Adoption of Drought mitigation strategies in irrigated cropping system of Madurai district

Abstract

In drought situation, farmers in Irrigated ecosystem often faced financial losses due to uncertainty of occurrence of drought event. With the intention of minimizing impact of drought through application of science and technology, drought management plans are implemented by government. The outcome of government supported mitigation strategies was studied. The result revealed that only less number of farmer have adopted technological mitigation strategies on their own. Conducting demonstrations, trainings and supply of critical mitigation inputs through development departments must be continued to educate the farmers to adopt the mitigation measures.

Key words: Climate change, Drought mitigation and Adoption of technologies

Introduction

In India's approximately 16 per cent of geographical area is drought prone (IMD 2014). Drought is recurring phenomena in Madurai district of Tamil Nadu where the occurrence are happening 5 to 7 years in a decade. Due to uncertainty of drought event, farmers in Irrigated ecosystem often faced losses in their investment in crop production. In Tamil Nadu, drought was viewed as a long- term development challenge and hence efforts were made to tackle the challenges through multi-sectorial and multi-dimensional efforts to overcome. Such efforts are mainly concentrated on the aspects like access to risk-reducing, productivity-enhancing technologies, diversification of livelihoods, better access to crop insurance and improved infrastructure for reducing vulnerability of poor farmers due to failure of monsoon. However, the outcome of such efforts was not known. Hence, this study was under taken to explore the Drought mitigation strategies adopted by the farmers in irrigation eco system.

Research Methodology

Four blocks of Madurai district of Tamil Nadu namely Allanganullur, Vadipatti, Chellampatti and Melur were purposively chosen because of prevalence of irrigated area.

Explorative research and ex-post-facto design was followed. The study was carried through semi - structured interview schedule among 100 randomly selected samples of 25 respondents per block. Information on agronomical mitigation coping strategies and technological mitigation strategies was collected tabulated and analyzed. To calculate the extent of adoption of mitigation measures of individual farmers, mitigation index was used through the formula given below. Mean and standard deviation was employed to categories the respondents as low (below 20 score), medium (between 20 to 32 score) and high (above 32 score).

$$\text{Mitigation index} = \frac{\text{No. of measures adopted by the farmers}}{\text{Total number of measures recommended}} \times 100$$

Further, the relationship between selected independent variables (socio-economic characteristics) and dependent variable (mitigation index) were studied through correlation and regression analysis.

Results and Discussion

Agronomical mitigation coping strategies

The agronomical mitigation strategies comprised of changing the cropping pattern, changing the cropping system on cultural aspect and on the number of crops cultivated in a year, and changing the method of irrigation.

Table.1. .Distribution of Respondents According to Change in Cropping Pattern (n=100)

S. No	Category	Number of respondents
1.	Seasonal crop to perennial crop	8.00
2.	Seasonal crop to Annual crop	5.00
3.	Annual crop to Seasonal crop	11.00
4.	Annual crop to perennial crop	4.00
5.	No change	72.00

Source: own survey data

Table 1 indicates that Notable proportion of the respondents have changed the cropping pattern to cope up with drought. The major shifts observed were from annual crops to seasonal

crops (11 per cent) and from Seasonal crops to Perennial crops (8 per cent). Minor shifts from seasonal crops to annual crops and from annual crops to perennial crops. Though around three fourth of the respondents did not change the cropping pattern as a coping strategy, they had preferred cultivating less water consuming crops like tapioca and tuberose to sugarcane, banana and turmeric.

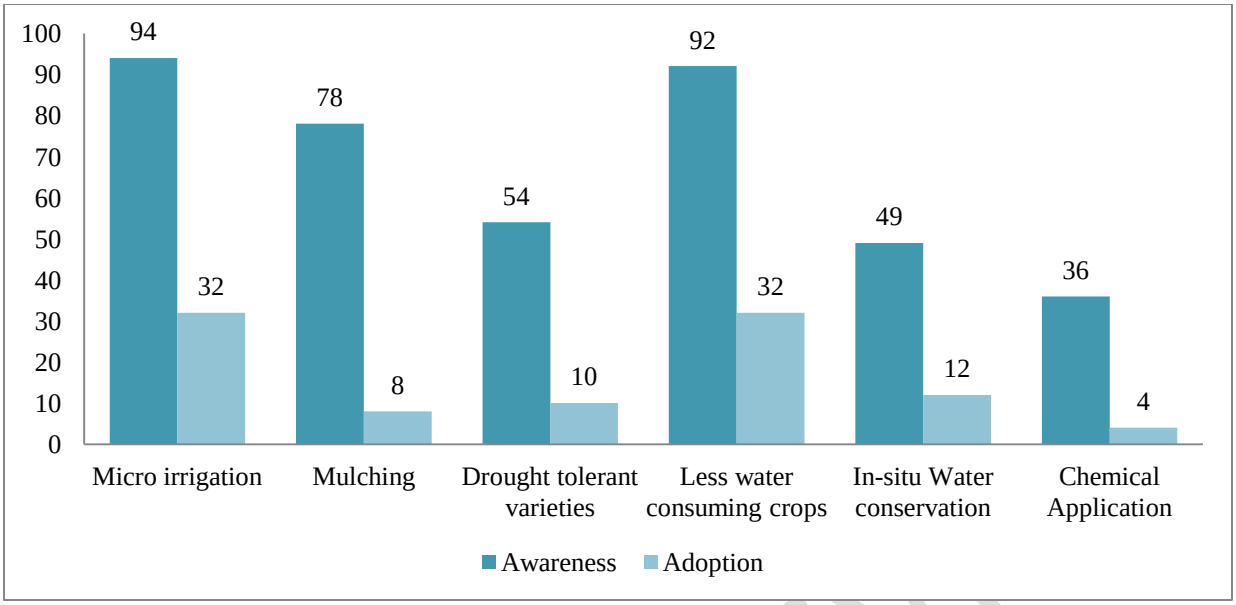
Table.2. .Distribution of Respondents According to Changes in Cultivation aspects (n=100)

S.No	Category	5 years before	At Present
1.	Mono cropping	57.00	88.00
2.	Double cropping	43.00	12.00
3.	Pure cropping	82.00	91.00
4.	Intercropping	18.00	9.00
5.	Flood irrigation	90.00	68.00
6.	Drip irrigation	10.00	32.00

Source: own survey data

Table 2 indicates that 31 percent of the respondents have shifted their cropping system from double cropping to mono cropping. Further it was found that both in the past and the present, the eminence of Pure cropping is observed over intercropping. There has been a gradual shift from the conventional flood irrigation method to Drip irrigation. This change can be attributed to the PMKSY (Pradan Mandri Krishi Sinchayee Yojana) programme.

Fig 1.Extent of Awareness and adoption of Technological Drought mitigation strategies



The technological mitigation strategies are proven scientific technologies recommended by Tamil Nadu Agricultural University. Figure 1 portrays that almost all of the technologies are known to considerable proportion of the respondents but the adoption of even most popular technologies is low. The higher awareness of certain technologies like Micro irrigation, selection of drought tolerant varieties and mulching to reduce moisture loss, these technologies can be associated with the Intensive extension strategies in promotion of such technologies under various programmes like NATP (National Agricultural Technology Project), NHM (National Horticulture Mission), NMSA (National Mission on Sustainable Agriculture). Application of anti-transpirant chemicals, Foliar Spray of Pink Pigmented Facultative Metholotrophs (PPFM), spraying crop boosters are the technologies promoted by KVK in limited scale through their On Farm Testing (OFT) and hence awareness is found to be low.

One third of farmers have adopted the drought mitigation techniques like less water consuming crops and drip / sprinkler method of irrigation. Though most of respondents aware of the technologies like drip / sprinkler method of irrigation, mulching and selection of drought tolerant varieties and application of anti-transpirent chemicals sprays but only few have adopted. The higher level of technological adoption gap is observed in formation of farm pond or other rain water harvesting structures among the already realized farmers. As the initial investment for establishment of rain water harvesting structures was found to be higher and fear of losing available cultivable area might be the reasons for the less adoption.

After derived the individuals' mitigation score through mitigation index, the respondents were classified in to three categories viz; low, medium and high as given in the table 3.

Table: 3.Distribution of Respondents According to their Mitigation score

Sl.No	**Adoption of Mitigation measures** (based on mitigation score)	**No. of Respondents**
1.	High (From 45 to upto 32 score)	17
2.	Medium(Below 32 to upto 20 score)	64
3.	Low (Below 20 score)	19

Source: own survey data

From the scores in the table 3, it can be understood that the mitigation measures followed by the farmers are very low as the high category itself secured the score between 32 to 45.More over, less than 20 percent of respondents alone found under that category. Further, another 20 percent of respondents were found with the mitigation score below 20. Majority of them were found under medium category between the mitigation score of 20 to 32.

Table: 4. Association and contribution of Independent Variables with Mitigation index

Variable	**Independent variables**	**'r'**	**Regression co-efficient**	**'P'**	**'t' value**
X1	Age	-0.056 ^{NS}	0.057 ^{NS}	0.302	-1.038
X2	Educational status	0.226*	0.029*	0.016	2.789
X3	Farm size	-0.040 ^{NS}	0.147 ^{NS}	0.314	-1.013
X4	Farming experience	0.016 ^{NS}	0.026 ^{NS}	0.235	1.195
X5	Occupational status	-0.031 ^{NS}	0.049 ^{NS}	0.687	-0.404
X6	Annual income	0.181 ^{NS}	0.144 ^{NS}	0.455	0.751
X7	Social participation	0.067 ^{NS}	0.026 ^{NS}	0.542	-0.613
X8	Information seeking	0.810**	0.051**	0.000	6.629
X9	Innovativeness	0.085 ^{NS}	0.004 ^{NS}	0.828	-0.219
X10	Access to weather forecasts	0.166 ^{NS}	0.076 ^{NS}	0.206	1.273
X11	Decision making behaviour	-0.145 ^{NS}	0.073 ^{NS}	0.606	-0.517
X12	Perception of farmers towards effects of drought	0.734**	0.067**	0.000	3.834

R^2 value =0.745, F value = 21.214**, NS – Non- Significant.

** - Significant at one per cent level, * - Significant at five per cent level

It is observed from the table that out of twelve variables, three variables found to be

positively associated with mitigation index. The variables namely information seeking behaviour (X_8) and perception of farmers towards effect of drought (X_{12}) are positively associated with one per cent level of probability. Education status found to be positively associated with level of mitigation at five per cent level of probability.

It could be seen that co-efficient of multiple regression viz, R^2 value 0.745, which meant that 74.50 per cent of the variation in the dependent variable is explained by the independent variables chosen for the study. The partial regression co-efficient value found to be positive and significant for the variable namely information seeking behaviour (X_8) and perception of farmers towards drought(X_{12}) at one per cent level of probability and the educational status at five per cent level of probability. The results indicate that a unit increase in educational status(X_2), information behaviour (X_8) and perception towards effect of drought (X_{12}) would increase the adoption of mitigation strategies by 0.029, 0.051and 0.067 units respectively.

The findings derive support from Sanjeevi (2019) who revealed that both educational status and information seeking behaviour had a positive and significant relationship with the adaptation behaviour of farmers on climate change. Increased educational level would have led them to seek more information about mitigation strategies that increased knowledge level. While there was high information flow from various institutional, non institutional and mass media sources, that would increased their knowledge level which ultimately increased the level of adoption of mitigation strategies of the respondents.

Conclusion

Mostly the technological mitigation strategies promoted by the extension agents were adopted by beneficiaries of government programmes. Only less number of farmer have adopted technology on their own. This is happening because most of the farmers are having less scientific knowledge about the recent innovation added with financial constraints. This can be overcome if the State Department of Agriculture and Horticulture collaboration with Agricultural University and KVK (Krishi Vigyan Kendra) conduct demonstration training and supply farm inputs like drought resistant crops seed materials, chemical sprays at subsidy rate to small and marginal farmers at least during drought prone seasons.

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