

A study on changes in agronomic practices of farmers to overcome drought situations in Namakkal district of Tamilnadu state

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Abstract

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, 2016-17 as per guidance from central committee (Tamil Nadu State Action Plan for Climate Change, 2017). Therefore, the study was conducted in Namakkal district of Tamil Nadu state, with the objective to identify and document the changes in the agronomic practices that are currently adopted by farmers in the study area to overcome the adverse effects of drought. Simple random sampling method was used in selection of 100 farmers each 50 belongs to annual and seasonal crops respectively. The findings revealed among various changes in agronomic practices at farm level to cope up with drought situations, About 30 per cent of respondents, there is a change from a seasonal crop to another seasonal crop. In the annual crop growers, all of them are monocrop cultivators at present. Eminence of pure cropping method is observed both in past and present. At present, nearly two third (62.00%) of the respondents are having bore well followed by open well (38.00%) as there is no release of water through canal in recent years. But at present due to reduction in the water level 40 per cent of respondents were moved to drip method of irrigation from flood type. Because now a day's installation of drip system in farmers field became easy as government provide subsidy to small and marginal farmers under PMKSY programme. Among the seasonal crops growers due to drought, reduction in intercropping method of cropping system is being observed. However, most of the farmers who possessed with open well stick on to the same source by deepening it or by drill the bore in it. Only 16 per cent of respondents solely depend on rain for cultivation. During dry season they kept the land as fallow.

Keywords: Change, Cropping pattern, System, Irrigation Methods and Source

Introduction

Drought can be referred as a normal recurring feature of earth's climate, it has a peculiar slow onset and disastrous, long lasting impacts; it affects more people than any other form of natural disaster. It is characterized in terms of spatial extension, intensity and duration (*Manual for Drought Management; Govt. of India, 2009*).

According to the *National Remote Sensing Centre (NRSC) (2008)*, about two thirds of the geographic area of India receives low rainfall (less than 1000 mm), which is also characterized by uneven and erratic distributions. Out of net sown area of 140 million hectares, about 68 per cent is reported to be vulnerable to drought conditions and about (50.00%)

of such vulnerable area is classified as 'severe', where frequency of drought is almost regular. During 2016-17, *The Integrated Drought Severity Index (IDSI)* for Tamil Nadu was assessed at district level. It can be noted that districts of Salem, Namakkal, Tirucherapalli, Ramanathapuram, Karur and Thoothukudi is under severe to extreme drought category; and Dindigul, Thiruvavur Southern parts of Erode and eastern parts of Cuddalore show moderate drought condition. A total area of close to 35 lakh hectare has suffered from extreme to moderate drought condition, and this accounts for up to 27 per cent of the total area of Tamil Nadu.

Therefore, in order to assess the effect of drought and its mitigation strategies the present study entitled as “An Explorative study of mitigation strategies followed by farmers to overcome drought situations in Namakkal district” which aims to find out the frequency and intensity of drought occurrence in the district through secondary data collection and documenting the coping strategies that are currently adopted and recommended to the farmers to overcome drought situations in different agro ecosystem through field investigation. with one of the objective to identify and document the changes in agronomic practices followed by farmers to overcome the adverse effects of drought.

Recent researchers have aimed at documenting the different agronomic based coping strategies followed by farmers to overcome drought situations. Kattumuri *et al.*, (2015) found that various adaptation strategies among farmers in the past five years, farmers in the village had been increasingly reliant on irrigation sources to overcome variations in rainfall patterns and the farmers had changed their crops to less water consuming crops like horse gram, pulses as main adaptation strategy followed during drought was 57 per cent and 78 per cent of the respondents reported that leaving a part of their land as fallow. Tripathi (2016) suggested that farmers are aware of changes in climatic variables, especially increasing temperature and changing seasonal pattern, and their impacts such as declining crop yield, increasing cost of cultivation. For that they are mostly involved in adaption practices like such as changing sowing and harvesting timing, cultivation of crops of short maturity period, inter-cropping, changing cropping pattern, investment in irrigation, agro-forestry etc. So, it may be concluded that farmers are implicitly taking initiatives to adapt climate change. Palanisami and Kumar (2017) found that Out of the 120 farmers surveyed, 67 per cent reported that they invested in drilling additional bore wells followed by adoption of drip irrigation to conserve water. 20 per cent followed the traditional flood irrigation method but reducing the quantum of water they normally used to irrigate; about 10 per cent of farmers fallowed the fields as the wells dried up and rest of the farmers adopted organic farming along with drip and mulching. Some farmers were forced to cut down 15 to 20% of the existing (old) coconut trees in order to adjust water use among the productive trees. Regarding the cropping pattern, of the total sample,

60% cultivate perennial and annual crops (such as arecanut, coconut, grapes, sugarcane, banana etc.) while the rest grow mostly seasonal crops like vegetables, onion and maize.

Methodology

Namakkal District of Tamil Nadu was purposively selected for this study, as it received normal rainfall only 2 years out of the past five years (Rainfall data 2017, JDA office Namakkal). Since this study is focused on coping up strategies being adopted by the different farmers, the experts opined that this study should cover both the seasonal crops and annual crops cultivated in this district. Keeping these in mind, two blocks namely Kabilarmalai block and Vennandur block out of 15 blocks of Namakkal district was chosen for major area of annual crops (namely Sugarcane and Tapioca) and Seasonal crops (Maize and Groundnut) respectively. Villages were chosen based on major area under cultivation and the respondents were chosen randomly to constitute the sample size of 100 from five villages. Data was collected through semi-structured interview schedule during Feb- March 2018.

Changes in Agronomical Practices followed by farmers

Farmers tend to overcome the drought through their change in cropping pattern, changing to different cropping system, change in source of irrigation and its pattern over a period of time. These aspects were considered as agronomical mitigation strategies and those changes were measured as given below.

1. Change in Cropping Pattern

Cropping system is defined as the yearly sequence and spatial arrangement of crops on a given area. Cropping pattern followed by farmers is determined mainly by rainfall, climate, temperature and soil type (Yellamanda Reddy, 1992). Due to the severity of drought, there must be change in cropping pattern, thus severity of drought noticed had been noted in the study area for 3 years in the past 5 years. The changes happened from the past 5 years to at present year was observed and such changes were noted as below,

S.No	Category	Score
1.	No change	1
2.	Seasonal crop to Seasonal crop	2
3.	Seasonal crop to Annual crop	3
4.	Annual crop to Seasonal crop	4
5.	Annual crop to Annual crop	5

2. Change in Cropping System

Cropping system is defined as the order in which the crops are cultivated on a piece of land over fixed period. Cropping system is the way in which different crops are grown, sometimes a number of crops are grown together or separately at short intervals in the same field (Reddy S.R. 1999). Due to the effects of drought, there is a change in cropping system followed before 5 years and at present which was recorded as follows,

S.No.	Category	Score
1.	Monocropping to Monocropping	1
2.	Double cropping to Mono cropping	2

S.No.	Category	Score
1.	Pure cropping to Pure cropping	1
2.	Pure cropping to Intercropping	2

3. Change in Source of Irrigation

It is referred to the irrigation sources used by the respondents for irrigating the crop. Due to the effects of drought, there is a change in irrigation source followed before 10 years and at present. The scoring procedure developed for this study as follows,

S.No	Category	Score
1.	Canal irrigation to Well irrigation	1
2.	Well irrigation to Rain fed	2

4. Change in Method of irrigation

It is referred as the way by which the respondents are applying water to the crop. Different methods are used to apply irrigation to crop depending upon land slope, amount of water, the crop and method of crop cultivation. The common methods of irrigation followed are flood, tube and micro irrigation (Yellamanda Reddy, 1992). Due to the effects of drought, there is a change in pattern of irrigation followed before 10 years and at present. The scoring procedure developed for this study as follows,

S.No	Category	Score
1.	Flood irrigation to Tube irrigation	1
2.	Tube irrigation to Micro irrigation	2
3.	Rain fed	3

Results and Discussion

Changes in Agronomical Strategies

Farmers tend to overcome the drought through their change in cropping pattern, changing to different cropping system, change in source and pattern of irrigation over a period of time. These aspects were considered as agronomical mitigation strategies and those changes were presented in the following tables.

1. Change in Cropping Pattern

Cropping pattern express the shares of different crops in the farmers total cultivated area in a year. It is an important indicator of farmers decision making ability. Due to scanty and high uncertainty of monsoon in the study area for last five years, there is wide range of shift in cropping pattern at present compare to 5 years before. Thus, depending upon the rainfall and water availability annual and seasonal crop growers had shifted their cropping pattern which is presented in Table 1.

Table 1: Distribution of the respondents according to Change in Cropping Pattern (Category wise)
(n=100)

S. No	Category	No. of respondents
1.	No change	10
2.	Seasonal crop to Seasonal crop	30
3.	Seasonal crop to Annual crop	21
4.	Annual crop to Seasonal crop	15
5.	Annual crop to Annual crop	24
	Total	100

The Table 1 gives a glimpse of change in cropping pattern observed among the respondents which was elaborated further in subsequent table.

About 30 per cent of respondents, there is a change from a seasonal crop to another seasonal crop followed by change from a annual crop (24.00 per cent) to another annual crop. In annual crop farmers prefer to go for less water consuming crops like tapioca over the sugarcane crop. In case of seasonal crop farmers shifted to maize instead of paddy (or) onion. A change from seasonal crop to annual crop observed among one fifth (21.00 %) of total respondents followed by another 15 per cent of respondents changed to seasonal crop from annual crop. Only 10 per cent of the respondents had stick on to the same cropping pattern for the last 5 years.

The further elaboration of change in cropping pattern from category wise to crop wise revealed that

five years before more than half (58.00%) of annual crop growers were cultivating sugarcane followed by paddy (26.00%) and maize (16.00%). But at present nearly one third (36.00%) of respondents are cultivating sugarcane and none of them was cultivating either paddy or maize. Further, More than half (52.00%) of them have shifted to tapioca (52.00%) followed by turmeric (12.00%) as these crops need less water than sugarcane and paddy (Table 2).

In case of seasonal crop growers at present majority (58.00%) of respondents are cultivating maize followed by groundnut (42.00%). But in early years these respondents cultivated tapioca (30.00%) followed by cotton (26.00%) and onion (22.00%). As the seasonal crops like groundnut and maize are short duration in nature that can come to harvest within three months period (Table 2). These crops are raised at the onset of South West Monsoon or subsequent North East Monsoon. The another reason for cultivating groundnut and maize may be that these crops could yield dry fodder which can be used during summer.

Table 2: Distribution of the respondents according to Change in Cropping Pattern (Crop wise) (n=100)

S. Category No.	At Present		5 years before	
	Number	Per cent	Number	Per cent
Annual Crop (n=50)				
1. Rice	-	0.00	13	26.00
2. Sugarcane	18	36.00	29	58.00
3. Maize	-	0.00	8	16.00
4. Tapioca	26	52.00	-	0.00
5. Turmeric	6	12.00	-	0.00
Total	50	100.00	50	100.00
Seasonal Crops: (n=50)				
1. Cotton	-	0.00	13	26.00
2. Onion	-	0.00	11	22.00
3. Tapioca	-	0.00	15	30.00
4. Maize	29	58.00	11	22.00
5. Groundnut	21	42.00	-	-
Total	50	100.00	50	100.00

2. Change in Cropping System based on Number of Crops Cultivated per Year

A cropping system usually refers to a combination of crops cultivated in a particular time and space. Combination in time occurs when crops occupy different growing period and combinations in space occur when crops are inter planted. Mono cropping refers to growing of only one crop on a piece of land over a season after season. It may be due to

climatalogical, socio-economic conditions or specialization of a farmer in growing particular crop. Double cropping refers to growing two crops on the same piece of land in one calendar year (Yellamanda Reddy, 1992). The change that occurs at present in these cropping system compare to five years before due to drought was studied by collecting data pertaining to number of crops cultivated per year and the results were presented in Table 3.

Table 3: Distribution of the respondents according to their Change in Cropping System Based on Number of Crops Cultivated per Year (n=100)

S. Category No.	5 years before		At Present	
	Number	Per cent	Number	Per cent
Annual Crops: (n=50)				
1. Monocropping	29	58.00	50	100.00
2. Double cropping	21	42.00	-	-
Total	50	100.00	50	100.00
Seasonal Crops: (n=50)				
1. Monocropping	28	56.00	33	66.00
2. Double cropping	22	44.00	17	34.00
Total	50	100.00	50	100.00

From the Table 3 it is observed that, the combination of different crops grown within a same period got reduced. In the annual crop growers, all of them are monocrop cultivators at present. But in earlier days (5 years before) 42 per cent of them had raised two crops (paddy and maize) per annum. Among the seasonal crop growers, slight changes in cropping system have occurred. Five years before 58 per cent of respondents were practicing monocropping but at present it got increased to 68 per cent and the practice of double cropping have decreased from 44 per cent to 34 per cent. The dominance of monocropping may be due to the reason that in both monsoon seasons (South West Monsoon and North East Monsoon) either groundnut or maize is cultivated subsequently in a year in the study area even as rain fed.

3. Change in Cropping System based on Cultural Aspect

Growing of two or more crops simultaneously on the same piece of land (field) is known as intercropping. Farmers manage more than one crop at a time in the same field. There are many types of intercropping such as mixed, row, strip and relay intercropping. Pure cropping referred as cultivating single crop variety in the field over a period of time (Reddy 1999). The change that occurs at present in these cropping system compared with five years before

due to drought was studied by collecting data pertaining to number of crops cultivated in a piece of land and the results were presented Table 4.

The Table 4 indicates that among the annual crop growers, eminence of pure cropping method is observed both in past and present. The intercropping practice was found to be very low because most of them have gone for commercial crops. As farmers were concentrating on increased production and quality of their sole commercial crops in order to fetch more market price.

Table 4. Distribution of the respondents according to their Change in Cropping System based on Cultural aspect (n=100)

S. Category No.	5 years before		At Present	
	Number	Per cent	Number	Per cent
Annual Crop (n=50)				
1. Pure cropping	42	84.00	50	100.00
2. Intercropping	8	16.00	-	-
Total	50	100.00	50	100.00
Seasonal Crops: (n=50)				
1. Pure cropping	30	60.0	40	80.0
2. Intercropping	20	40.0	10	20.0
Total	50	100.0	50	100.0

Among the seasonal crops growers due to drought, reduction in intercropping method of cropping system is being observed. At present majority (80.00%) of the respondents were following pure cropping and only 20% of respondents were following intercropping.

4. Change in Source of Irrigation:

In this study, the major area irrigated through a particular type of irrigation source was considered as source of irrigation. Due to frequent occurrence of drought significant changes in source of irrigation has occurred among farmers to cope up with the water requirement and irrigation schedule of the crops grown. The data pertaining to such changes at present compared with 10 years before was collected, analyzed and presented Table 5.

From the table 5, it can be observed that, there is change in source of irrigation due to drought. In case of annual crop growers, ten years before respondents were having open well (38.00%) and followed by canal (34.00%) as irrigation source and rest of them (28.00%) are having bore well for irrigation. But at present, nearly two third (62.00%) of the respondents are having bore well followed by open well (38.00%). As there is no release of water through

canal in recent years, the farmers in the study area have drilled more bore well in their farm itself to mitigate the water requirement for irrigation.

Table 5: Distribution of the respondents according to their Change in Source of Irrigation (n=100)

S. Category No.	10 years before		At Present	
	Number	Per cent	Number	Per cent
Annual Crops: (n=50)				
1. Open well	19	38.00	19	38.00
2. Bore well	14	28.00	31	62.00
3. Canal irrigation	17	34.00	-	-
Total	50	100.00	50	100.00
Seasonal Crops:(n=50)				
1. Open well	28	56.00	20	40.00
2. Bore well	14	28.00	22	44.00
3. Rain fed	8	16.00	8	16.00
Total	50	100.00	50	100.00

As for the seasonal crop growers are concerned, compare to 10 years before the respondents have dugged more bore well for irrigation which resulted in increase from 28 to 44%. However, most of the farmers who possessed with open well stick on to the same source by deepening it or by drill the bore in it. This helps them to store the excess rain water in the well itself and that can be used in later period for crop cultivation. Only 16 per cent of respondents solely depend on rain for cultivation. During dry season they kept the land as fallow.

Table 6: Distribution of the respondents according to their Change in Method of Irrigation (n=100)

S. Category No.	10 years before		At Present	
	Number	Per cent	Number	Per cent
Annual Crops: (n=50)				
1. Flood irrigation	40	80.00	20	40.00
2. Tube irrigation	10	20.00	10	20.00
3. Drip irrigation	-	-	20	40.00
4. Sprinkler irrigation	-	-	-	-
Total		50	100.00	50
Seasonal Crops:(n=50)				
1. Flood irrigation	25	50.00	11	22.00
2. Tube irrigation	9	18.00	14	28.00
3. Drip irrigation	8	16.00	13	26.00
4. Sprinkler irrigation	-	-	4	8.00
5. Rain fed	8	16.00	8	16.00
Total		50	100.00	50

5. Change in Method of Irrigation

Method of irrigation is referred to way in which water is distributed to the field. The availability of water and the type of crops cultivated usually depends on the method of irrigation. Now a days due to scarcity of irrigation water, as to avoid the conveyance wastage of water, farmers are adopting micro irrigation methods. In these methods the water use efficiency and conveyance efficiency are higher compare to other methods of irrigation. The table 6 shows the change that occurs in the method of irrigation due to the drought.

From the table 6, it is observed that, ten years before nearly 80 per cent of annual crop growers were following only flood method of irrigation followed by tube irrigation (20.00%). But at present due to reduction in the water level 40 per cent of respondents were moved to drip method of irrigation from flood type. Because now a day's installation of drip system in farmers field became easy as government provide subsidy to small and marginal farmers under PMKSY programme.

Whereas the seasonal crop growers are concerned, compare with 10 years before, the respondents were moving towards tube and micro irrigation method which was observed in the study area. Only 16 per cent of respondents fall on rain fed category and they were sowing only after the onset of monsoon showers.

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