Research Article
Journal of Extension Education
Vol. 32 No. 4, 2020
DOI:https://doi.org/10.26725/JEE.2020.4.32.6604-6612

Farmers' perceptions on Drought, Technological preferences in Drought mitigation and their Implications in Mulberry Sericulture in South India

A. Mahimasanthi[1] and S. Rajaram[2]

ABSTRACT

Due to widespread monsoon irregularities, farmers are facing drought situations intermittently. Farmers' participatory rural appraisal was conducted in selected silkworm growing clusters of South India covering 300 farmers to determine how sericulture farmers perceive and cope with drought, to study the technological preferences and their implications in mulberry, Morus alba leaf production & rearing of silkworm, Bombyx mori. The study revealed that drought is a major constraint for silk cocoon production among 84 per cent of total farmers surveyed. The local drought perceptions described by farmers were acute water shortage, dry and desiccating wind, drying of leaves in the silk worm rearing shed disease outbreak in silkworms, spinning of small size cocoons, higher melting of cocoons and lesser Silk Ratio. While studying the technological preferences, it was observed that farmers gave more importance to technologies which have direct impact on silk cocoon yield.

Keywords: *Drought; Farmer perception; Technological preferences; Mulberry cultivation; Silkworm rearing; South India*

INTRODUCTION

India Meteorological Department has classified drought as an occasion when the rainfall for a week is half of the normal or less, when the normal weekly rainfall is above 5 mm or more. If such 4 consecutive weeks occur from middle of May to October, it is considered as agricultural drought. From agriculture perspective, drought is a condition, in which, the amount of water needed for transpiration and direct evaporation exceeds the amount available in the soil (IMD, 2018). Drought requires management actions, as less water becomes available to meet the needs of the same or even higher water demands.

The Mulberry cultivation and silk worm rearing in several sericultural clusters in 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 quality of the silk cocoons produced in drought affected areas is also not good. The ill effects of drought, to a considerable extent, can be alleviated by adopting proper management strategies.

1. *Central Sericultural Research &Training Institute, Central Silk Board, Ministry of Textiles, Govt. of India, Madurai- 625 402. India*
2. *Central Sericultural Research & Training Institute, Central Silk Board, Ministry of Textiles, Govt. of India, Mysore - 570 008. India*

Received : 09-04-2021; Accepted : 30-08-2021

Integrated drought management technologies is propagated to farmers to mitigate drought but the extent of adoption of these technologies is very low. Mahimasanthi et al (2018) had reported very high gap in adoption of technologies. Adoption of integrated drought management technologies would differ across regions, in accordance with land type, land area, availability of farm and frequency of occurrence of drought. The preference of farmers to adopt integrated drought management measures in their sericultural activities is determined by many factors. The purpose of this research is to study the perceptions of farmers on drought, their technological preferences in mitigating the drought in mulberry cultivation & silkworm rearing and their implications on mulberry leaf production, silkworm rearing & silk cocoon production in three major silk producing states of South India.

METHODOLOGY

The study was conducted in three major silk producing southern states viz. Karnataka, Andhra Pradesh and Tamil Nadu. A total of six sericulture clusters – two from each state which were declared as drought affected areas by the concerned states were selected by purposive sampling design. Accordingly. Tumkur & Ithandahally clusters from Karnataka, Penugonda & Hindupur clusters from Andhra Pradesh and Oddanchatram & Adaikalapattinam clusters from Tamil Nadu were selected for the study. The average rainfall of these clusters ranged from 465 mm to 750 mm. As per the hydrometric division of IMD, the rainfall received in these areas were not uniform and highly uneven. About 73 percent of annual rainfall is received in less than 100 days in south west or North east monsoon seasons leading to drought condition in other seasons (IMD, 2018). Hence the above clusters were purposively selected. A total of 50 farmers was selected randomly from each chosen cluster by simple random sampling design to avoid bias. Out of 1280 farmers available in these clusters (SERI5K, 2018) a total number of 300 farmers were selected for the study. The selection of the farmers was done in coordination with the project co-investigators and officials of departments of sericulture of particular cluster. An interview schedule was designed based on the objectives of the study for data collection. Socioeconomic characteristics, farmer's perceptions, technological preferences of drought management technologies, mulberry cultivation and silkworm rearing details and their expectations were included in the schedule. The different perceptions of farmers on occurrence of drought were studied to find out their views and observation on the crisis. Data from the identified sample of 300 sericulture farmers were collected to define the farmers' perceptions on drought. The observations collected from the farmers were compiled on ten different major aspects.

The drought management technologies released by various research institutions were compiled under the different titles such as mulberry plantation in drought prone areas, soil moisture management technologies, *in-situ* rainwater harvesting and conservation methods for mulberry plantations and management of pruning schedule In silk

worm rearing, rearing of temperature tolerant silkworm hybrids, rearing practices, planning of silkworm rearing schedule, maintenance of rearing shed, silkworm egg transportation, young age silkworm rearing, late age rearing and shoot harvesting & preservation technologies were selected for studying the technology preferences. . The schedule was pre-tested and necessary modifications were made. Data were collected through personal interviews of the sericulture farmers, compiled and analysed using statistical tools. Preferences and expectations of farmers from research and extension personnel to overcome the crisis were collected by personal interviews, compiled and enlisted.

FINDINGS AND DISCUSSION

Socio-economic Profile of Sericulture Farmers

In order to know the background of the sericulture farmers in the area the socio-economic characteristics of the sericulture farmers were surveyed. Ten socio-economic variables were selected for the study and analysed which showed that the mean age of the farmers surveyed were 46, 56 and 45 years in Tamil Nadu , Karnataka and Andhra Pradesh respectively and most of the farmers were middle aged (35-55 years). The highest proportion of the respondents, were educated up to high school in all the clusters. The mean experience of the sericulture farmers was 10 years in Tamil Nadu, 13.6 years in Karnataka and 20 years in Andhra Pradesh. The mean land holding of the respondents were 2.47 ha, 1.71ha and 2.74 ha respectively in three state clusters and the mean mulberry land holding was 0.92 ha, 0.51 ha and 0.66 ha respectively. Water availability is insufficient for 84 per cent of the respondents for their sericultural activities in Tamil Nadu, 62 per cent in Karnataka and 74 per cent in Andhra Pradesh.

The farmers in the study area practiced 5 to 12 silkworm rearings per annum. The average number of disease free silkworm layings (DFLs) reared by a farmer is recorded as 1697 ± 320/hectare in Tamil Nadu, 1983± 772 in Karnataka and 1797±785 in Andhra Pradesh. The rearing capacity of the farmers ranged between150 to 250 Disease Free Layings(dfls) per batch. The average silk cocoon yield of the farmers is 78.23 kg per 100 dfls in Tamil Nadu, 74.86kg in Karnataka and 76.64kg in Andhra Pradesh clusters which was above the national average (Note on Sericulture,2020). The average gross returns received by a farmer per hectare from silkworm rearing is Rs.4,10,216/- in Tamil Nadu, Rs 4,45,473/- in Karnataka and Rs 4,13,185/- from Andhra Pradesh.

Farmers' Perceptions on Drought

The study was conducted at the sericulture clusters located in Semi-Arid Zone of South India where the recurrence of drought is a common phenomenon. The average rainfall of the study area ranged from 550 mm to 750 mm. The mean maximum temperature and minimum temperature prevailed in these areas during drought period is 40°C and 19°C respectively. Drought was a major constraint for leaf production in mulberry and in turn silk cocoon production among 84 per cent of total

farmers surveyed. The drought perceptions described by farmers are given in Figure.1. In the study 84 per cent of the farmers reported the existence of water shortage during drought period which affected their irrigations schedules and cocoon production. This is in conformity with the studies of Benjamin et al., (1997). 72 per cent of the farmers reported about the dry and desiccating winds in their mulberry gardens which affected the quality and quantity of leaf production. 55 per cent of farmers suffered from drying of leaves in the shed which led to low silk cocoon yields and 58 per cent suffered from disease outbreak in silk worm rearing which caused partial or complete crop failures. 71 per cent of the rearing is affected by spinning of small sized silk cocoons, 41 per cent of farmers experienced higher melting of silk cocoons and 68 per cent of farmers informed that the cocoons formed with lower silk ratio which led to low price in the market. This is in conformity with reports of Rajaram et al., (2006) where they reported decline in mulberry area, quantity of dfls brushed and cocoon production, respectively and reduction in annual sericulture returns per acre in drought hit areas.

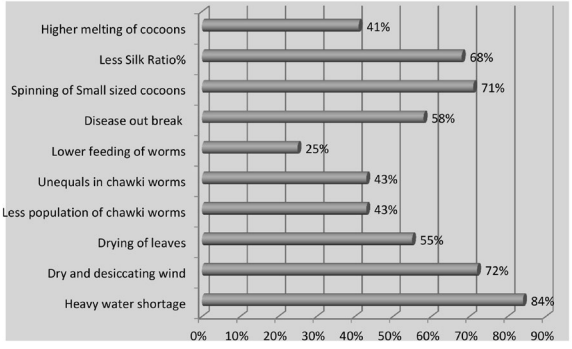

Figure. 1 Drought Perception of the Farmers

Technological Preferences

While studying the technological preferences, farmers gave more importance to technologies which gave immediate results like harvesting and preservation of mulberry leaves in cooler hours of the day, providing required aeration for silkworms in the rearing, increased frequency of feeding and maintaining micro climate in the rearing sheds for better growth of silkworms. Farmers also preferred micro-irrigation techniques to manage water shortage, managed pruning schedule to avoid peak summer and planted drought tolerant mulberry varieties to with stand dry environment.

In the mulberry garden, drought management technologies such as impounding rainwater in the garden, summer ploughing, green manuring /green leaf manuring to increase the moisture holding capacity, trenching & mulching, sub-soiling to break hard pan, formation of run off collection pits/ farm ponds, opening trenches in the garden and bore well recharging were less preferred by the farmers. In silk worm rearing drought management technologies such as early brushing of silkworm layings in summer season, providing false ceiling in silkworm rearing shed, Covering the roof of the shed to prevent direct sunlight, covering the rearing bed to prevent drying of leaves, providing drip line on the roof of shed to bring cool atmosphere in the shed, rearing new hybrid suitable for drought and painting roof of rearing shed with cool guard / lime solution to bring down temperature during summer were less preferred by the farmers.

Table 1
Technological Preferences by the Farmers

Sl. No	Technologies	Preference (%)
1	Harvesting shoots during cooler hours of the day	100
2	Feeding Chawki& moult resuming worms with shoots from irrigated garden	100
3	Preserving shoots in upright position	100
4	Sprinkling water & cover shoots with wet cloth	100
5	Avoiding long transportation of shoots	100
6	Providing required aeration in shed	98
7	Drip irrigation/Micro Irrigation Technique	92
8	Increase frequency of feeding if required	92
9	Hanging wet curtains to windows and doors of shed	86
10	Sprinkle clean water on the floor and walls	76
11	Management of pruning schedule	70
12	Plantation of Drought resistant host plant varieties	50
13	Raising trees around rearing house	46
14	Impounding rainwater in the garden	28
15	Summer ploughing	26
16	Early brushing in summer season	24
17	Providing false ceiling in rearing shed	22
18	Green manuring /green leaf manuring	20
19	Covering the roof of the shed	18
20	Trenching & mulching	16
21	Hanging filled earthen pots inside shed	16
22	Covering the rearing bed	14
23	Sub-soiling	10
24	Run off collection pits/ farm ponds	8
25	Providing drip line on the roof of shed	6
26	Awareness rearing new hybrid suitable for drought	6
27	Opening trenches	4
28	Bore well recharging	2
29	Painting roof with cool guard / lime solution	2
30	Planting across the slope	0

Yadav et al. (2012) recommended that the full adoption of crop production technologies is very important in achieving the desired level of productivity in dry land crops. Hence the farmers should be educated and trained well through various extension methodologies to adopt full package of recommended drought management technologies.

Preferences and Expectations of Farmers from Research and Extension Personnel

"Give us water we will follow all technologies" was the voice of the farmers in all three states. Preferences and expectations of farmers from research and extension personnel to overcome the crisis were collected by personal interviews, compiled and enlisted in Table 2. In mulberry, the high yielding varieties require more irrigations and do not perform well during drought seasons hence 75 per cent of farmers expected to develop drought resistant high yielding mulberry varieties. Moreover availability of cutting or saplings of newly released resource constraint mulberry varieties is meagre, hence farmers expected to increase the availability by mass multiplication programmes. Due to non-availability of labourers 80 per cent of the farmers needed low cost implements to adopt soil moisture conservation techniques. Majority of farmers expected financial assistance to adopt higher cost technologies such as digging borewell, to buy machineries etc., 52 percent of the respondents suggested that the extension personnel should encourage the voluntary organizations for the construction of farm ponds and water harvesting structures by involving farmers groups. Few respondents also suggested that the scientists as well as extension personnel should conduct field visits to monitor the mulberry cultivation & silk worm rearing and give need based suggestions especially during the drought.

Table 2
Preferences and Expectations of Farmers from Research and Extension Personnel

Sl.No	Preferences / Expectations	Percentage (%)
1	Develop high yielding mulberry varieties that could tolerate drought	**75**
2	Increase the availability of saplings of newly released varieties	**70**
3	Appropriate and accurate forecasting / forewarning techniques	**25**
4	Techniques to increase the water use efficiency	**71**
5	Develop low cost inter cultivation implements suitable for mulberry plantations, deep ploughing, trenching & mulching and green manure mulching	**80**

Sl.No	Preferences / Expectations	Percentage (%)
6	Voluntary organizations to take initiatives to construct farm ponds and water harvesting structures	**52**
7	CRCs should be motivated to brush drought tolerant hybrids	**71**
8	Monitor CRCs to distribute healthy worms during summer	**72**
9	Timely visits of the scientists/extension workers for rendering timely advisory especially during summer	**25**
10	Financial assistance to dig or deepen openwell or borewell	**80**
11	Financial assistance for trenching and mulching	**25**
12	Financial assistance for borewell recharging	**10**
13	Financial assistance for cooling system for rearing sheds	**55**
14	Formulation of contingency plans well in advance to cope with the crisis and creating awareness among farmers	**10**
15	Awareness and guidance on relief programmes	**36**
16	Timely financial support from the Government bodies to face the crisis & the losses	**10**
17	Utilizing mass media for dissemination of ameliorative measures to save the crop	**38**

Implications on Mulberry Cultivation & Rearing of Silkworm

The knowledge of farmers' perceptions on drought and coping strategies provided an access point for improving farmers' productivity during drought period. Farmers adopting drought mitigation technologies recorded 22 per cent improvement in mulberry leaf yield, 7.6 per cent lower occurrence of silkworm diseases, 5.05 per cent improvement in cocoon yield and 4.61per cent better quality silk cocoons(Figure.2). This is in conformity with the reports of Manjula and Vijayakumari (2017). Hence the farmers especially from sericulture clusters should follow drought management technologies to manage drought.

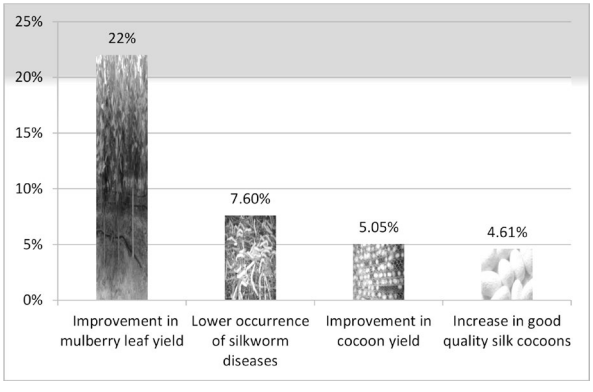

Figure. 2 Implications on Leaf Production & Rearing of Silkworm

CONCLUSION

Prevalence of drought is unavoidable in sericultural clusters of South India. The study revealed that drought was a major constraint for leaf production in mulberry and in turn silk cocoon production. The drought perceptions described by farmers were acute water shortage, dry and desiccating wind, drying of leaves in the shed, disease outbreak, spinning of small size cocoons, higher melting of cocoons and lower Silk Ratio. This affected the production and productivity of mulberry cultivation and silkworm rearing. Hence the farmers to a certain extent especially from drought affected areas followed drought management technologies to cope up drought. While studying the technological preferences, majority of farmers gave more importance to only few technologies which gave immediate effect on production and gave less importance to others which was beneficial in long term. Farmers who adopted drought mitigation technologies recorded improvement in mulberry leaf yield, lower occurrence of silkworm diseases, improvement in cocoon yield and produced better quality silk cocoons on comparing to others. The knowledge of farmers' perceptions on drought and coping strategies provided an entry point for improving farmers' productivity during drought period. The perception and adoption of integrated drought management technologies will help the farmers to mitigate the crisis of drought in their fields and help to produce good quality cocoons in drought period also. . Even though farmers have good perceptions about drought, the preferences of integrated drought management technologies were selective. Some important technologies were not preferred. From the expectations listed by the farmers it is understood that farmers require some technological and financial support to practise all the technologies to mitigate the drought. The findings of the study indicate that the farmers should be continuously motivated to improve the perception and technological preferences to increase the adoption of the integrated drought management technologies besides fulfilling the technological and financial expectations

REFERENCES

Benjamin, K. V, Nizamuddin, S. Sabitha, M. G. & Ghosh, A. (1997) Mulberry cultivation technique under water stress condition. *Indian Silk*., *36(3),* 12-18

IMD. (2018). Drought Monitoring. Retrieved from http://www.imdagrimet.gov.in/fap

Mahimasanthi, A. Rajaram, S. Daniel, A. G. K. Vidunmala, M. Vedavyasa, K. Morrison, M. N & Sivaprasad, V. (2018) Bridging of gaps in adoption of drought management technologies in mulberry cultivation in drought prone areas of South India. *Sericologia 58*(1), 55-63

Manjula, M & Vijaya Kumari, N. (2017) Effect of Drought on the Growth and Development of Mulberry. *International Journal of Applied Agricultural Research,12(3),* 339-355

Note on Sericulture (2020) Retrieved from http://www.csb.gov.in/

Rajaram S, Benchamin K. V & Qadri S. M. H (2006) Impact of drought on sericulture. *Indian Silk, 45 (8),* 10-12

SERI5K (2018) Retrieved from www.seri5k.csb.gov.in

Yadav,V.P.S, Yadav,S.K, Singh, B.K & Sharma K.(2012) An Analysis of Factors Associated with Productivity of Dryland Crops in Haryana. *Indian Journal of Extension Education 48* (3), 30-33