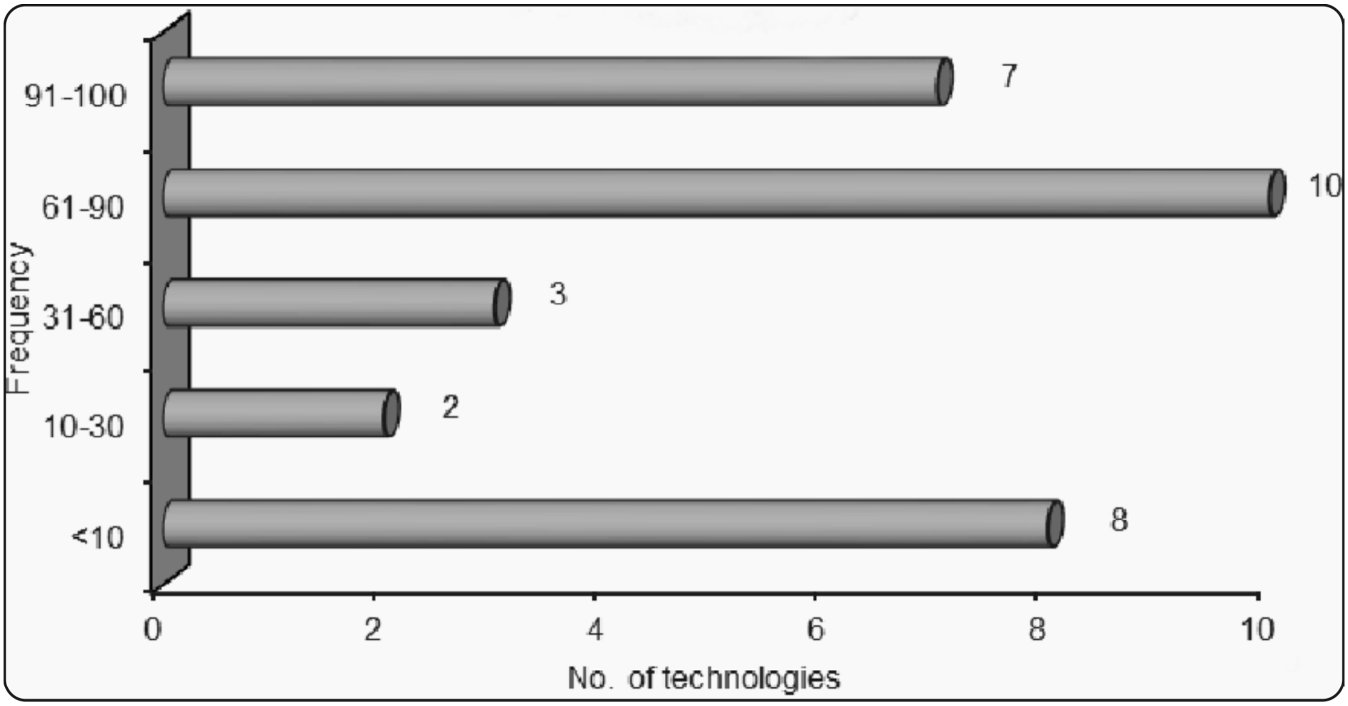


Figure 1: Adoption Gap

Cateogorywise extent of adoption

Technologywise extent of adoption is cateogorised in the Table 4. 36.67 percent of the technologies have high level of adoption, 3.33% of the technologies have medium level of adoption and 60% percent of technologies have below 30 percent of adoption.

Table 4
Technologywise extent of adoption

Category	*Adoption Index*	*Number*	*%*
Low	< 30	18	60
Medium	30 – 60	1	3.33
High	> 60	11	36.67

Correlation between socio economic variables and adoption index

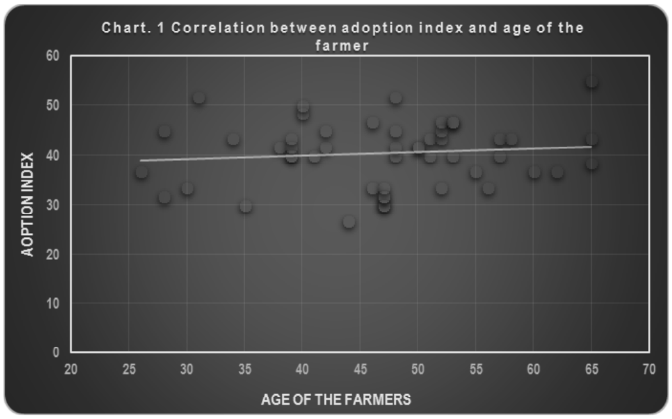
The age and experiecne of the farmers is positively corelated with the adoption index and is in accordance of the findings of Lakshmanan and Geethadevi [5]. The dfls brushing capacity of the farmers and average cocoon yield of the farmers are positively correlated to their level of adoption. This is in consonance with the findings of Meenal and Rajan, [9]. The extent of land area is negatively correlated with the adoption level and this is in line with the earlier findings by Srinivas *et al.*, [20].

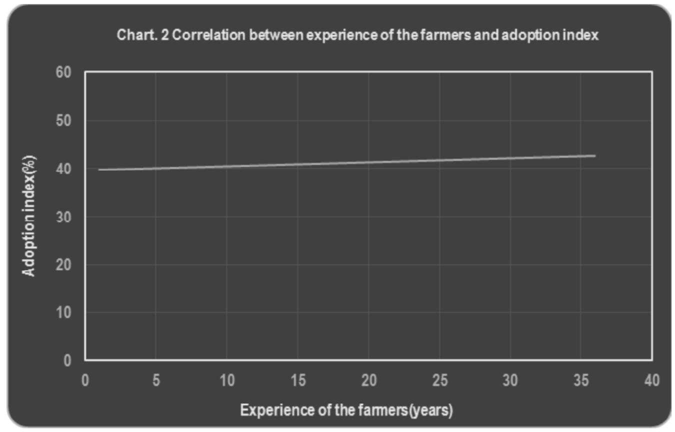
CONCLUSION

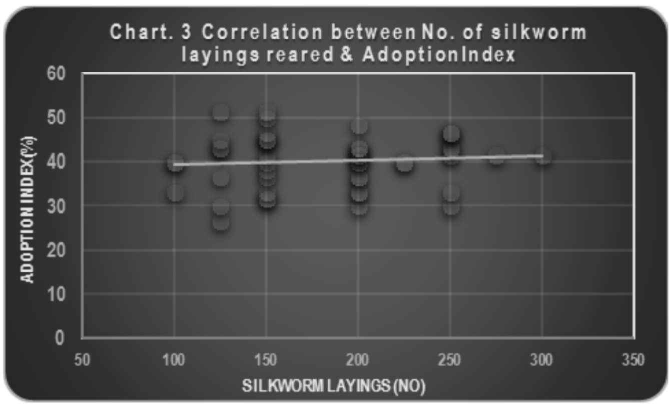
In the present study, 84 percent of the farmers reported insufficient water to carryout the sericultural activities during the drought period. But the adoption level of the farmers to cope up the situation is very very less. 92 percent of the farmers have low level of adoption and 60 percent of the drought management technologies were low adopted by the farmers. The adoption level of soil moisture management and rain water harvesting technologies exists with high adoption gap.

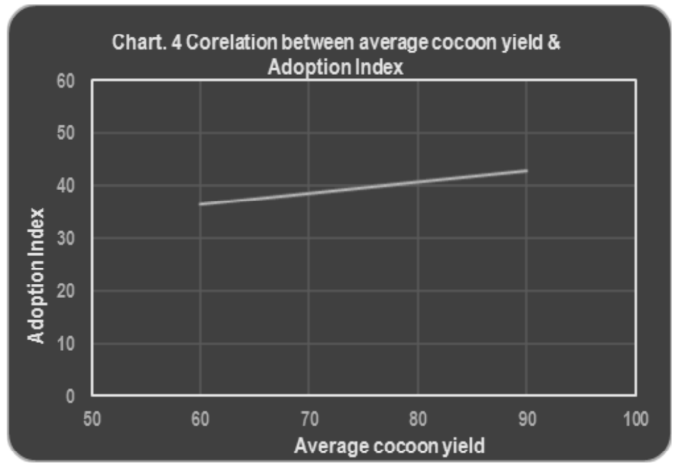
The findings of the study indicates that the farmers should be well motivated to adopt the drought management technologies to overcome the illeffects of drought. Awareness programmes should to conducted to increase the adoption level. Singh and Yadhav [19] informed that suitable measures should be taken to increase the awareness of the farmers to reduce the adoption gaps.

Mamathalakshmi *et al.*,[8] informed that there is a need for organizing intensive educational activities such as trainings, demonsterations, seminars, exhibitions, field days and field visits effectively and frequently to achieve higher level of adoption. Mehta *et al.*, [11] observed significant









difference between in all adoption index calculated for members and non members of cooperative soceities. Hence grouping of the farmers into self help groups or cooperative soceities can be done to increase the adoption level.

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