# An Explorative Study on Drought Mitigation Strategies Followed By Farmers in Madurai District

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*Abstract* — Madurai district in the state of Tamil Nadu used to face frequent drought due to failure of rainfall and less rainy days in monsoon. A notable mention about the severity of drought that occurred during the year of 2019, where Madurai is one among the 24 districts in Tamil Nadu which is declared as drought affected by the State government of Tamil Nadu and hence, adoption of mitigation strategies such as altering the cropping pattern, cropping system, cropping intensity and irrigation pattern etc., has to be followed by the farmers to get away from income loss. To explore the changes, this study was conducted among 40 farmers chosen from 3 different blocks such as Melur, Alanganallur and Chellampatti to know the impact of agricultural drought in the district. The results were found using percentage analysis and it revealed that about 20 per cent of respondents shifted from seasonal crops to annual crops and from double cropping to mono cropping during drought year. It was also observed that drip irrigation (60%) is gaining momentum in recent years due to prevalence of drought. The awareness level on technological mitigation strategies was high related to preserving dry fodder for livestock (100%), drip/sprinkler method of irrigation (100%), moving to less water consuming crops (100%), changing of planting dates (97.50%) and mulching (97.50%). The extent of awareness and availing benefits from the government schemes and policies related to mitigation of drought such as waiving of crop loan in cooperatives, Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) and Pradhan Mantri Fasal Bima Yojana (PMFBY) was found to be higher among farmers.

***Keywords:*** Drought, Drought mitigation strategies, Drought in Madurai

## I. INTRODUCTION

Agriculture is extremely vulnerable to climate change and drought is an inevitable phenomenon in the southern peninsula of India due to absence of Perennial River, fluctuations of rainfall, prolonged summer period, etc. *As per Census (2011)*, nearly 119 million farmers and another 144 million landless laborers are engaged in agriculture. The impacts of drought on agriculture will be severely felt in the country. India had faced 26 major droughts from 1870 to 2018, affecting Agriculture and water resources across the country. Tamil Nadu is facing worst drought due to uncertainty and failure of monsoon showers for the last few years. The state government declared the state as drought hit in 2012-2013, 2016-17as per guidance from central committee (*Tamil Nadu State Action Plan for Climate Change*, 2017). As per *Government of Tamil Nadu Gazette Revenue notification* on 18th January 2017, in the year 2016 the State has received only 168.3 mm which was 62 per cent less than normal. The rainfall deficit in the 32 districts ranges from 35 to 81 per cent. The order also revealed that, of the 16,682 revenue villages in the State, 13,305 revenue villages have been affected by drought and 87 per cent of the crops cultivated had been affected by drought. According to *Central Research Institute for Dry Land Agriculture (CRIDA) (2013)* and *Drought Management Plan (2017) of Govt. of India*, scientific intervention can minimize the impact of drought. The research system supported the farmers by evolving less water consuming crops /varieties and developing technologies like drip / sprinkler method of irrigation, mulching and application of anti- transparent chemicals sprays etc. To give relief to the farmers from the effect of drought, Government of India has promoted lot of interventions through schemes like *Pradhan Mantri Krishi Sinchayee Yojna, Watershed development programme, Pradhan Mantri Fasal Bima Yojana* and *Mahatma Gandhi National Rural Employment Generation Guarantee scheme* (MGNREGS). In this context, the Madurai district in the southern part of Tamil Nadu which was frequently affected by drought, where those mitigation technologies were promoted by the extension agencies for many decades was studied through the objective of extent of awareness and adoption of different mitigation strategies followed by the farmers during drought.

## II. METHODOLOGY

Madurai district was purposively selected for this study because of occurrence of drought in the past four years of the present decade. Since, this study is focused on mitigation strategies being adopted by the different farmers for drought, the expert opined that this study should cover both the major seasonal crops, major annual crops and major perennial crops cultivated in this district. Keeping these in mind, three blocks namely Alanganallur, Melur and Chellampatti were chosen out of 13 blocks of Madurai district. Farmers contact number was collected from the agriculture department and then farmers of the three blocks were pooled, from which forty numbers of farmers were selected randomly by simple random sampling method. As the research is explorative in nature, a semi-structured interview schedule was used for data collection. The data were collected from the respondents personally through a phone call since it is pandemic period (covid19. Data were tabulated in EXCEL sheet and simple percentage analysis was employed to derive the result.

## III. RESULTS AND DISCUSSION

### A. *Mitigation Strategies*

The coping mechanisms followed by the farmers to mitigate the drought through some proven scientific technologies recommended by the Tamil Nadu Agricultural University and popularized by the state department of agriculture and horticulture is themed as technological mitigation strategies. Farmers tend to overcome the drought by altering the crops, cropping system and irrigation pattern over a period of time. These aspects were studied under agronomical mitigation strategies and the results were presented in the following table.

| S.No | Mitigation Strategies | Level of awareness among Respondents | | Level of adoption among Respondents | |
|---|---|---|---|---|---|
| | | No | Percentage | No | Percentage |
| 1 | Drip/Sprinkler | 40 | 100 | 25 | 62.50 |
| 2 | Mulching | 39 | 97.50 | 12 | 30.00 |
| 3 | Shifted towards Drought tolerant crops | 40 | 100 | 10 | 25.00 |
| 4 | Changing of planting dates | 39 | 97.50 | 39 | 97.50 |
| 5 | Construction of water harvesting structures | 16 | 40.00 | 6 | 15.00 |
| 6 | PPFM and Crop boosters | 11 | 27.50 | 5 | 12.50 |
| 7 | Shift from seasonal crop to annual and perennial crop | 40 | 100 | 13 | 32.50 |
| 8 | Shift from double to mono cropping | 40 | 100 | 8 | 20.00 |
| 9 | Shifted to less cropping intensity | 40 | 100 | 8 | 20.00 |

Table 1: Extent of Awareness and adoption of Mitigation Strategies

From the above table, it is observed that all the respondents aware of most of the technological mitigation strategies such as, drip/sprinkler method of irrigation (100.00%), moving to less water consuming crops, mono cropping, skipping the cultivation in adverse season, changing of planting dates (97.50%) and mulching (97.5). Nearly half of the respondents were aware of selection of drought tolerant varieties (55.00%) and formation of farm pond or other rain water harvesting structures (80.00%). However, awareness on technological mitigation strategies such as, Foliar Spray of Pink Pigmented Facultative Metholotrophs (PPFM), crop boosters (27.50%) and anti-transpirant chemicals are found to be low as these technologies were promoted by KVK (Krishi Vigyan Kendra) in limited scale through field demonstrations. (Annual report of KVK Madurai -2021).

Due to intensive extension strategies being promoted through various programmes like NATP (National Agricultural Technology Project), NHM (National Horticulture Mission), NMSA (National Mission on Sustainable Agriculture), Precision farming etc., the awareness level on drip/sprinkler method of irrigation, selection of drought tolerant varieties and mulching to reduce moisture loss, were found to be higher. Though formation of farm pond was promoted by the state agricultural department for the last one decade, such establishments did not enhance the awareness among farmers.

From the table it can be observed that, most of the farmers have adopted the drought mitigation techniques like changing the planting dates according to availability of moisture (97.50%) followed by drip/ sprinkler method (62.50%) of irrigation and mulching (30.0%). 32.50% of respondents shifted from water consuming seasonal crops like paddy, vegetables, annual crops like sugarcane and banana to drought tolerant seasonal crop like maize annual crop like tapioca or perennial crops like casuarinas, amla etc. As the initial investment for establishment of rainwater harvesting structures was found to be higher and fear of losing available cultivable area, the wider adoption gap was observed. The results are in line with the study of Philip (2022) and Paramasivam (2021). The technological mitigation strategies such as application of anti-transpirant chemicals, Foliar Spray of Pink Pigmented Facultative Metholotrophs (PPFM), spraying crop boosters promoted by the extension agents were adopted by half (12.50%) of the realized farmers. This happened because the farmers who have not adopted perceived that purchasing and applying of these critical inputs are costly.

With regard to change in cropping pattern nearly one third of farmers changed from seasonal crop to annual and perennial crops and one fifth of them have shifted from double cropping in normal period to mono cropping during drought period which resulted in less cropping intensity. Normal period is observed when the water is released from the Mullai periyar.

Since most of the farmers are having less scientific knowledge about the recent innovation added with financial constraints the adoption gap was found to be high. This can be overcomed 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 to mitigate it.

### *B. Administrative Mitigation Strategies*

To compensate the crop failures due to severe drought, government have initiated certain mitigation strategies which is listed out as schemes and policies. Extent of Awareness and availing of benefits from such programmers are present in below table.

| S.No | Schemes | Extent of awareness | | Extent of availing benefits | |
|---|---|---|---|---|---|
| | | No | Percentage | No | Percentage |
| 1 | Crop loan from cooperative credit societies | 40 | 100 | 33 | 82.5 |
| 2 | Kisan credit card | 34 | 85 | 25 | 62.5 |
| 3 | Drought relief fund | 39 | 97.5 | 22 | 55 |
| 4 | PMFBY | 29 | 72.5 | 19 | 47.5 |
| 5 | PMKSY | 25 | 62.5 | 7 | 17.5 |

Table 2: Extent of Awareness and availing of benefits from Schemes related to Drought Mitigation Strategies

In recent years the credit institutions and the extension agencies of development departments were promoting the schemes and policies related to drought mitigation in the villages, more than 60 percent of them were well aware of them and more than half have availed benefits from the state sponsored schemes. Crop loan from the primary cooperative credit societies is one of the major avenues in which most of the farmers (82.50%) get benefit followed by Kisan Credit Card scheme (62.50 %) and drought relief fund (55.00%) respectively. Since, the Regional Rural Banks (RRB) and Primary Agricultural Co-operative Societies (PACS) are at the foot step of the farmers, they could able to avail benefits easily. Through the centrally sponsored schemes like PMFBY and PMKSY, 47.5 percent and 17.5 percent of respondents availed benefits respectively.

To get insurance for crop losses that is caused due to drought, farmers has to wait for more than a year to get the insurance amount since the whole process is time consuming. Hence, it is the reason that half of respondents alone stated that they availed benefit from PMFBY schemes. The main reason behind the failure of PMKSY which promote micro irrigation is that this is theoretically well structured but in practice farmers are finding difficulties in observing the stipulated formalities like filling the form and producing required land related documents like encumbrance certificate, Patta, Chitta, Adangal.

## IV. Suggestions to Overcome the Constraints Expressed by the Farmers

Majority of respondents (87.5%) suggested that proper guidance for filling the forms and adherence of procedures should be given to farmers regarding state and centrally sponsored schemes and polices and complex procedure of the scheme should be simplified followed by 72.5 percent of respondents suggested, relief measures may be offered through promotion of agricultural allied sector like back yard poultry farming, employment through MGNREGA work for 150 days.

Nearly two-third (67.5%) of the respondents expressed that seed material of less duration crops like sesame, pulses and coriander and drought tolerant crop like cassava during drought. Half of respondents (50%) suggests Vocational training related to improved agronomical and technological mitigation strategies should be provided by agricultural departments.

52.5 percent of respondents suggested that, providing sufficient water during cropping season through canals and rivers will be useful. 45 percent of respondents who had stated that faster and necessary arrangements should be taken to provide compensation / insurance for crop loss during drought and 37.5 percent of respondents suggested, timely availability of farm inputs like pro tray raised seedlings at subsidy rate should be provided ahead of the commencement of monsoon. The results are in line with the study of Palanisami (2019).

## V. Conclusion

There is a need to expose the farmers to new agricultural technologies, and motivate them to adopt the new technologies by organizing group discussions and meetings which would boost their crop income. Intensive training programs need to be conducted by government and non-government agencies for awareness about available opportunities, decision making, innovations, participation in implementation of government schemes, time and financial management, which would enable for efficient utilization of their potentials followed by vigorous follow up, guidance, counseling for sustainable use of resources. As financial constraints like lack of investment, low income due to crop loss is more. The government can intervene and can give subsidy when farmers have crop loss and provide employment opportunities during lean season. Availability of materials is one of the major reason for non-adoption. Hence it should be made available at the extension office or at private shops at a reasonable price.

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