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A STUDY ON DROUGHT CONDITION AND ITS IMPACT ON FARM HOUSEHOLDS IN SIVAGANGA DISTRICT TAMILNADU

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ABSTRACT

Drought is a weather-related natural disaster. It affects vast regions for months or years. It has an impact on food production and it reduces life expectancy and the economic performance of large regions or entire countries. Drought is a recurrent feature of the climate. It occurs in virtually all climatic zones, and its characteristics vary significantly among regions. Drought differs from aridity in that drought is temporary; aridity is a permanent characteristic of regions with low rainfall. This paper deals with drought condition and its impact on farm households in Sivaganga district Tamilnadu. It outlines the indicators of drought condition in the study area as per the rating of the farm households and farmers observation on impact of drought on farm economy. This paper concludes with some interesting findings.

KEYWORDS: *Drought, climatic zones, rainfall, weather system*

INTRODUCTION

Drought is a complex, slow-onset phenomenon of ecological challenge that affects people more than any other natural hazards by causing serious economic, social and environmental losses in both developing and developed countries. The period of unusual dryness (i.e. drought) is a normal feature of the climate and weather system in semi-arid and arid regions of the tropics, which covers more than one-third of the land surface and is vulnerable to drought and desertification (Nagarajan, R 2003)[1]. A drought is an extended period where water availability falls below the statistical requirements for a region. Drought is not a purely physical phenomenon, but instead is an interplay between natural water availability and human demands for water supply (Agrawal, P. K 2002)[2]. There is no universally accepted definition of drought. It is generally considered to be occurring when the principal monsoons, i.e. southwest monsoon and northeast monsoon, fail or are deficient or scanty. Monsoon failure causing crop failure, drying up ecosystems and shortage of drinking water results in undue hardship to the rural and urban communities (NDMD, 2000)[3]. Although droughts are still largely unpredictable; they are a recurring feature of the climate. Drought varies with regard to the time of occurrence, duration, intensity and extent of the area affected from year to year (Ray Sinha, K. C , 2006)[4]. Land abuse during periods of good rains and its continuation during periods of deficient rainfall is the combination that contributes to desertification (UN, 1990)[5]. Dry regions in India include about 94 mha and about 300 million people (one-third of India's population) live in these areas; more than 50% of the region is affected by drought once every four years (UN,1990)[6]. Different countries and states have developed codes, manuals, procedures, processes and policies for monitoring and management of drought with varying understanding. Over the years, India has developed a fairly elaborate governance system of

institutionalized drought monitoring, declaration and mitigation at different levels (Samra, J. S, 2004)[7]. India's response to the need for enhanced drought management has contributed to overall development. For example, the drought of 1965–1967 encouraged the 'green revolution', after the 1972 drought employment generation programmes were developed for the rural poor; the 1987–1988 drought relief effort focused on preserving the quality of life.

Drought: Causes and Effects:-

Drought is defined in many ways, like, 'a period of dry weather'; 'a condition of abnormal dry weather resulting in a serious hydrological imbalance, with consequences such as losses of standing crop and shortage of water needed by people and livestock' (Alexander, D, 1993)[8]; 'a temporary reduction in water or moisture availability significantly below the normal or expected level for a specified period', and 'a creeping situation of scarcity without recharging of resources' 9 Swami, S. K, 2001)[9]. The variables to be used are, for example, rainfall, run-off aquifer level; duration considered – annual, seasonal, instantaneous minimum; truncation level – percentage, quartile, standardized anomaly, and area of region – single site, river basin, country zone, etc. Drought has been categorized under different classification systems based on the characteristics of occurrence. Drought is responsible for many direct and indirect economic, social and environmental consequences throughout the world. Certain impacts are unavoidable but can be reduced significantly through planned interventions, whereas few other impacts can be mitigated by way of drought resistance.

METHODS AND MATERIALS

This study deals with drought disaster in Sivaganga District in Tamilnadu. In this study, the indicators relating to drought condition and impact of drought are identified under the exploratory research framework. The identified indicators relating to drought condition and impact of drought are cross tabulated with the socioeconomic status of the farmer respondents and thereby it gives analytical orientation to the study. Thus this study is partly exploratory in nature and partly analytical in nature. The researcher has selected the Sivaganga district in the first stage of sampling. From this district, the researcher has selected the Sivaganga taluk. From this taluk five drought prone villages are selected as sample. From each village 25 farmers are selected as sample under simple random sampling method. The relevant primary data have been collected from the farmers of Sivaganga taluk of Sivaganga district in Tamilnadu State.

The collected data have been classified and tabulated with the help of computed programming, cross tabulation is done by putting independent variables such as farm size, caste, status , educational status, family size status and gender status with dependent variables of impact of drought on farm households.

In order to study the impact of drought the researcher has adopted 5 point rating scale. It includes very high level 5 point rating score, high level 4 point rating score, moderate level 3 point rating score, low level 2 point rating score and not at all 1 point rating score. To study the variation due to impacts of drought and variation due to independent variables, the researcher has applied the anova two way test. To analyze the two group mean sample, the researcher has applied the't' test. The general data interpretation is dome with the help of average analysis.

RESULTS AND DISCUSSION

This section deals with respondents' impact of drought. It can be assessed with the help of 27 factors on a 5 point rating scale. These include loss of income, crop loss, lack of water for livestock, decline in surface water, poor water quality, reduction in agri business revenue, food shortage, seasonal migration, lack of sufficient employment, starvation, lack of alternative employment, household debt increase, decline in ground water availability, drinking water problem, selling livestock, decline in number of livestock, malnutrition, reduction in spending on festivals, hopelessness, limited food preferences, food scarcity, famine, drying of water resources, increase in food prices, conflicts for water fetching, affected schooling of children and farmers' suicide problem.

Table 1 Farm Wise Respondents' Rating on Impact of Drought

Variables	Marginal	Small	Medium	Large	Mean
Loss of income	1.98	2.15	2.30	2.53	2.24
Crop loss	2.25	2.42	2.57	2.80	2.51
Lack of water for livestock	2.67	2.93	3.16	3.56	3.07
Decline in surface water	2.41	2.70	2.83	3.03	2.74
Poor water quality	3.29	3.83	3.97	4.04	3.78
Reduction in agri business revenue	2.97	3.22	3.48	3.91	3.39
Food shortage	1.90	2.05	2.12	2.40	2.12
Seasonal migration	3.59	4.06	4.09	4.15	3.97
Lack of sufficient employment	2.20	2.37	2.52	2.75	2.46
Starvation	3.85	4.08	4.10	4.16	4.05
Lack of alternative employment	3.08	3.33	3.89	4.02	3.50
Household debt increase	3.35	4.01	4.04	4.14	3.89
Decline in ground water availability	2.59	2.85	2.98	3.18	2.89
Drinking water problem	2.76	3.01	3.24	3.64	3.15
Selling livestock	3.01	3.40	3.98	4.12	3.63
Decline in number of livestock	1.86	1.95	2.02	2.24	2.02
Malnutrition	2.35	2.64	2.77	2.97	2.68
Reduction in spending on festivals	1.97	2.10	2.21	2.47	2.19
Hopelessness	4.02	4.13	4.15	4.16	4.12
Limited food preferences	2.86	3.11	3.37	3.80	3.28
Food scarcity	2.06	2.23	2.38	2.61	2.32
Famine	2.27	2.56	2.69	2.89	2.60
Drying of water resources	2.60	2.86	3.09	3.49	3.00
Increase in food prices	3.03	3.28	3.54	3.97	3.45
Conflicts for water fetching	2.64	2.90	3.03	3.23	2.94
Affected schooling of children	2.51	2.73	2.90	3.10	2.81
Farmers' suicide problem	3.21	3.75	3.89	3.96	3.70
Average	2.71	2.99	3.16	3.38	3.06

Source: Computed from primary data

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*F crit*
Variation due to drought impact components	42.53074	26	1.635798	106.7863	1.638019
Variation due to farm size	6.445963	3	2.148654	140.266	2.721783
Error	1.194837	78	0.015318		
Total	50.17154	107			

Data presented in table 1 indicate the farm wise respondents' rating impact of drought. It could be noted that out of the 27 impacts of drought, the respondents rate the hopelessness is the first level impact of drought and it is evident from their secured mean score of 4.12 on a 5 point rating scale. Starvation is rated at second level impact of drought and it is estimated from the respondents' secured mean score of 4.05 on a 5 point rating scale. The respondents cite the seasonal migration as their third level observed impact of drought. It is evident from their secured mean score of 3.97 on a 5 point rating scale. The respondents report the fourth level impact of drought by citing the event of increase in household debt and it is observed from the respondents' secured mean score of 3.89 on a 5 point rating scale. Poor water quality is rated at fifth level impact of drought and it could be known from the respondents' secured mean score of 3.78 on a 5 point rating scale.

The respondents rate the farmers' suicide problem is the sixth level observed impact of drought and it is revealed from their secured mean score of 3.70 on a 5 point rating scale. Selling livestock is rated at seventh level observed impact of drought and it observed from the respondents' secured mean score of 3.63 on a 5 point rating scale. The respondents realize the eighth level impact of drought by citing the situation of lack of alternative employment. It is evident from their secured mean score of 3.50 on a 5 point rating scale. The respondents report the ninth level impact of drought by citing the event of increase in food prices as per their secured mean score of 3.45 on a 5 point rating scale. Reduction in agri business revenue is rated at tenth level observed impact of drought and it is evident from the respondents' secured mean score of 3.39 on a 5 point rating scale.

The respondents rate the limited food preferences is the eleventh level observed impact of drought and it could be known from their secured mean score of 3.28 on a 5 point rating scale. Drinking water problem is rated at twelfth level noted impact of drought and it is reflected from the respondents' secured mean score of 3.15 on a 5 point rating scale. The respondents report the thirteenth level impact of drought by citing the event of lack of water for livestock. It is evident from their secured mean score of 3.07 on a 5 point rating scale. The respondents realize the fourteenth level impact of drought by citing the event of drying of water resources and it is clear from their secured mean score of 3.00 on a 5 point rating scale. Conflict for water fetching is rated at fifteenth level observed impact of drought as per the respondents' secured mean score of 2.94 on a 5 point rating scale.

The respondents rate the decline in ground water availability is the sixteenth level observed impact of drought and it could be known from their secured mean score of 2.89 on a 5 point rating scale. Affected schooling of children is rated at seventeenth level observed impact of drought and it is reflected from the respondents' secured mean score of 2.81 on a 5 point rating scale. The respondents perceive the eighteenth level impact of drought by citing the event of decline in surface water. It is evident from their secured mean score of 2.74 on a 5 point rating scale. The respondents opine the nineteenth level observed impact of drought by citing the malnutrition scenario and it is clear from their secured mean score of 2.68 on a 5 point rating scale. Famine is rated at twentieth level observed impact of drought as per the respondents' secured mean score of 2.60 on a 5 point rating scale.

The respondents visualize the twenty first level impact of drought by citing the situation of crop loss. It is evident from their secured mean score of 2.51 on a 5 point rating scale. The respondents observe the twenty second level impact of drought by citing the event of lack of sufficient employment and it is clear from their secured mean score of 2.46 on a 5 point rating scale. Food scarcity is rated at twenty third level observed impacts of drought as per the respondents' secured mean score of 2.32 on a 5 point rating scale.

The respondents rate the loss of income is the twenty fourth level observed impact of drought and it could be known from their secured mean score of 2.24 on a 5 point rating scale. Reduction in spending on festivals is rated at twenty fifth level observed impact of drought and it is reflected from the respondents' secured mean score of 2.19 on a 5 point rating scale. The respondents perceive the twenty sixth level noted impact of drought by citing the event of food shortage. It is evident from their secured mean score of 2.12 on a 5 point rating scale. The respondents realize the twenty seventh level observed impact of drought by citing the situation of decline in number of livestock and it is clear from their secured mean score of 2.02 on a 5 point rating scale.

The large farm household respondents' rank the first position in their overall rated impact of drought on their livelihood and it is reflected from their secured mean score of 3.38 on a 5 point rating scale. The medium farm household respondents' record the second position in their overall observed impact of drought on their livelihood and it is learnt from their secured mean score of 3.16 on a 5 point rating scale. The small farm households register the third position in their overall witnessed impact of drought on their livelihood and it is revealed from their secured mean score of 2.99 on a 5 point rating scale. The marginal farm households come down to the last position in their overall observed impact of drought on their livelihood as per their secured mean score of 2.71 on a 5 point rating scale.

The anova two ways model is applied for further discussion. The computed anova value 106.78 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the components of impact of drought is statistically identified as significant. In anotherpoint, the computed anova value 140.26 is greater than its tabulated value at 5 percent level significance. Hence the variation among the farm size groups is statistically identified as significant as per the respondents rated impact of drought.

Table 2 Caste Wise Respondents' Rating on Impact of Drought

Variables	Forward caste	backward caste	Most backward caste	Scheduled caste	Mean
Loss of income	2.04	2.20	2.25	2.46	2.24
Crop loss	2.31	2.47	2.52	2.73	2.51
Lack of water for livestock	2.73	2.98	3.11	3.49	3.07
Decline in surface water	2.47	2.75	2.78	2.96	2.74
Poor water quality	3.35	3.88	3.92	3.97	3.78
Reduction in agri business revenue	3.03	3.27	3.43	3.84	3.39
Food shortage	1.96	2.10	2.07	2.33	2.12
Seasonal migration	3.65	4.11	4.04	4.12	3.97
Lack of sufficient employment	2.26	2.42	2.47	2.68	2.46
Starvation	3.91	4.13	4.05	4.15	4.05
Lack of alternative employment	3.14	3.38	3.84	3.95	3.50
Household debt increase	3.41	4.06	3.99	4.07	3.89
Decline in ground water availability	2.65	2.90	2.93	3.11	2.89
Drinking water problem	2.82	3.06	3.19	3.57	3.15
Selling livestock	3.07	3.45	3.93	4.05	3.63
Decline in number of livestock	1.96	2.00	1.97	2.17	2.02
Malnutrition	2.41	2.69	2.72	2.90	2.68
Reduction in spending on festivals	2.03	2.15	2.16	2.40	2.19
Hopelessness	4.08	4.18	4.10	4.16	4.12
Limited food preferences	2.92	3.16	3.32	3.73	3.28
Food scarcity	2.12	2.28	2.33	2.54	2.32
Famine	2.33	2.61	2.64	2.82	2.60
Drying of water resources	2.66	2.91	3.04	3.42	3.00
Increase in food prices	3.09	3.33	3.49	3.90	3.45
Conflicts for water fetching	2.70	2.95	2.98	3.16	2.94
Affected schooling of children	2.57	2.82	2.85	3.03	2.81
Farmers' suicide problem	3.14	3.52	4.00	4.12	3.70
Average	2.77	3.03	3.12	3.33	3.06

Source: Computed from primary data

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*F crit*
Variation due to drought impact components	42.74344	26	1.643978	100.3377	1.638019
Variation due to caste groups	4.295163	3	1.431721	87.38292	2.721783
Error	1.277987	78	0.016384		
Total	48.31659	107			

Data presented in table 2 indicate the caste wise respondents' rating on impact of drought. The scheduled caste respondents' rank the first position in their overall rated impact of drought on their livelihood as per their secured mean score of 3.33 on a 5 point rating scale. The most backward caste respondents record the second position in their overall realized impact of drought on their livelihood as per their secured mean score of 3.12 on a 5 point rating scale. The backward caste respondents' rank the third position in their overall perceived impact of drought on their livelihood as per their secured mean score of 3.03 on a 5 point rating scale. The forward caste respondents come down to the last position in their overall observed impact of drought on their livelihood as per their secured mean score of 2.77 on a 5 point rating scale.

The anova two way model is applied for further discussion. At one point, the computed anova value 100.33 is greater than its tabulated value at 5 per cent level significance. Hence, the variation among the impact components of drought is statistically identified as significant. In another point, the computed anova value 87.38 is greater than its tabulated value at 5 per cent level

significance. Hence, the variation among the caste groups is statistically identified as significant.

Table 3 Education Wise Respondents' Rating on Impact of Drought

Variables	Illiterate	Primary	Secondary	Higher secondary	Mean
Loss of income	2.60	2.37	2.08	1.91	2.24
Crop loss	2.87	2.64	2.35	2.18	2.51
Lack of water for livestock	3.63	3.23	2.86	2.60	3.07
Decline in surface water	3.10	2.90	2.63	2.34	2.74
Poor water quality	4.11	4.04	3.76	3.22	3.78
Reduction in agri business revenue	3.98	3.55	3.15	2.90	3.39
Food shortage	2.47	2.19	1.98	1.88	2.12
Seasonal migration	4.15	4.16	3.99	3.52	3.97
Lack of sufficient employment	2.82	2.59	2.30	2.13	2.46
Starvation	4.18	4.17	4.01	3.78	4.05
Lack of alternative employment	4.09	3.96	3.26	3.01	3.50
Household debt increase	4.16	4.11	3.94	3.28	3.89
Decline in ground water availability	3.25	3.05	2.78	2.52	2.89
Drinking water problem	3.71	3.31	2.94	2.69	3.15
Selling livestock	4.19	4.05	3.33	2.94	3.63
Decline in number of livestock	2.21	2.09	1.88	1.89	2.02
Malnutrition	3.04	2.84	2.57	2.28	2.68
Reduction in spending on festivals	2.54	2.28	2.03	1.90	2.19
Hopelessness	4.15	4.12	4.09	4.01	4.12
Limited food preferences	3.87	3.44	3.04	2.79	3.28
Food scarcity	2.68	2.45	2.16	1.99	2.32
Famine	2.96	2.76	2.49	2.20	2.60
Drying of water resources	3.56	3.16	2.79	2.53	3.00
Increase in food prices	4.04	3.91	3.21	2.96	3.45
Conflicts for water fetching	3.30	3.10	2.83	2.57	2.94
Affected schooling of children	3.17	2.97	2.70	2.44	2.81
Farmers' suicide problem	4.19	4.12	3.40	3.08	3.70
Average	3.45	3.24	2.91	2.65	3.06

Source: Computed from primary data

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*F crit*
Variation due to drought impact components	42.15674	26	1.621413	79.25303	1.638019
Variation due to educational groups	10.06985	3	3.356616	164.068	2.721783
Error	1.595778	78	0.020459		
Total	53.82237	107			

Data presented in table 3 indicate the education wise respondents' rating on impact of drought. The illiterate respondents' rank the first position in their overall observed impact of drought on their livelihood as per their secured mean score of 3.45 on a 5 point rating scale. The primary level educated respondents record the second position in their overall realized impact of drought on their livelihood as per their secured mean score of 3.24 on a 5 point rating scale. The secondary level educated respondents register the third position in their overall perceived impact of drought on their livelihood as per their secured mean score of 2.91 on a 5 point rating scale. The higher secondary level respondents come down to the last position in their overall reported impact of drought on their livelihood as per their secured mean score of 2.65 on a 5 point rating scale.

The anova two way model is applied for further discussion. At one point, the computed anova value 79.25

is greater than its tabulated value at 5 per cent level significance. Hence the variation among the impact components of drought is statistically identified as significant. In another point, the computed anova value 164.06 is greater than its tabulated value at 5 per cent level significance. Hence, the variation among the educational groups is statistically identified as significant.

Table 4 Family Size Wise Respondents' Rating on Impact of Drought

Variables	Small	Medium	Large	Mean
Loss of income	2.10	2.25	2.50	2.24
Crop loss	2.37	2.52	2.77	2.51
Lack of water for livestock	2.88	3.11	3.53	3.07
Decline in surface water	2.65	2.78	3.00	2.74
Poor water quality	3.78	3.92	4.01	3.78
Reduction in agri business revenue	3.17	3.43	3.88	3.39
Food shortage	2.00	2.07	2.37	2.12
Seasonal migration	3.82	4.04	4.14	3.97
Lack of sufficient employment	2.32	2.47	2.72	2.46
Starvation	3.85	4.05	4.15	4.05
Lack of alternative employment	3.28	3.84	3.99	3.50
Household debt increase	3.96	3.99	4.11	3.89
Decline in ground water availability	2.80	2.93	3.15	2.89
Drinking water problem	2.96	3.19	3.61	3.15
Selling livestock	3.35	3.93	4.09	3.63
Decline in number of livestock	1.90	1.97	2.21	2.02
Malnutrition	2.59	2.72	2.94	2.68
Reduction in spending on festivals	2.05	2.16	2.44	2.19
Hopelessness	4.00	4.07	4.16	4.12
Limited food preferences	3.06	3.32	3.77	3.28
Food scarcity	2.18	2.33	2.58	2.32
Famine	2.51	2.60	2.86	2.60
Drying of water resources	2.81	3.04	3.46	3.00
Increase in food prices	3.23	3.79	3.94	3.45
Conflicts for water fetching	2.75	2.88	3.10	2.94
Affected schooling of children	2.72	2.85	3.07	2.81
Farmers' suicide problem	3.70	3.84	3.93	3.70
Average	2.92	3.11	3.35	3.06

Source: Computed from primary data

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*F crit*
Variation due to drought impact components	33.66348	26	1.294749	114.2172	1.70962
Variation due to family size	2.538002	2	1.269001	111.9458	3.175141
Error	0.589464	52	0.011336		
Total	36.79094	80			

Data presented in table 4 indicate the family size wise respondents' rating on impact of drought. The large family size respondents' rank the first position in their overall reported impact of drought on their livelihood as per their secured mean score of 3.35 on a 5 point rating scale. The medium family size respondents record the second position in their overall observed impact of drought on their livelihood as per their secured mean score of 3.11 on a 5 point rating scale. The small family size respondents come down to the last position in their overall perceived impact of drought on their livelihood as per their secured mean score of 2.92 on a 5 point rating scale.

The anova two way model is applied for further discussion. At one point, the computed anova value 114.21 is greater than its tabulated value at 5 per cent level significance. Hence the variation among the drought impact components is statistically identified as significant. In another point, the computed anova value 111.94 is greater than its tabulated value at 5 per cent level significance. Hence, the variation among the family size groups is statistically identified as significant.

Table 5 Sex Wise Respondents' Rating on Impact of Drought

Variables	Male	Female	Mean
Loss of income	2.11	2.37	2.24
Crop loss	2.36	2.66	2.51
Lack of water for livestock	2.91	3.23	3.07
Decline in surface water	2.58	2.92	2.74
Poor water quality	3.59	3.91	3.78
Reduction in agri business revenue	3.26	3.52	3.39
Food shortage	2.06	2.18	2.12
Seasonal migration	3.86	4.1	3.97
Lack of sufficient employment	2.21	2.71	2.46
Starvation	3.95	4.15	4.05
Lack of alternative employment	3.24	3.76	3.50
Household debt increase	3.69	4.09	3.89
Decline in ground water availability	2.66	3.12	2.89
Drinking water problem	2.99	3.31	3.15
Selling livestock	3.39	3.87	3.63
Decline in number of livestock	1.95	2.09	2.02
Malnutrition	2.45	2.91	2.68
Reduction in spending on festivals	2.08	2.30	2.19
Hopelessness	4.08	4.16	4.12
Limited food preferences	3.07	3.49	3.28
Food scarcity	2.16	2.48	2.32
Famine	2.37	2.84	2.60
Drying of water resources	2.82	3.18	3.00
Increase in food prices	3.19	3.71	3.45
Conflicts for water fetching	2.71	3.17	2.94
Affected schooling of children	2.58	3.04	2.81
Farmers' suicide problem	3.31	3.79	3.70
Average	2.88	3.22	3.06

Source: Computed from primary data

T Statistical Value -14.14, df 26, T Critical Value 1.70

Data presented in table 5 indicate the sex wise respondents' rated impact of drought. The female respondents rank the first position in their overall realized impact of drought on their livelihood as per their secured mean score of 3.22 on a 5 point rating scale. The male respondents come to the second position in their overall rated impact of drought on their livelihood as per their secured mean score of 2.88 on a 5 point rating scale.

The T test is applied for further discussion. The computed t value -14.14 is greater than its tabulated value at 5 per cent level significance. Hence there is a significant difference between male respondents and female respondents in their overall rated impact of drought on their livelihood.

DROUGHT INDICATORS

This section deals with respondents' rating on drought indicators. It can be assessed with the help of 22 factors on a 5 point rating scale. These include inadequate rain, increase in temperature, low humidity, low moisture, dry aeration, high level precipitation, monsoon failure, climate change, low vegetative cover, reduction in quality of life, impoverishment of land, land erosion, loss of biodiversity, low land productivity, high level transpiration, drying of ponds, decline in ground water tables, drying of wells, drying of rivers, streams and other water bodies, low water retention capacity of the land, drying of grassing lands and drinking water shortage.

Table 6 Farm Wise Respondents' Rating on Drought Scenario

Variables	Marginal	Small	Medium	Large	Mean
Inadequate rain	4.09	4.10	4.16	4.18	4.13
Increase in temperature	2.94	3.22	3.45	3.74	3.35
Low humidity	4.01	4.02	4.08	4.10	4.05
Low moisture	3.14	3.54	3.87	4.09	3.67
Dry aeration	2.38	2.56	2.81	3.00	2.69
High level precipitation	2.17	2.35	2.40	2.59	2.38
Monsoon failure	2.75	3.03	3.26	3.55	3.16
Climate change	3.47	3.89	4.01	4.08	3.86
Low vegetative cover	2.16	2.44	2.59	2.68	2.47
Reduction in quality of life	3.33	3.59	3.89	4.07	3.72
Impoverishment of land	1.83	1.88	2.01	2.12	1.96
Land erosion	2.94	3.33	3.56	3.96	3.46
Loss of biodiversity	2.04	2.15	2.20	2.32	2.18
Low land productivity	2.51	2.79	3.04	3.33	2.92
High level transpiration	2.24	2.42	2.67	2.86	2.55
Drying of ponds	2.38	2.66	2.91	3.20	2.79
Decline in ground water tables	2.67	2.95	3.20	3.49	3.08
Drying of wells	2.15	2.26	2.31	2.43	2.29
Drying of rivers, streams and other water bodies	3.06	3.45	3.68	4.08	3.58
Low water retention capacity of the land	2.03	2.08	2.10	2.21	2.11
Drying of grassing lands	1.99	2.04	2.06	2.17	2.07
Drinking water shortage	3.63	3.99	4.04	4.07	3.93
Average	2.72	2.94	3.10	3.29	3.02

Source: Computed from primary data

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*F crit*
Variation due to drought indicators	42.3345	21	2.015928	110.7268	1.725969
Variation due to farm size	3.795676	3	1.265225	69.4937	2.750541
Error	1.146999	63	0.018206		
Total	47.27717	87			

Data presented in table 6 indicate the farm wise respondents' rating on drought scenario. It could be noted that out of the 22 drought indicators, the respondents rate the inadequate rain is the first level drought indicator and it is evident from their secured mean score of 4.13 on a 5 point rating scale. Low humidity is rated at second level drought indicator and it is estimated from the respondents' secured mean score of 4.05 on a 5 point rating scale. The respondents cite the drinking water shortage is the third level observed drought indicator. It is evident from their secured mean score of 3.93 on a 5 point rating scale. The respondents report the fourth level drought indicator by citing the event of climate change and it is observed from the respondents' secured mean score of 3.86 on a 5 point rating scale. Reduction in quality of life is rated at fifth level drought indicator and it could be known from the respondents' secured mean score of 3.72 on a 5 point rating scale.

The respondents rate the low moisture is the sixth level observed drought indicator and it is revealed from their secured mean score of 3.67 on a 5 point rating scale. Drying of rivers, streams and other water bodies is rated at seventh level observed drought indicator and it observed from the respondents' secured mean score of 3.58 on a 5 point rating scale. The respondents realize the eighth level drought indicator by citing the situation of land erosion. It is evident from their secured mean score of 3.46 on a 5 point rating scale. The respondents report the ninth level drought indicator by citing the event of Increase in temperature as per their secured mean score of 3.35 on a 5 point rating scale. Monsoon failure is rated at tenth level observed drought indicator and it is evident from the respondents' secured mean score of 3.16 on a 5 point rating scale.

The respondents rate the decline in ground water tables is the eleventh level observed drought

indicator and it could be known from their secured mean score of 3.08 on a 5 point rating scale. Low land productivity is rated at twelfth level observed drought indicator and it is reflected from the respondents' secured mean score of 2.92 on a 5 point rating scale. The respondents report the thirteenth level drought indicator by citing the event of drying of ponds. It is evident from their secured mean score of 2.79 on a 5 point rating scale. The respondents realize the fourteenth level drought indicator by citing the scenario of dry aeration and it is clear from their secured mean score of 2.69 on a 5 point rating scale. High level transpiration of plantsof plants is rated at fifteenth level observed drought indicators as per the respondents' secured mean score of 2.55 on a 5 point rating scale.

The respondents rate the low vegetative cover is the sixteenth level observed drought indicator and it could be known from their secured mean score of 2.47 on a 5 point rating scale. High level precipitation is rated at seventeenth level observed drought indicator and it is reflected from the respondents' secured mean score of 2.38 on a 5 point rating scale. The respondents perceive the eighteenth level drought indicator by citing the event of drying of wells. It is evident from their secured mean score of 2.29 on a 5 point rating scale. The respondents realize the nineteenth level observed drought indicator by citing the scenario of loss of biodiversity and it is clear from their secured mean score of 2.18 on a 5 point rating scale. Low water retention capacity of the land is rated at twentieth level observed drought indicator as per the respondents' secured mean score of 2.11 on a 5 point rating scale.

The respondents visualize the twenty first level drought indicator by citing the situation of drying of grassing lands. It is evident from their secured mean score of 2.07 on a 5 point rating scale. The respondents observe the twenty second level drought indicator by citing the event of impoverishment of land and it is clear from their secured mean score of 1.96 on a 5 point rating scale.

The large farm household respondents' rank the first position in revealing the drought scenario in their locality and it is reflected from their secured mean score of 3.29 on a 5 point rating scale. The medium farm household respondents' record the second position in revealing the drought condition in their locality and it is learnt from their secured mean score of 3.10 on a 5 point rating scale. The small farm households register the third position in revealing the drought scenario in their area it is revealed from their secured mean score of 2.94 on a 5 point rating scale. The marginal farm households come down to the last position in revealing the drought condition in their locality as per their secured mean score of 2.72 on a 5 point rating scale.

The anova two ways model is applied for further discussion. The computed anova value 110.72 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the drought indicators is statistically identified as significant. In another point, the computed anova value 69.49 is greater than its tabulated value at 5 percent level significance. Hence, the variation among the farm size groups is statistically identified as significant as per the respondents rating on drought condition.

Table 7 Caste Wise Respondents' Rating on Drought Scenario

Variables	Forward caste	backward caste	Most backward caste	Scheduled caste	Mean
Inadequate rain	4.10	4.14	4.15	4.16	4.13
Increase in temperature	2.99	3.27	3.39	3.68	3.35
Low humidity	4.06	4.07	4.02	4.08	4.05
Low moisture	3.19	3.59	3.81	4.09	3.67
Dry aeration	2.43	2.61	2.75	2.94	2.69
High level precipitation	2.08	2.40	2.34	2.53	2.38
Monsoon failure	2.80	3.08	3.20	3.49	3.16
Climate change	3.52	3.94	3.95	4.10	3.86
Low vegetative cover	2.11	2.49	2.53	2.62	2.47
Reduction in quality of life	3.38	3.64	3.83	4.07	3.72
Impoverishment of land	1.80	1.88	2.06	2.11	1.96
Land erosion	2.99	3.38	3.50	3.90	3.46
Loss of biodiversity	2.02	2.05	2.20	2.26	2.18
Low land productivity	3.68	4.04	3.98	4.01	2.92
High level transpiration	2.29	2.47	2.61	2.80	2.55
Drying of ponds	2.43	2.71	2.85	3.14	2.79
Decline in ground water tables	2.72	3.00	3.14	3.43	3.08
Drying of wells	2.20	2.31	2.25	2.37	2.29
Drying of rivers, streams and other water bodies	3.11	3.50	3.62	4.12	3.58
Low water retention capacity of the land	2.04	2.08	2.13	2.15	2.11
Drying of grassing lands	2.00	2.04	2.09	2.11	2.07
Drinking water shortage	3.68	4.04	3.98	4.01	3.93
Average	2.80	3.03	3.11	3.28	3.02

Source: Computed from primary data

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*F crit*
Variation due to drought indicators	46.57401	21	2.21781	131.087	1.725969
Variation due to caste groups size	2.611277	3	0.870426	51.44781	2.750541
Error	1.065873	63	0.016919		
Total	50.25116	87			

Data presented in table 7 indicate the caste wise respondents' rating on drought condition. The scheduled caste respondents' rank the first position in revealing the drought scenario in their area as per their secured mean score of 3.28 on a 5 point rating scale. The most backward caste respondents record the second position in revealing the drought scenario in their living environment as per their secured mean score of 3.11 on a 5 point rating scale. The backward caste respondents' rank the third position in revealing the drought indicators in their living environment as per their secured mean score of 3.03 on a 5 point rating scale. The forward caste respondents come down to the last position in revealing the drought scenario in their locality as per their secured mean score of 2.80 on a 5 point rating scale.

The anova two way model is applied for further discussion. At one point, the computed anova value 131.08 is greater than its tabulated value at 5 per cent level significance. Hence, the variation among the indicators of drought condition is statistically identified as significant. In another point, the computed anova value 51.44 is greater than its tabulated value at 5 per cent level significance. Hence, the variation among the caste groups is statistically identified as significant.

Table 8 Education Wise Respondents' Rating on Drought Condition

Variables	Illiterate	Primary	Secondary	Higher secondary	Mean
Inadequate rain	4.18	4.14	4.10	4.09	4.13
Increase in temperature	3.68	3.48	3.19	3.01	3.35
Low humidity	4.15	4.09	4.04	3.91	4.05
Low moisture	4.03	3.89	3.51	3.21	3.67
Dry aeration	2.94	2.83	2.53	2.45	2.69
High level precipitation	2.53	2.42	2.32	2.24	2.38
Monsoon failure	3.49	3.23	3.05	2.82	3.16
Climate change	4.09	4.03	3.86	3.54	3.86
Low vegetative cover	2.72	2.51	2.41	2.23	2.47
Reduction in quality of life	4.01	3.81	3.66	3.40	3.72
Impoverishment of land	2.14	1.96	1.88	1.84	1.96
Land erosion	3.90	3.58	3.30	3.01	3.46
Loss of biodiversity	2.36	2.12	2.12	2.01	2.18
Low land productivity	4.06	3.96	3.93	3.80	2.92
High level transpiration	2.80	2.69	2.39	2.31	2.55
Drying of ponds	3.14	2.93	2.63	2.45	2.79
Decline in ground water tables	3.43	3.22	3.92	2.74	3.08
Drying of wells	2.37	2.33	2.23	2.22	2.29
Drying of rivers, streams and other water bodies	4.02	3.70	3.42	3.13	3.58
Low water retention capacity of the land	2.15	2.15	2.10	2.02	2.11
Drying of grassing lands	2.20	2.07	2.02	1.98	2.07
Drinking water shortage	4.06	3.96	3.93	3.80	3.93
Average	3.29	3.14	3.02	2.83	3.02

Source: Computed from primary data

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*F crit*
Variation due to drought impact components	46.06418	21	2.193532	97.67543	1.725969
Variation due to educational groups	2.542986	3	0.847662	37.7454	2.750541
Error	1.414814	63	0.022457		
Total	50.02198	87			

Data presented in table 8 indicate the education wise respondents' rating on drought condition. The illiterate respondents' rank the first position in reflecting the drought condition on their area as per their secured mean score of 3.29 on a 5 point rating scale. The primary level educated respondents record the second position in reporting the drought condition in their locality as per their secured mean score of 3.14 on a 5 point rating scale. The secondary level educated respondents register the third position in rating the drought condition in their locality as per their secured mean score of 3.02 on a 5 point rating scale. The higher secondary level respondents come down to the last position in revealing the drought condition in their loaclity as per their secured mean score of 2.83 on a 5 point rating scale.

The anova two way model is applied for further discussion. At one point, the computed anova value 97.67 is greater than its tabulated value at 5 per cent level significance. Hence the variation among the indicators of drought condition is statistically identified as significant. In another point, the computed anova value 37.74 is greater than its tabulated value at 5 per cent level significance. Hence, the variation among the educational groups is statistically identified as significant.

Table 9 Family Size Wise Respondents' Rating on Drought Condition

Variables	Small	Medium	Large	Mean
Inadequate rain	4.07	4.14	4.18	4.13
Increase in temperature	2.94	3.18	3.48	3.35
Low humidity	4.01	3.98	4.11	4.05
Low moisture	3.14	3.50	3.90	3.67
Dry aeration	2.38	2.52	2.84	2.69
High level precipitation	2.03	2.31	2.43	2.38
Monsoon failure	2.75	2.99	3.29	3.16
Climate change	3.47	3.85	4.04	3.86
Low vegetative cover	2.06	2.40	2.62	2.47
Reduction in quality of life	3.33	3.55	3.92	3.72
Impoverishment of land	1.90	1.93	2.05	1.96
Land erosion	2.94	3.29	3.59	3.46
Loss of biodiversity	2.10	2.08	2.29	2.18
Low land productivity	3.63	3.95	4.07	2.92
High level transpiration	2.24	2.38	2.70	2.55
Drying of ponds	2.38	2.62	2.94	2.79
Decline in ground water tables	2.67	2.91	3.23	3.08
Drying of wells	2.15	2.22	2.34	2.29
Drying of rivers, streams and other water bodies	3.06	3.41	3.71	3.58
Low water retention capacity of the land	1.99	2.10	2.22	2.11
Drying of grassing lands	1.98	2.02	2.21	2.07
Drinking water shortage	3.63	3.95	4.07	3.93
Average	2.77	2.97	3.19	3.02

Source: Computed from primary data

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*F crit*
Variation due to drought indicators	33.08678	21	1.575561	141.284	1.812817
Variation due to family size	2.001694	2	1.000847	89.74812	3.219942
Error	0.468373	42	0.011152		
Total	35.55685	65			

Data presented in table 9 indicate the family size wise respondents' rating on drought conditions. The large family size respondents' rank the first position in rating the drought scenario in their locality as per their secured mean score of 3.19 on a 5 point rating scale. The medium family size respondents record the second position in reporting the drought condition in their locality as per their secured mean score of 2.97 on a 5 point rating scale. The small family size respondents come down to the last position in revealing the drought condition in their locality as per their secured mean score of 2.77 on a 5 point rating scale.

The anova two way model is applied for further discussion. At one point, the computed anova value 141.28 is greater than its tabulated value at 5 per cent level significance. Hence the variation among the indicators of drought is statistically identified as significant. In another point, the computed anova value 89.74 is greater than its tabulated value at 5 per cent level significance. Hence, the variation among the family size groups is statistically identified as significant.

Table 10 Sex Wise Respondents' Rating on Drought Condition

Variables	Male	Female	Mean
Inadequate rain	4.09	4.16	4.13
Increase in temperature	3.01	3.69	3.35
Low humidity	3.94	4.16	4.05
Low moisture	3.55	3.89	3.67
Dry aeration	2.90	2.48	2.69
High level precipitation	2.26	2.50	2.38
Monsoon failure	3.01	3.31	3.16
Climate change	3.64	4.08	3.86
Low vegetative cover	2.33	2.61	2.47
Reduction in quality of life	3.51	3.91	3.72
Impoverishment of land	1.88	2.04	1.96
Land erosion	3.17	3.75	3.46
Loss of biodiversity	2.10	2.26	2.18
Low land productivity	2.68	3.16	2.92
High level transpiration	2.29	2.81	2.55
Drying of ponds	2.60	2.98	2.79
Decline in ground water tables	2.93	3.21	3.08
Drying of wells	2.18	2.40	2.29
Drying of rivers, streams and other water bodies	3.42	3.74	3.58
Low water retention capacity of the land	1.91	2.30	2.11
Drying of grassing lands	2.02	2.12	2.07
Drinking water shortage	3.78	4.08	3.93
Average	2.87	3.17	3.02

T Statistical Value 6.24, df 21, T Critical Value 1.72

Data presented in table 10 indicate the sex wise respondents' reported drought condition. The female respondents rank the first position in rating the drought scenario in their locality as per their secured mean score of 3.17 on a 5 point rating scale. The male respondents come to the second position in reporting the drought scenario in their locality as per their secured mean score of 2.87 on a 5 point rating scale.

The T test is applied for further discussion. The computed t value 6.24 is greater than its tabulated value at 5 per cent level significance. Hence there is a significant difference between male respondents and female respondents in their overall rated indicators of drought scenario in their locality.

CONCLUSION

The findings of respondents' rating on impact of drought on their livelihood reveal the following facts. The respondents' rate the high level impact of drought in their locality by citing the events of hopelessness, starvation, seasonal migration, increase in household debt, poor water quality, farmers' suicide problem, selling livestock and lack of alternative employment as per their secured mean score above 3.50 on a 5 point rating scale. The respondents' rate the moderate level impact of drought by stating the events of increase in food prices, reduction in agri business revenue, limited food preferences, drinking water problem, lack of water for livestock, drying of water resources, conflict for water fetching, decline in ground water availability, affected schooling of children, decline in surface water, malnutrition, famine and crop loss as per their secured mean score in the range of 2.50 to 3.50 on a 5 point rating scale. The respondents' rate the low level impact of drought by indicating the events of lack of sufficient employment, food scarcity, loss of income, reduction in spending on festivals, food shortage and decline in number of livestock as per their secured mean score below 2.50 on a 5 point rating scale. The result of caste wise analysis reveals that the scheduled caste respondents rank the first position in their overall observed impact of drought on their livelihood, most backward caste respondents' the second, the backward caste respondents' the third and forward caste respondents' the last. The education wise result of analysis reveals that the illiterate level respondents' rank the first position in their overall rated impact of drought on their livelihood, primary level educated respondents' the second, secondary level educated the third and higher secondary level respondents' the last.

The result of family size wise analysis indicates that the large family size respondents rank the first position in their overall realized impact of drought on their livelihood, medium family size respondents' the

second, and small family size respondents' the last. The sex wise result of analysis shows that the male respondents lag behind the female respondents in their overall reported impact of drought on their livelihood.

The findings of respondents' rating on identification of indicators of drought condition reveal the following facts. The respondents' rate the high level prevalence of drought condition by citing the indicators of inadequate rain, low humidity, drinking water shortage, climate change, reduction in quality of life, low moisture and drying of rivers, streams and other water bodies as per their secured mean score above 3.50 on a 5 point rating scale. The respondents' rate the moderate level prevalence of drought condition by stating the indicators of land erosion, increase in temperature, monsoon failure, decline in ground water tables, low land productivity, drying of ponds, dry aeration and high level transpiration of plants as per their secured mean score in the range of 2.50 to 3.50 on a 5 point rating scale. The respondents' rate the low level prevalence of drought condition by reporting the indicators of low vegetative cover, high level precipitation, drying of wells, loss of biodiversity, low water retention capacity of the land, drying of grassing lands and impoverishment of land as per their secured mean score below 2.50 on a 5 point rating scale. The result of caste wise analysis reveals that the scheduled caste respondents rank the first position in their overall observed indicators of drought scenario in their locality, most backward caste respondents' the second, the backward caste respondents' the third and forward caste respondents' the last.

The result of education wise analysis indicates that the illiterate respondents' rank the first position in their overall rated indicators of drought condition in their locality, primary level educated respondents' the second, secondary level educated the third and higher secondary level respondents' the last. The result of family size wiseanalysis indicates that the large family size respondents rank the first position in their overall realized indicators of drought scenario in their locality, medium family size respondents' the second, and small family size respondents' the last. The result of sex wise analysis reveals that the male respondents lag behind the female respondents in their overall reported indicators of drought scenario in their locality.

REFERENCES

1. *Nagarajan, R., Drought: Assessment, Monitoring, Management and Resource Conservation, Capital Publishing Company, New Delhi, 2003, p. 312.*
2. *Agrawal, P. K., Impact of climate change on Indian agriculture. J. Plant Biol., 2003, 30, 189–198.*
3. *NDMD, MoHA, GOI, Contingency plan – Drought 2000. Department of Agriculture and Cooperation. MoAg, GOI, New Delhi, 2000.*
4. *Ray Sinha, K. C., Role of drought early warning systems for sustainable agriculture research in India. IMD, Pune, 2006, pp. 131– 146.*
5. *UN, Desertification and drought: at a glance. International Decade for Natural Disaster Reduction, IDNDR Secretariat, Geneva, 1990.*
6. *UN, What can be done about drought? International Decade for Natural Disaster Reduction, IDNDR Secretariat, Geneva, 1990.*
7. *Samra, J. S., Review and analysis of drought monitoring, declaration and management in India. Working Paper 84. International Water Management Institute, Colombo, Sri Lanka, 2004.*
8. *Alexander, D., Natural Disasters, UCL Press, London, 1993*
9. *Swami, S. K., Management of drought in India. UNDP Subregional Seminar on Drought Mitigation, Iran, 28–29 August 2001; www.ndmindia.nic.in/documents/drought-iran.ppt.*