ISSN (online): 2320-9836
ISSN (Print): 2320-9828

Coping Strategies during drought situation: a case of dry land farmers in Rayalaseema Region of Andhra Pradesh, India

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Abstract

Objectives: The present study has been constituted to assess the coping mechanism strategies of the dry land farmers in Rayalaseema region of Andhra Pradesh.
Methods/ Statistical analysis: To get a complete understanding of the problems prevailing agriculture in dryland areas and the constraints that the farmers face analyse the same. A proportionate sample of 600 farm households from a dissimilar group of Rayalaseema region is chosen from the list of farm households for primary study. The selection of Mandals and villages are based on coverage of drought and drought proneness and also based on rainfall criterion. The sample villages are highly rain fed areas.
Findings: The present study provides the insides from twenty-four villages from the Rayalaseema region of Andhra Pradesh. The inside from the present micro-level analysis indicates that the adverse impact of drought at the household level. Crop loss was observed to be high in most of the villages. Further, the burden of income loss forced the people into the poverty trap during that period, while the lack of resources and non-existence of institutional support during the drought period adversely affected the income of the families. At that place were local-level coping strategies adopted by the villagers to overcome the adverse effects of drought; these included sales of stock and assets, shift in occupational diversification, migration and other mechanisms. Yet, the community in the other study village coped with the drought by migrating. This involved a distress-led migration rather than developer-oriented migration. People with a few assets, such as smaller landholding size, absence of irrigation, and deficiency of other assets, namely livestock, migrated more compared to the others.
Applications: The present study attempted to analyze the different coping mechanisms adopted, at the household level. Realizing the impact of drought and the coping strategies might provide better inputs for the policy implication.
***Keywords*:** Coping strategies, Natural Disaster, Drought and Dry land Agriculture etc.

1. Introduction

India is one of the major agricultural countries in the world. Farming plays an important part in the economic system of India and about 54.6% of the population is engaged in agriculture and allied activities [1] and 67% of the rural population still depends directly and indirectly on the farming sector for employment and income, and it contributes 17.4% to the country's Gross Value Added [2]. Dry land agriculture plays an important role in the food system of India [3]. About seventy per cent of the cropped area in India is cultivated under dry conditions and a large proportion of output of important crops such as cereals, pulses, oil-seeds and cotton comes from these areas. These areas produce forty-two percent of total food grains, almost all the coarse grains and more than three-fourth of pulses and oil-seeds of the country. The dryland agricultural farmers constitute a considerable proportion of rural workforce in India [4]. The productivity in agriculture depends upon the efficiency of agricultural farmers, which in turn depends upon their socio-economic conditions. The present study an attempt is made to examine the coping strategies during drought situation of dryland farmers in 24 villages of 12 selected Mandals in Rayalaseema region of Andhra Pradesh.

ISSN (online): 2320-9836
ISSN (Print): 2320-9828

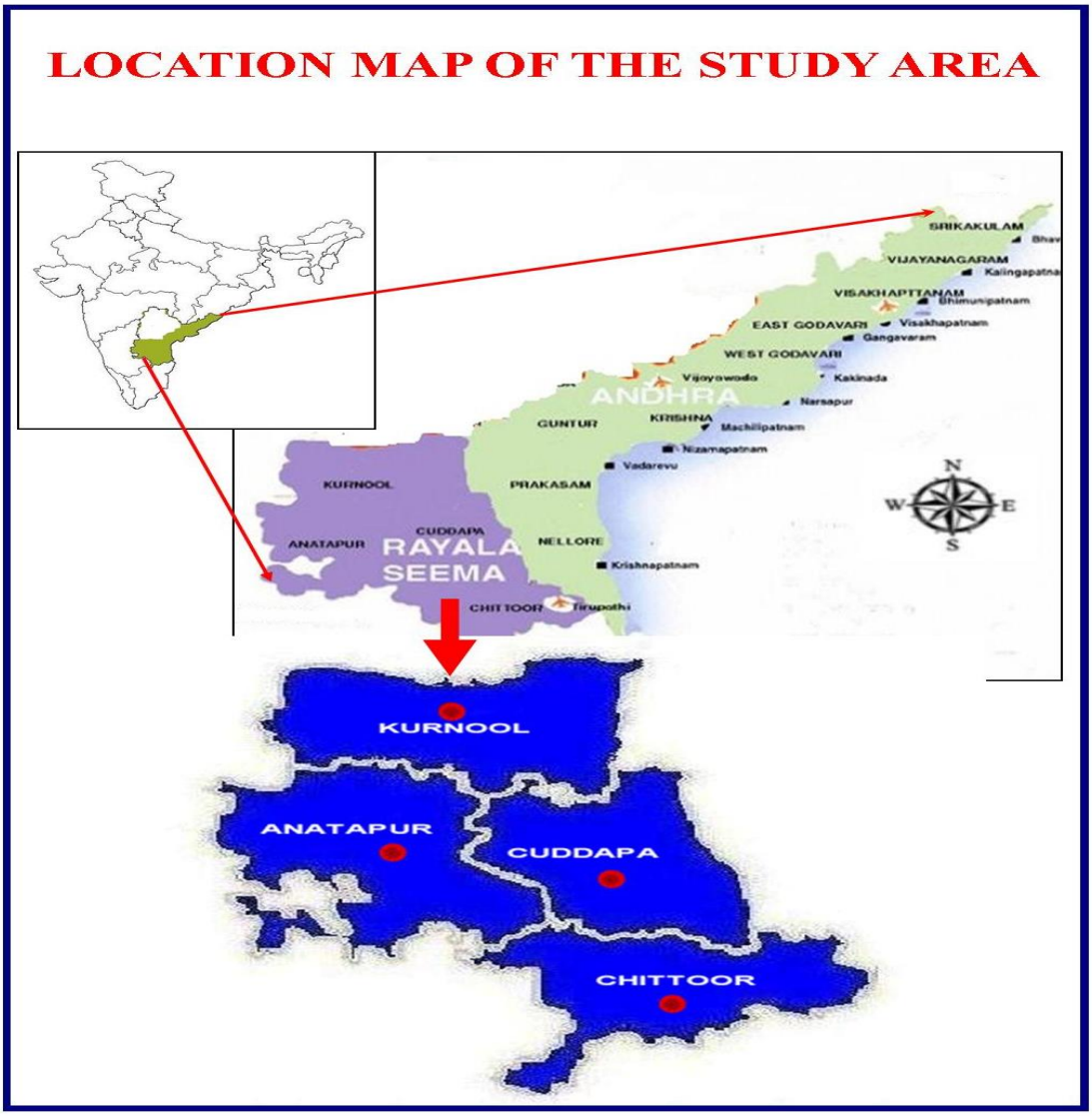
2. Methodology

The methodology is the blueprint of research investigation. It refers to the systematic methods and procedures to approach the research problem and also to seek proper answers. The following methodology is adopted in conducting the research under the following subheads.

2.1.1 Study area

Rayalaseema region was selected purposely for the present study on dry land Agriculture. Andhra Pradesh is split into two geographical regions, Coastal Andhra and Rayalaseema. Rayalaseema (Figure 1) is one of the backward regions, with diversified regional dimensions among the regions of the Andhra Pradesh. The odd distribution of rainfall, lack of natural resources, lack of development of irrigation sources, without minimum infrastructural facilities and agro-climatic conditions are dealt. In Rayalaseema region, agro-climatic variables are critical to the operation of the agricultural sector. To get complete understanding of the problems prevailing agriculture in dryland areas and the constraints that the farmers face analyze the same.

Figure 1. Location Map of Rayalaseema region



ISSN (online): 2320-9836
ISSN (Print): 2320-9828

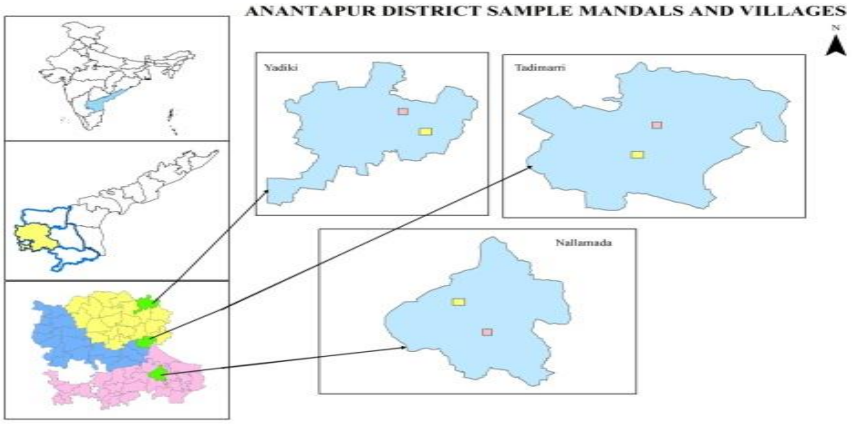
2.2. Sampling design

Rayalaseema region consists of four districts namely Anantapur, Chittoor, Kadapa and Kurnool. Each district has been divided into three revenue divisions. In each division, one Mandal is selected and in each Mandal two villages are selected for the study, four districts and twelve Mandals and twenty four villages have been selected randomly. A proportionate sample of 600 farm households from a dissimilar group of Rayalaseema region is chosen from the list of farm households for primary study. The selection of Mandals and villages are based on coverage of drought and drought proneness and also based on rainfall criterion. The sample villages are highly rainfed areas.The presentations of location maps of the sample divisions, Mandals as well as villages are presented in Figures 2-5. The survey was conducted to collect information following are the list of districts and Mandals and villages selected for primary study (Table 1).

Table 1. Selected District, Mandals and villages for primary survey, 2015-2016

Name of the District	Division	Mandal	Village
Anantapur	1.Penugonda	1.Nallamada	1.Vellamaddi
			2.Nallamada (Rural)
	2.Anantapur	2.Yadiki	3.Thippareddypalli
			4.Thirunampalli
	3.Dharmavaram	3.Tadimarri	5.Peddakotla
			6.Madhulacheruvu
Chittoor	4.Madanapalli	4.Rompicherla	7.Motumallela
			8.Peddamallela
	5.Chittoor	5.Irala	9.Morampalli
			10.Nampalli
	6.Tirupathi	6.Pulicherla	11.Devampeta
			12.Kallur
Kadapa	7.Rajampet	7.Bramhamgarimatam	13.Papireddypalli
			14.Mallepalli
	8.Kadapa	8.Ramapuram	15.Nallaguttapalli
			16.Gopagudipalli
	9.Jammalamadugu	9.Simhadripuram	17.Agraharam
			18.Diddekunta
Kurnool	10Adhoni	10Pattikonda	19.Nalakadoddi
			20.Hosur
	11.Kurnool	11.Krishnagiri	21.Katarukonda
			22.Alamkonda
	12Nandyal	12Sanjamala	23.Kanala
			24.Perusomala

Figure 2. Location Maps of the selected sampled Mandals and villages in Anantapur district



ISSN (online): 2320-9836
ISSN (Print): 2320-9828

Figure 3. Location Maps of the selected sampled Mandals and villages in Chittoor district

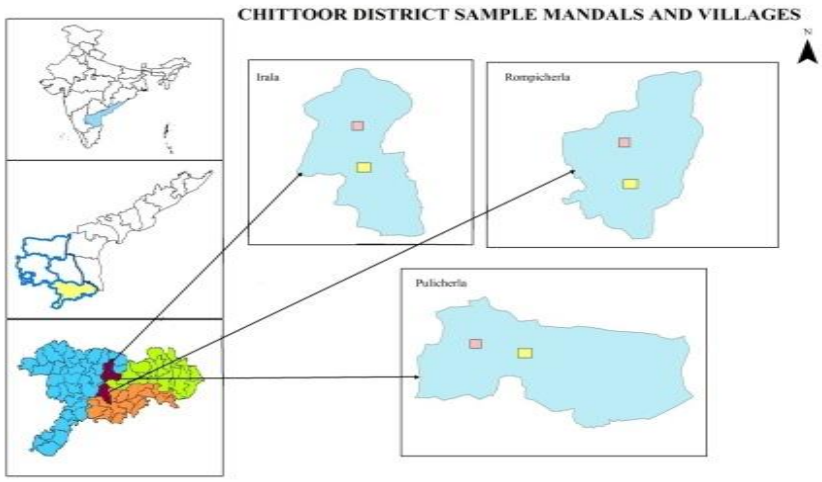
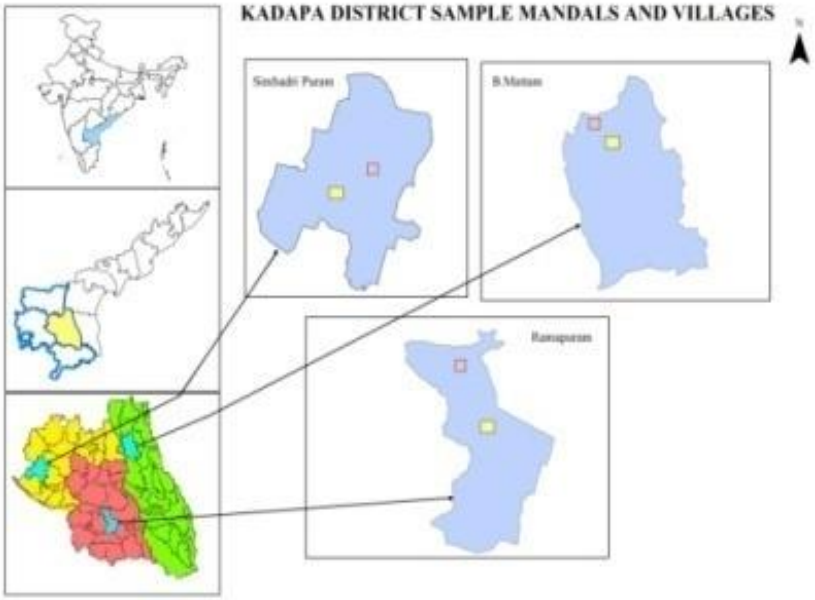


Figure 4.Location Maps of the selected sampled Mandals and villages in Kadapa district



2.3. Data collection

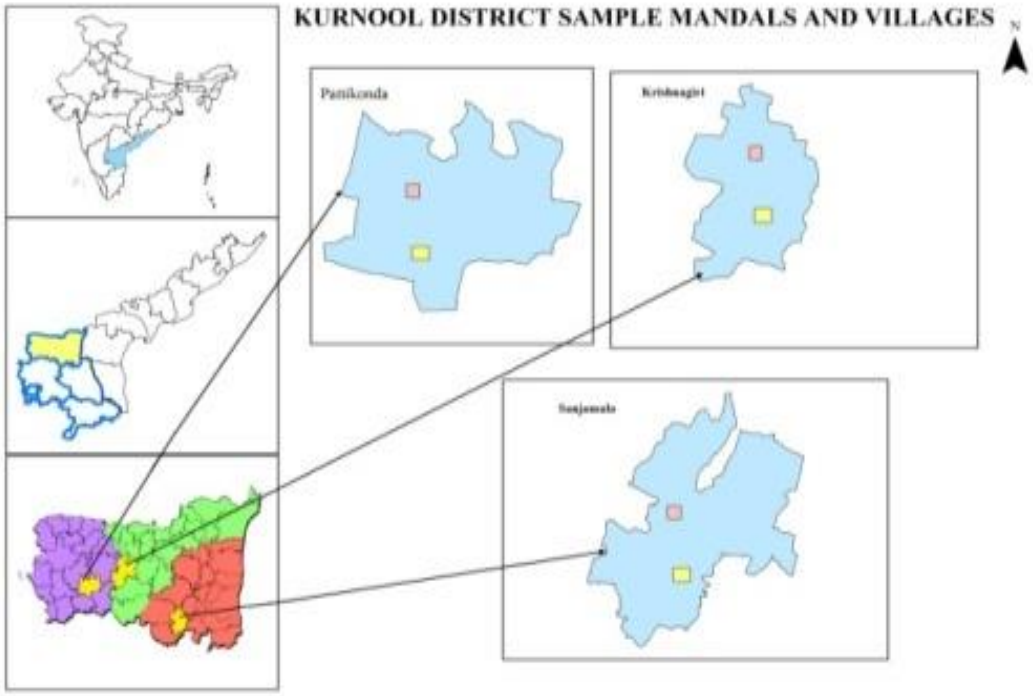
The data for the present study is gathered from both primary as well as secondary sources.

2.3.1. Primary data

The questionnaire is based on personal interview method. The detailed information required for the study was collected from each of the selected two villages of every three revenue divisions in four districts. The total respondents are 600. The primary data pertains to demographic particulars of the respondent and family the information regarding the status of migration in the farm household and the impact of migration on economic status. Further information related to strategies used to cope up during drought periods within the hamlet.

ISSN (online): 2320-9836
ISSN (Print): 2320-9828

Figure 5. Location maps of the selected sampled Mandals and villages in Kurnool district



2.3.2. Secondary data

The secondary sources of data were obtained from various departments of Rayalaseema districts. Handbook of Statistics 2015-16 and Chief Planning Office (CPO) etc.,

2.4. Analytical framework

The following are the statistical tools used for the data analysis and interpretation of the present study.

2.4.1. Cross tabulation

The data were tabulated through Statistical Packages for Social Sciences (SPSS) entry method making use of 21.0 versions and the required bivariate tables were drawn through cross tabulation in the following pages, the results of the survey data and analysis are presented.

2.4.2. Percentage analysis

The calculation in the present study was done by using the percentages in the analysis of personal profile, socioeconomic status, cropping pattern, coping mechanisms and other variables of the study. These are used to acquire a fair idea regarding the selected sample of the work and also to create comparisons between two or more variables of the data.

$$\text{Percentageofrespondents} = \frac{\text{Numberofrespondents}}{\text{Totalrespondents}} \text{X100}$$

2.4.3. Net Un-irrigated Area analysis

Net un-irrigated field is the area arrived at by subtracting the net irrigated area from the net sown area. The un-irrigated area analysis is also useful to find a total rain-fed area in the region.

$$\text{Netunirrigatedarea} = \text{Netsownarea} - \text{Netirrigatedarea}$$

ISSN (online): 2320-9836
ISSN (Print): 2320-9828

2.4.4. Rainfed area analysis

Rainfed area is the measure of total un-irrigated area of any region. It is an important metric to understand the rainfed agriculture. To estimate the rainfed area of the region, the following formula was used.

$$\text{Percentageofrainfedarea} = \frac{\text{Netunirrigatedarea}}{\text{Netsownarea}} \text{X100}$$

2.5. Problem of the study

In almost every part of the world dryland agriculture is more important than the wet cultivation because only a small portion of the cultivated area can be assured of irrigation. In a nation like India, where the seasonal distribution is highly uneven and the amount and schedule of the yearly rainfall is uncertain and erratic, this character of agriculture assumes a peculiar significance and it is very widely used. 'For almost all states in India, except the coastal ones, rainfed agriculture is the mainstay' [5].Based on the analysis of dryland farming on, the study investigates the coping mechanisms from the Rayalaseema region of Andhra Pradesh, India.

3. Results and Discussion

The province of Andhra Pradesh can be broadly divided into two geographical regions based on the different physical, socioeconomic, agro-climatological parameters, namely Coastal Andhra and Rayalaseema. Rayalaseema region is regarded as the most backward area of Andhra Pradesh. Rayalaseema region is located in southern and South-Western part of Andhra Pradesh covering an expanse of 67,298 Sq KM. It comprises four southern districts namely Anantapur, Chittoor, Kadapa and Kurnool. Due to its peculiar geographical position in the peninsula, the region suffers from several handicaps. The average rainfall recorded in this part is relatively low at ranges from 300 mm to 700 mm when compared to Coastal Andhra (i.e., above 1,000 mm) region. Owing to the frequent failure of rainfall, this area has been adjudged a component of a famine zone in South India. The area lies under drylands in Rayalaseema region is mentioned in Table 2.

Table 2. District wise rainfed area in Rayalaseema region from 2015-16 Area in Hectares)

Districts	Net Sown Area	Net Irrigated Area	Net Un-irrigated Area	% to Rainfed area	% to Net irrigated area
Anantapur	849106	138652	710454	83.67	16.32
Chittoor	371644	175452	196192	52.79	47.20
Kadapa	340271	132919	207352	60.93	39.06
Kurnool	851882	175304	676578	79.42	20.57
Andhra Pradesh	2412903	622327	1790576	74.20	25.79

Source: *Directorate of Economics & Statistics, Government of Andhra Pradesh, Vijayawada*
Note: *Net Un-irrigated area= Net Sown Area- Net Irrigated*

It is evident, that dryland agriculture accounts for about 74.20% of its cultivated area. Though there is considerable variance among the territories. The part of the area of dryland agriculture to the total cultivated area is lowest in Chittoor district (52.79%) and the highest in Anantapur district (83.67%), the latter is followed by Kurnool district (79.20%) and Kadapa district (60.93%t). The agricultural economy of the Rayalaseema region today stands at crossroads. Out of 75T of the rainfed area only 25% of the area is under irrigated in the study area. The food crop like paddy is limited to limited pockets under well irrigation as a major source. Most of the cultivators (nearly 82%) and all the agricultural labourers are under pressure by stagnation. The mainstream of small and marginal farmers has already been pushed under the poverty line.

In Rayalaseema region, nearly 65% of the net sown area is under rainfed conditions. The reduction of ground water, deterioration of ecology and environment degradation of land health and land texture in dryland agriculture are other really dangerous challenges that agriculture in Rayalaseema region is facing. There is no resolution of the problems to the existing cropping pattern and crop technology in dryland farming. This has led to the root of distress situations in agriculture, where the lone source of income for the people is cultivation.

ISSN (online): 2320-9836
ISSN (Print): 2320-9828

3.1. Farmers respond and coping strategies to drought

3.1.1. Agricultural preparedness for Drought

Famers in all 24 villages, which have been surveyed, have described various kinds of adaptability to manage with droughts and thus in turn cut down or minimize the impact of drought. Table 3 shows the preparedness of farmers against drought in Rayalaseema region. Out of 600 Households, 287 (47.8%) households reported with some preparation to cope with drought, while 52.2% of them reported no preparation. This shows the helplessness on the part of farmers to manage up with drought conditions.

Table 3. Farmers' preparedness to cope up with the drought situation

Name of the District	Anantapur	Chittoor	Kadapa	Kurnool	Total
Prepared	80(13.3)	63(10.5)	77(12.8)	67(11.2)	287(47.8)
Not prepared	70(11.7)	87(73)	73(12.2)	83(13.8)	313(52.2)
Total	150(25.0)	150(25.0)	150(25.0)	150(25.0)	600(100.0)

Source: Field Data

Note: Figures in the parentheses indicate the percentage to the respective response of the farmers

Significant variation has been observed across these territories in terms of farmers' preparedness against drought. The highest number of farmers (13.3%) reported preparation against drought in Anantapur district, followed by 10.5% in Chittoor, 11.2 % in Kurnool district and 12.8% in Kadapa district. These areas suffer a lot and have shown a kind of helplessness on the part of farmers to cope up with drought conditions. All the same, whatever little strategies, they can adopt, these are not sufficient to bring down or minimize the impact of drought.

3.1.2. Response on coping strategies of farmers during the drought season

Amongst the various coping strategies that have been embraced by the farmers, "late developing" is important as about 18.1% of the farmers reported late saving of crop to avoid the seasonal impact of drought (Table 4).

Table 4. Coping strategies of farmers during the drought season

Name of the District	Grow drought resistant crops	Mix crops growing	Late growing	Less use fertilizers	Other preparation	No other preparation	Total
Anantapur	16(5.6)	24 (8.4)	17(5.9)	11(3.8)	6(2.1)	6(2.1)	80(27.9)
Chittoor	17(5.9)	17(5.9)	12(4.2)	7(2.4)	4(1.4)	6(2.1)	63(22.0)
Kadapa	19(6.6)	26(9.1)	13(4.5)	15(6.89)	1(0.3)	3(1.0)	77(26.8)
Kurnool	21(7.3)	19(6.6)	10(3.5)	9(3.1)	3(1.0)	5(1.7)	67(23.3)
Total	73(25.4)	86(30.0)	52(18.1)	42(14.6)	14(4.9)	20(7.0)	287(100.0)

Source: Field Data

Note: Figures in the parentheses indicate the percentage to the respective coping strategies

This strategy is followed by mixed cropping (30% farmers), less use of fertilizers (14.6 % farmers) and the use of drought resistant crops (only 25.4%). Some mutations have also been discovered across the territories in various adapting strategies to cope up with droughts. "Mixed cropping" and "Grow resistant crops" has been the usual exercises in all the territories. However, Anantapur and Kadapa districts have shown higher reposes in adopting mixed cropping to cope up impact of drought, as compared to other territories. Similar response have been reported in case of adapting to late growing of crops; in this case response of farmers from the Anantapur district (5.9%), followed by Kurnool district (3.5%) respectively.

The comparatively higher number of farmers in Kadapa district (6.6%) and Chittoor district (5.9%) has reported adapting to drought resistant seeds. There also exists a marginal variation in using less fertilizer as coping mechanisms across these districts. Again Anantapur district (3.8%) and Kadapa district (6.8%) reported the highest number of farmers using less fertilizer. In short districts, particularly Chittoor district (2.4%) and Kurnool district (3.1%) have shown poorer responses in adopting strategies for to fight against drought.

ISSN (online): 2320-9836
ISSN (Print): 2320-9828

Weak adaptation has been honoured in case of using drought resistance seeds or crops across the villages in these territories. Where there is a universal deficiency of awareness of modern use of agronomical inputs. On the other hand, the access to drought resistant seeds in this country is also inadequate. Government agencies, along with market forces have been ineffective to turn over these inputs to the farmers in such distant regions. There is also a lack of linkages between farmer's adaptability and scientific research community. Agriculture research needs to bridge these gaps and it should also make available, the required inputs that are drought resistant to the farmer.

3.1.3. Strategies used to cope during with drought years

The rural households in the study area in order to dilute the impact of drought have adopted various coping mechanisms and adaptive strategies. It is a compounding of single bills and community based actions. The adopted strategies and coping mechanisms depended on households' perception of extreme effects and the problem associated with it. Apart from the occupational diversification, the detailed strategies adopted by the people are furnished in the Table 5. The majority of the farm households used to cope during drought year through appreciation of easy accessibility of seeds. Chittoor district farmers are high (5%). Most of the farmers in the study area reported that variability in the rainfall is high. Pest attacks are high in Kadapa district (3.3%). Market factors are extremely determined by the Chittoor district (1.7%), Kadapa and Kurnool district (1.5%). Lack of water is also the main problem in the study area.

Table 5. Strategies used to cope during with Drought years

Coping strategies	Anantapur	Chittoor	Kadapa	Kurnool	Total
Indigenous Knowledge	23(3.8)	18(3.0)	18(3.0)	15(2.5)	74(12.3)
Easy accessibility of seeds	26(4.3)	30(5.0)	26(4.3)	26(4.3)	108(18.0)
Highly subsidized	3(0.5)	2(0.3)	3(0.5)	5(0.8)	13(2.2)
Market factors	5(0.8)	10(1.7)	9(1.5)	9(1.5)	33(5.5)
Variability in rainfall	33(5.5)	37(6.2)	32(5.3)	36(6.0)	138(23.0)
Lack of water	14(2.3)	21(3.5)	19(3.2)	13(2.2)	67(11.2)
Poor soil conditions	7(1.2)	9(1.5)	7(1.2)	9(1.5)	32(5.3)
Pest attacks	11(1.8)	13(2.2)	20(3.3)	18(3.0)	62(10.3)
Lack of markets in vicinity	16(2.7)	6(1.0)	9(1.5)	9(1.5)	40(6.7)
New crops have shorter life cycle	12(2.0)	4(0.7)	7(1.2)	10(1.7)	33(5.5)
Total	150(25.0)	150(25.0)	150(25.0)	150(25.0)	600(100.0)

Source: Field Data

Note: Figures in the parentheses indicate the percentage to the respective coping strategies

3.1.4. Farmer's own response to associated problems during drought

Household's response to various problems associated with drought reveals very poor supports facilities for agriculture in these areas (Table 6). Approximately 34.5% of the total households surveyed reported severe lack of irrigation facilities, while 25% households reported lack of High Yield Variety (HYV) seeds. Approximately 5.2% households reported lack of fodder crops, while 6.3% of them reported having no crop insurance.

Thus about 24.5% of the total rural households surveyed reported serious lack of various kinds support system of agriculture. Significant variation has been noted across the territory in this regard.

Lack of irrigation is one of the major problems in drought prone villages in the territories. However, the scenario is worse in Anantapur, Kadapa and Kurnool districts. Farmers responded well with their suggestions to tackle these associated problems of drought in the desert and drought prone areas in Rayalaseema region.

ISSN (online): 2320-9836
ISSN (Print): 2320-9828

Table 6.District wise problems faced by the farmers during the drought season

Name of the District	Lack of irrigation	Lack of seeds (HYV) / Fertilizers	Lack of equipment	Lack of knowledge about drought crops	No crop insurance	Lack of fodder crops	Regular crop failure	Total
Anantapur	60(10.0)	32(5.3)	20(3.3)	11(1.8)	14(2.3)	9(1.5)	4(0.7)	150(25.0)
Chittoor	44(7.3)	39(6.5)	22(3.7)	21(3.5)	11(1.8)	8(1.3)	5(0.8)	150(25.0)
Kadapa	52(8.7)	38(6.3)	25(4.2)	11(1.8)	2(0.3)	5(0.8)	17(2.8)	150(25.0)
Kurnool	51(8.5)	41(6.8)	15(2.5)	17(2.8)	11(1.8)	9(1.5)	6(1.0)	150(25.0)
Total	207(34.5)	150(25.0)	82(13.7)	60(10.0)	38(6.3)	31(5.2)	32(5.3)	600(100)

Source: Field Data

Note: Figures in the parentheses indicate the percentage to the respective response on various problems

3.1.5. Occupational diversification

Another common coping strategy adopted among the households was shifting their occupation from agriculture to other unskilled non-farm activities. Agriculture is the main livelihood source among the community, but during a crisis situation when there is crop loss, the cultivators shifted from agriculture to non-agriculture activities. The landless labourers, shifted from agricultural labour to non-agricultural labour activities. The details of occupational diversification during drought periods presented in the Table 7. The results testify that in Anantapur district around 29.56%, Chittoor district around 23.47%Kadapa district around 25.67 and Kurnool district around 21.30% of the households shifted their line of work, whereas in selected villages in Rayalaseema region around 230 sample households shifted their line. Most of the small and marginal landholding cultivators informed that they shifted their occupation and played in different activities such as construction of building workers and as MGNREGA workers.

Table 7. Occupational diversification of farm households

Occupational diversification	Anantapur	Chittoor	Kadapa	Kurnool	Total
Dairy	14(28.57)	12(24.48)	13(26.53)	10(20.42)	49(100.0)
Private service	1(33.33)	1(33.33)	0(0.0)	1(33.33)	3(100.0)
Animal Husbandry	20(29.85)	14(20.89)	18(26.86)	15(22.38)	67(100.0)
Business	5(15.62)	9(28.12)	14(43.75)	4(12.5)	32(100.0)
Agricultural Labour	23(31.08)	18(24.32)	14(18.91)	19(25.67)	74(100.0)
Fishery	5(100.0)	0(0.0)	0(0.0)	0(0.0)	5(100.0)
Total	68(29.56)	54(23.47)	59(25.67)	49(21.30)	230(100.0)

Source: Field Data

Note: Figures in the parentheses indicate the percentage to the respective farm households

3.1.6. Selling of assets

Due to shortage of food in the household, and to lack job opportunities, the livestock was either sold or suffered from mortality. Therefore, drought might reduce the holding of the livestock in two ways: directly by mortality, or indirectly through distress sale [6]. During the period of crisis the households sold their livestock in order to cope with the adverse state of affairs. Households possessing livestock either took a loan using their animals as collateral or sold their animals, depending on their valuation of market prices.The results show (Tables8-9) that about 41.3% of sample households sold their stock during the drought period in order to cope with the distress, whereas in Kadapa and Anantapur districts comparatively number (10.8 and 10.7%) of households sold their stock. This was due to lack of forest resources near the study villages. Another cause for the higher sale of livestock in the survey region may be ascribable to the high pace of migration from the villages. Most people in the study region migrated from the village in search of jobs; hence, they opted to sell their animals. When the head of the household migrates out, they prefer to sell the animals in order to bring down the loading on the female member.

ISSN (online): 2320-9836
ISSN (Print): 2320-9828

The sale of farm tools was high in Kurnool and Kadapa districts when compared to remaining districts. There were instances where the households were even forced to sell their land in order to cope with the drought. During the serious drought, around 7% of the small farmers, 4.7% of the semi-medium farmers, 3.2% of medium farmers, 1.5% of large farmers and 0.8 % of marginal farmers sold their nation in order to cope with the distress position. The sale of land was higher among the low and marginal farmers compared to the great and medium farmers. This indicates that there is a downturn in the economy, where the landed households joined the group of landless labourers because of the drought situation.

3.1.7. Seasonal migration

Rural poverty and natural calamity are obviously closely associated. The poor in developing countries reside primarily in rural regions, and are dependent on farming. Migration is often a direct reaction to cope with natural disorders and rural poverty. The individual, family and the community adopt strategies for coping with drought, of which out-migration is an important one. Migration may be regarded as percentage of a household survival strategy, even during non-drought years, whereby a family allocates part of its project for non-farm employment. On that point there are numerous evidences that the people from rural areas migrate to other rural areas or nearby urban areas for survival**.** In [6] most of the villages in Rayalaseema region the contractor fixes a contract for a period of four to six months and the laborers work as bonded laborers in activities such as brick making and building. Such seasonal migration generally takes place during the post-monsoon season. Some portions of the survey region, peoples were migrated to Gulf countries like Kuwait, Qatar and Dubai to work as drivers, agricultural laborers, shepherds and especially adult females were operating as a maid of the homes.The present study finds that migration is an important coping mechanism adopted by the sample households during the crisis. The outcome shows that out of 600 farm households around 182 (30.4%) farmers migrated, whereas approximately 7% migrate out in Kurnool district, in order to cope with the distress situation - the pace of migration was noted to be higher in Anantapur and Kadapa districts (9% and 8.2%) compared to Chittoor district (6.2%). The details of caste wise, size wise and age wise number of persons were migrated during drought year furnished in the Tables 10-13.

Table 8. District wise households engaged in selling of productive assets during drought

S.No	Type of Asset sold	Anantapur	Chittoor	Kadapa	Kurnool	Total
1.	Selling of Animals*	64(10.7)	58(9.7)	65(10.8)	61(10.2)	248(41.3)
2.	Selling of Assets	43(7.2)	55(9.2)	45(7.5)	47(7.8)	190(31.7)
3.	Selling of Land and Buildings	30(5.0)	23(3.8)	24(4.0)	26(4.3)	103(17.3)
4.	Others	13(2.2)	14(2.3)	16(2.7)	16(2.7)	59(9.8)
All of the above		150(25.0)	150(25.0)	150(25.0)	150(25.0)	600(100)

Source: Field Data

*Note: *Refers to large animals such as cattle, buffalo, bullocks, goats and sheep's*

Table 9. Size of Land Holdings wise households engaged in selling of productive assets during drought

S.No	Type of Asset sold	Marginal Farmers	Small Farmers	Semi-medium Farmers	Medium Farmers	Large Farmers	Total
1.	Selling of Animals*	14(2.3)	107(17.8)	68(11.3)	30(5.0)	29(4.8)	248(41.3)
2.	Selling of Assets	12(2.0)	81(13.5)	49(8.2)	19(3.2)	29(4.8)	190(31.7)
3.	Selling of Land and Buildings	5(0.8)	42(7.0)	28(4.7)	19(3.2)	9(1.5)	103(17.3)
4.	Others	4(0.7)	25(4.2)	21(3.5)	5(0.8)	4(0.7)	59(9.8)
All of the above		40(6.7)	250(41.7)	166(27.7)	73(12.2)	71(11.8)	600(100)

Source: Field Data

*Note: *Refers to large animals such as cattle, buffalo, bullocks, goats and sheep's*

ISSN (online): 2320-9836
ISSN (Print): 2320-9828

Table 10. District wise number of persons migrated during drought

Name of the district	Yes	No	Total
Anantapur	54(9.0)	96(16.0)	150(25.0)
Chittoor	37(6.2)	113(18.8)	150(25.0)
Kadapa	49(8.2)	101(16.8)	150(25.0)
Kurnool	42(7.0)	108(18.0)	150(25.0)
Total	182(30.4)	418(69.6)	600(100.0)

Source: Field Data

Note: Figures in the parentheses indicate the percentage to the respective migrated persons

Table 11. Caste wise distribution of number of persons Migrated by Farm Households

District	Caste Groups				Total
	OC	BC	SC	ST	
Anantapur	14(9.3)	16(10.7)	19(12.7)	5(3.3)	54(36.0)
Chittoor	9(6.0)	16(10.7)	10(6.7)	2(1.3)	37(24.7)
Kadapa	17(11.3)	18(12.0)	11(7.3)	3(2.0)	49(32.7)
Kurnool	15(10.0)	9(6.0)	14(9.3)	4(2.7)	42(28.0)
Total	55(9.2)	59(9.8)	54(9.0)	14(2.4)	182(30.4)

Source: Field Data

Note: Figures in the parentheses indicate the percentage to the respective caste group

Table 12. Distribution of number of persons Migrated of Farm Households by Size of Land Holdings

District	Size of Land Holdings					Total
	Marginal	Small	Semi-medium	Medium	Large	
Anantapur	0(0.0)	20(13.3)	19(12.7)	7(4.7)	8(5.3)	54(36.0)
Chittoor	1(0.7)	17(11.3)	9(6.0)	5(3.3)	5(3.3)	37(24.7)
Kadapa	0(0.0)	31(20.7)	10(6.7)	5(3.3)	3(2.0)	49(32.7)
Kurnool	11(7.3)	16(10.7)	7(4.7)	5(3.3)	3(2.0)	42(28.0)
Total	12(2.0)	84(14.0)	45(7.5)	22(3.7)	19(3.2)	182(30.4)

Source: Field Data

Note: Figures in the parentheses indicate the percentage to the respective size group

Table 13. Age wise distribution of number of persons Migrated by Farm Households

Age groups	Name of the District				Total
	Anantapur	Chittoor	Kadapa	Kurnool	
25 to 35	10(6.7)	2(1.3)	1(0.7)	1(0.7)	14(2.3)
36 to 45	13(8.7)	13(8.7)	18(12.0)	16(10.7)	60(10.0)
46 to 55	16(10.7)	17(11.3)	17(11.3)	12(8.0)	62(10.3)
56 to 65	15(10.0)	5(3.3)	13(8.7)	13(8.7)	46(7.7)
66 to 75	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(100.0)
Total	54(9.0)	37(6.2)	49(8.2)	42(7.0)	182(30.4)

Source: Field Data

Note: Figures in the parentheses indicate the percentage to the respective age group

Migration depends on the social network process of the rural people. However, some people are forced to migrate without having any objective other than to find a livelihood. They migrate in order to cope with the vulnerable place. As these types of people do not have any link in the cities or townships, they do not find jobs right away. The frictional unemployment period is very much painful for them as well as to their family members [7]. Within the study area backward communities are higher percentage to migrate and it is 32.4%. Followed by forward communities and scheduled castes 30.2 and 29.6% respectively.

ISSN (online): 2320-9836
ISSN (Print): 2320-9828

The number of persons who migrated from farm households by size of land holdings is also observed in the study area. The majority of the small farmers (46.2 %) in the subject area are migrating to other stations, followed by semi-medium farmers (24.7 %), medium farmers are 12.1 %; large farmers are 1.04 % and 6.5 % of marginal farmers were migrated.

Migration also depends on a person's capacity to migrate. Actually it depends on the age. Otherwise forced migration or distress migration, helping households cope with calamity, can result in long-term adverse consequences, socially and economically. Sometimes, migrant families that migrate to distant places do not return in time to restart their normal agricultural activities even when the drought is over. In the study area the age group between 46-55 and 36-45 are high and it denotes 34.1 and 32.9 %. The remaining age groups 56-65 and 25-35 are 25.3 and 7.6 % respectively. Income from seasonal migration was observed to be a common practice among the households even during a normal year. It is seen as an important source of income, especially among the small, marginal and the landless labourers. Compared to the large and medium landholders, the other categories of households migrate more, due to their lack of resources.

3.2. Other important coping mechanism adapted by farm households

3.2.1. Consumption adjustments

Since rice is a staple food, a production loss can be expected to result in major adjustments in the household food balance. These adjustments could range from reduced sale of rice, through a reduced quantity retained as seed for the next year, an increased quantity of purchase rice, a substitution of other crops for rice in the consumption basket, and supplementation of the food deficit by other characters of food not normally eaten, too, in the worst-case scenario, a reduction in consumption.

Results from the survey indicate that all these types of adjustments are made to varying degrees. One of the major effects of yield loss is reductions in the quantity sold, the amount of seed saved for the subsequent year, and the quantity stored for future function. The amount of rice sold during drought years decreased by 72-88 per cent compared to normal years. This decrease in marketing quantity would obviously cause a price effect in the local grocery store, which, if not neutralized by the inflow of grains from other areas, would result in an overall decrease in expenditure per capita. This price effect is likely to accept a regressive impact on the wellbeing of poor labourers and marginal farmers, who spend a bigger percentage of their income on rice.

3.2.2. Expenditure adjustments

A forced adjustment in expenditure is a legitimate outcome of income loss. Reduced expenditures on some non-indispensable items such as wear and social functions will not have much welfare effect. However, farmers often reduce expenditures even on essential items such as food and medical treatment. Such cuts are more probable to have adverse short- and long-term consequences. More than 50 per centime of the farmers also reported curtailing children's education. This apparently counterintuitive result occurs for three reasons. First, parents may be ineffective to see the recurring price of training, although the absolute amount may be diminished. Second, adolescent children may be plucked out of school as labour to augment family income. Third, children leave school to come with their migrant parents, who are unlikely to be able to re-enrol children in the new location due to the seasonal nature of migration. Lack of familiarity with the new position and poor social integration of the seasonal migrant community with local residents may aggravate the trouble.

Any the reason, interruption of children's education is a disinvestment in human capital that will most definitely cut their future earning potential. So an important pathway to break away from poverty may be forbidden as a consequence of drought.

3.2.3. Crop management adjustments

Analysis of farmers' various adjustments in rice production practices indicates that, overall, the farmers do not seem to have much flexibility in making management adjustments in the rice crop in relation to drought. This could partly be due to the fact that drought mostly occurs in the late season, by which time opportunities for crop management adjustments are no longer available.

ISSN (online): 2320-9836
ISSN (Print): 2320-9828

Other than delaying crop establishment if the rains are late, replanting and re-sowing when suitable opportunities arise, and some decrease in fertilizer use, farmers mostly follow a stock set of practices irrespective of the natural event of drought. The timing of drought (mostly later rather than early) and the lack of suitable technological options have probably limited flexibility to make tactical adjustments in harvest management practices. As a consequence, most farmers seem to have got an outward-looking strategy of generating income through migration in times of drought.

3.2.4. Credit

Borrowing to smooth out seasonal fluctuations in agricultural income is a normal and steady activity in rural fields. Borrowing may be in both cash and kind. During periods of suffering such as drought, reliance on borrowing tends to increase. Study data indicated that the number of farmers who borrow increased during drought years. Farmers borrowed mainly cash, rice for consumption or seed, other food crops, and germs of other crops. Still, reliance on borrowing as a drought management strategy varied across countries. Borrowing does not have adverse welfare consequences when credit markets are competitive. However, adverse economic and social consequences can arise in rural areas where such markets are poorly developed. When credit markets are not competitive, lenders may be tend to extract more payments from borrowers by raising the interest rate or by extracting additional payments in other ways. Borrowers reported that the interest rate of borrowing during drought years increases by 5-9 %age points.

In Anantapur and Kurnool districts, farmers reported an average interest rate of as much as 33 per cent per annum during drought years. Such a high interest rate obviously could force poor farmers into a perpetual debt trap. Borrowing from landlords and friends was very common among the villagers. Most of the borrowing was mainly informal. They generally borrowed from friends and large farmers in the small town and in that respect were also cases of borrowing from landlords. They also borrowed from the contractor under whom they worked. The borrowing could be in the shape of hard currency as well as farm, and under the condition to yield back the amount in terms of work during the next cropping season. Nevertheless, when borrowing from the contractor, they bore to work extra hours or days to repay the loan. The study found that borrowing was a regular practice among the villagers, but the volume of borrowing increased during the drought period when compared to the normal period.

3.2.5. Reliance on relief support

Government-sponsored relief programs can function as an important safety net. Although the Government of India spends substantial resources on relief programs, it does not appear to have extended to needy people adequately. In the villages studied, the number of households that participated in drought relief programs was relatively low and ranged from 10 to 28 per cent. The limited coverage and amount of assistance received per household generally reduced the strength of these plans. During the drought situation many people engaged in Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) activities. However, there were complaints regarding not getting appropriate days of employment when needed. Even though the masses were quite interested to work as MGNREGA labourers, they at best received only approximately 15 to 21 days of use. The non-availability of employment in the MGNREGA program during the drought period, forced the poor and marginalized community to migrate away.

4. Conclusion

Drought brings on a complex circle of highly differentiated adverse impacts that ripple through many sectors of the economic system. It affects the biophysical, socioeconomic, and environmental sectors of the region hit. Drought contributes to food insecurity, malnutrition, starvation, poverty, disinvestment in human capital, and reduction in the financial resources. The present study attempted to analyze the different coping mechanisms adopted, at the household level. Realizing the impact of drought and the coping strategies might provide better inputs for the policy implication.

ISSN (online): 2320-9836
ISSN (Print): 2320-9828

The present study provides the insides from twenty four villages from the Rayalaseema region of Andhra Pradesh. The inside from the present micro-level analysis indicates that the adverse impact of drought at household level. Crop loss was observed to be high in most of the villages. Further, the burden of income loss forced the people into the poverty trap during that period, while lack of resources and non-existence of institutional support during the drought period adversely affected the income of the families. At that place were local-level coping strategies adopted by the villagers to overcome the adverse effects of drought; these included sales of stock and assets, shift in occupational diversification, migration and other mechanisms. Yet, the community in the other study village coped with the drought by migrating. This involved a distress-led migration rather than developer-oriented migration. People with a few assets, such as smaller landholding size, absence of irrigation, and deficiency of other assets, namely livestock, migrated more compared to the others. The other major coping mechanisms included selling of stock and gold or silver jewellery, reduction and change in the consumption pattern, and shifting the occupational pattern. Generally the resource-poor farmers were pressured to trade their assets during the distress position.

Traditional knowledge on the coping mechanisms of the farmers is also effective in reducing vulnerability of the masses. These coping strategies should be backed up by scientific and technical methods so that the losses due to climatic extreme events can be minimized to a large extent.

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The Publication fee is defrayed by Indian Society for Education and Environment (www.iseeadyar.org)
Cite this article as:
Dr. M. Swarna Pragathi, Dr. M. Anitha. Coping Strategies during drought situation: a case of dryland farmers in Rayalaseema Region of Andhra Pradesh, India. Indian Journal of Economics and Development. September 2019, Vol 7 (9), 1-14.

Received on: 12/08/2019
Accepted on: 10/09/2019