

Working Paper No. 116  
RULNR Working Paper No. 17  
August, 2012

# Livelihood Pattern and Coping Mechanisms during Drought: A Study of Two Villages in Odisha

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*(Supported by Jamsetji Tata Trust)*



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## **Acknowledgements**

The study is a part of the project funded by the Jamsetji Tata Trust, Mumbai, I am highly grateful to the trust for this support. I would like to sincerely thank Prof. M. Gopinath Reddy, the Principal Coordinator-RULNR, who was highly supportive of during all stages of the research work. The suggestion and the comments provided by the referees helped in different ways to shape this paper, I highly acknowledge their effort. Last but not the least, I thank all the field investigators who were engaged with me during the whole period.

**Author**

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## **ABSTRACT**

The present study makes an attempt to understand the impact of drought on the social and economic conditions of the people. The impact of the drought can be seen at two levels: impact on the food security pattern and on the economic condition. The study also attempts to understand the different coping mechanism adopted by households when they face a drought like conditions. The units of the analysis are households in a village. The work is based on intensive field work based on two villages in a region in Odisha which is identified as drought prone i.e., KBK districts. The two villages are situated in Balangir district. The impact of drought leads to the reduction in food security of the households. The strategies used by households were sale of livestock, asset and shift in employment pattern and migration of people. The study shows that the economic loss of drought leads to disinvestment and adversely affects the asset creation of the farm households. The inability of poorer households to adopt proper coping strategies may increase vulnerability and widen gap between the rich and the poor. The poor and marginalised community of the backward region, without proper coping strategies, lack of provision of institutional arrangements and lack of assets pushed the people behind the poverty trap due to the occurrence of repeated distress situation like drought.

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## Chapter: I

### Introduction

In India, 35 percent of the area receives rainfall between 750 mm and 1100 mm, and is considered as drought prone. Most of the drought prone areas lie in the arid (19.6 percent), semi-arid (37 percent), and sub-humid (21 percent) areas of the country, that occupy 77.6 percent of its total land area of 329 million hectares. Around 33 percent of the area receives less than 750 mm of rainfall and is chronically drought prone, while 16 percent of the area receives less than 500 mm of rainfall (large area of Peninsular India and Rajasthan). On an average, rainfall gets erratic every four out of ten years (Ministry of Agriculture/Drought Management Division, 2008). Around 30 percent of the net sown area comes under the semi-arid region, and around 43 percent of total the net sown area is irrigated.

The agricultural production as well as income in the rainfed areas encounters climatic fluctuations (seasonality) and drought on a periodic basis. Drought is a common feature in rainfed agriculture. Conceptually, drought is described as a situation of limited rainfall that is substantially below what has been established to be "normal" for the area concerned (Pandey and Bhandari, 2007). According to Gautam and Rao (2007), the risk involved in crop cultivation in drought-prone areas depends on the nature, duration, and periodicity of occurrence of drought within the season. In the arid region where the mean annual rainfall is less than 500 mm, often drought is almost predictable. In the semi-arid regions (mean annual rainfall 500-750 mm), droughts occur in 40 percent to 60 percent of the years due to deficit seasonal rainfall or inadequate soil moisture availability between two successive rainfall events. Thus, those areas in the country, which receive less than 750 mm of rainfall, are classified as drought-prone; this includes 35 percent of the country's total area, and covers 39 percent of India's total rural population (Subbiah, 2004). The percentage of area in India where the frequency of drought varies between 2-3 years covers around 13 percent of the total geographical area, 11 percent of the total cropped area, and 6 percent of the rural population. The share of area where the frequency of drought is four years covers 36 percent of the geographical area, 42 percent of the total cropped area, and 36 percent of the rural population. In around 30 percent of the country's total geographical area, drought

reoccurs every five years, and covers 37 percent of the rural population, and 30 percent of the total gross cropped area (Jodha, 1988).

The impact of drought may be physical, social, economic or environmental. The present study emphasises on analysing the impact of drought on the economic and social conditions of the poor people in the rural areas. The other possible impacts of drought are out of the scope of coverage of this present study.

### **Review of Past Studies**

According to the National Commission of Agriculture in India, drought is classified as: a) meteorological drought; b) hydrological drought; and c) agricultural drought. *Meteorological drought* is defined as a situation where there is significant decrease from normal precipitation over an area, i.e., more than 25 percent decrease. More precisely, meteorological drought is defined as an occasion when the rainfall for a week is half of the normal or lesser; i.e., when the normal weekly rainfall is 5 mm or more. *Agricultural drought* occurs when soil moisture and rainfall are inadequate to support healthy crop growth to maturity and cause crop stress and wilting. From the farming point of view, agricultural drought refers to drought during the growing season. It is defined as a period of four consecutive weeks of drought between May and the middle of October. *Hydrological drought* may be a result of long-term meteorological drought which results in the drying up reservoirs, lakes, streams, and rivers, and a fall in the ground water level. Conceptually, drought is considered to describe a situation of limited rainfall that is substantially below what has been established to be a "normal" value for the area concerned (Pandey and Bhandari, 2007).

The ICAR divided the whole country into 20 agro-climatic zones, by considering indicators such as rainfall, soil type, and length of growing period, to define the zones. When rainfall and access to irrigation were considered as the defining features of dryland agriculture, 15 zones came under the category of either completely or partially dryland agriculture zones. Table 1.1 presents the details of occurrence of drought in the different meteorological sub-divisions in India. It has been observed that the occurrence of the drought is very frequent in the sub-divisions such as West Rajasthan, Tamil Nadu, Jammu & Kashmir, and the Telangana Region of Andhra Pradesh.

The rainfed areas in the country contribute about 42 percent of the total food grain production. Most of the coarse grains such as sorghum, pearl millet, finger millet, and other millets are grown in drylands (Rao, 2004). Rainfed crops account for about 48 percent of the area under food crop, and about 68 percent under the non-food crops (Ministry of Agriculture, 2008). In such areas, the kind of crop grown and the yield

obtained from them are determined specifically by the seasonal concentration of rainfall, its variability, quantity, and the timing (Joshi, 2001; Prabhakar and Shaw, 2008).

**Table 1.1: Probability of Occurrence of Drought in Different Meteorological Sub-Divisions**

Meteorological Sub-Division	Frequency of Deficient Rainfall (75% of normal or less)
Assam	Very rare, once in 15 years
West Bengal, Madhya Pradesh, Konkan, Bihar, and Odisha	Once in 5 years
South Interior Karnataka, Eastern Uttar Pradesh, and Vidarbha	Once in 4 years
East Rajasthan, Gujarat, and Western Uttar Pradesh	Once in 3 years
West Rajasthan, Tamil Nadu, Jammu & Kashmir, and Telangana Region of Andhra Pradesh	Once in 2.5 years

*Source:* Ministry of Statistics and Programme Implementation, Govt. of India. [www.indiastat.com](http://www.indiastat.com).

A total of 218 districts in the states of Punjab, Haryana, Rajasthan, Uttar Pradesh, Madhya Pradesh, Chhattisgarh, Gujarat, Maharashtra, Andhra Pradesh, Karnataka, and Tamil Nadu are rainfed (Singh et al., 2000). In these belts, cultivation of coarse cereals (91 percent), pulses (91 percent), oilseeds (80 percent), and cotton (65 percent) are predominate (Sharma and Singh, 2006). Moreover, in these areas, higher dependency on the livestock, as an alternative source of income, is observed. This shows the importance of rainfed agriculture in the Indian economy as well as for the food security of the people.

The people in drought-prone areas generally cultivate multiple crops, and do not specialize in a particular crop due to the high risk involved in the cropping pattern (Mohanti and Padhi, 1995; Pathy, 2003). Mixed and multiple cropping methods are not only strategies for crop protection from pests, but also help to spread/minimize the risk (Pionetti and Reddy, 2002). Crop diversity constitutes one of the pillars of agriculture in semi-arid regions. However, crop diversification in rainfed/dryland areas again depends upon factors such as the size of operational holding (Pathy, 2003), and wealth (Arrow, 1990).

In the drought-prone areas, with the increase in the fragmentation of land, which does not have irrigation facilities, the poor farmers never gain much from the farming activity

(Pathy, 2003). Even when they manage to obtain the necessary implements, bullocks, seeds, etc., they rarely acquire the required skills, given the very small size of the holdings and their lack of experience as owner-cultivators; thus, the farmers are unable to earn more income (Kshirsagar, Pandey and Bellon, 2002). Apart from agriculture the "household industry" and "other services" (in which the bulk of non-agricultural workers are engaged) largely include rope-making with *sabai* grass, and tassar-cocoon rearing and weaving.

The backward drought-prone regions are also characterized by overcrowding in the agricultural sector, increasing small size of holdings, absence of irrigation, and a number of other socio-cultural factors. Further, knowledge transfer is minimal in these regions, and information regarding new production is limited to relatives and neighbours (Mahapatra, 1978). Another prominent feature of the rainfed areas is multi-cropping. The farmers in the rainfed areas generally cultivate multiple crops and do not specialize in a particular crop, due to the high risk involved in the cropping pattern. The size of the operational holdings is a major deciding factor regarding the type of crop to be cultivated (Mohanti and Padhi, 1999; Pathy, 2003). Risk aversion is expected to be negatively correlated with wealth, which in rural societies is mainly agricultural land (Arrow, 1970). Thus, diversity may be negatively correlated with the farm size.

The agents in the dryland areas prefer to cultivate the traditional varieties of crop rather than the modern ones, as the traditional varieties contain lesser risk than the modern varieties. However, the traditional varieties generate lesser profit compared to the modern varieties, leading to an increase in the inequality among the coastal regions and the dryland regions (Kshirsagar and Bellon, 2002). The small size of the operational holdings, as well as the absence of irrigation facilities, hindered the modernization of agriculture (Singh, 1982). The shift of the workers from farm to non-farm sector was identified to be different in pattern in the backward regions compared to the developed regions (Jha, 2005). In the backwards regions, the shift from the farm to non-farm activities is mainly driven by distress-led factors rather than development-oriented ones. Further, the share of the workers in the farm sector was also found to be higher in these regions. The very high percentage of agricultural labour is also an index of the non-availability of alternative non-agricultural employment (Mahapatra, 1978).

Drought affects slowly over a considerable period of time and the impact may linger even for years even after the termination of the event. The occurrence and severity of the drought adds confusion to the efforts made by the government for a suitable planning. Drought produces a complex set of highly differentiated adverse impacts that undulate through many sectors of the economy. It affects the biophysical, socio-economic, as well as the environmental sectors of the affected region (Pandey, Bhandari and Hardy,



2007). Drought leads to food insecurity, malnutrition, starvation, poverty, disinvestment in human capital, and reduction in the financial resources (Pandey, Bhandari and Hardy, 2007; Hedlund, 2007; Ababa, 2007). For example, in the village of Jhabua in Madhya Pradesh, the incidence of drought caused failure of crops such as wheat, groundnuts and cotton, and the production of all the Kharif crops was less than 10 percent of the normal production. There was also a big loss in fodder availability which was only 13 percent of the normal availability. Further, as a result of non-availability of fodder and water, milk production also reduced. Finally, death and distress sale of cattle was the long-term loss that occurred during the drought period (Joshi, 1999).

One of the sectors where the immediate impact of drought is felt is agriculture. With the increased intensity or extended duration of drought prevalence, a significant fall in food production is often noticed. Drought results in crop loss of different magnitudes, depending on its geographic incidence, intensity, and duration. Drought not only affects the food production at the farm level, but also the national economy and the overall food security (SAARC/SDMC). The estimation conducted by Pandey and Bhandari (2009) shows that the crop loss due to drought in Eastern India was calculated to be around 80 percent. The loss of rice yield during drought years was calculated to be between 25 and 40 percent in Jharkhand and Odisha, respectively; in Chhattisgarh, where there was complete crop failure during the 2002 drought, the crop loss was almost 100 percent. They also calculated the loss of farmer's income during drought, and found it to be around 24 percent, 26 percent, and 58 percent in Jharkhand, Odisha and Chhattisgarh respectively. The overall impact of drought was summarised to be on the decline in the crop area under cultivation, thus leading to a decline in the agricultural production and in turn, a fall in the level of employment. This consecutively led to a fall in the income and the purchasing power of those engaged in agricultural activity (Pandey and Upadhyay, 1979; Dubhashi, 1992; Muranjan, 1992; Uddin, 1984; Acharya, 1992). Drought also leads to scarcity of drinking water and food grains, which results in an increase in the price of food grains and other commodities. As a result, drought leads to the reduction in the calorie intake, which results in different health problems as well as death due to malnutrition among children. Moreover, the fall in the effective demand from the agricultural sector leads to the slowing down of the economic activity in the secondary and tertiary sector.

The effects of drought can be classified as short term and long term. Short-term effects include decline in the crop area and agricultural activity, which in the long run, lead to the migration of people to other areas. The consequence of drought in the short run adversely affects the food grain production which can lead to a drop in employment and income, which in the long run, leads to distress sale of assets and migration out of

the village. Another short-term effect of drought is decline in the food stock; this leads to increase in food grain prices, and thus, there is reduction in the intake of food. This leads to starvation and in the long run, affects the health of people.

The severe drought-like situations force the poor households to sell their assets for survival. In this process, the marginal farmers join the group of landless labourers - during a drought they remain landless for a long time as they do not have any means of recovering their lands (Dubhashi, 1992).

The poor households in the backward drought-prone areas are affected by both demand side and supply side factors: The price at which the farmers sell their assets during the drought period is lower compared to the purchase price of the assets in the normal year. On the other hand, the price of these assets acquires greater momentum during the post-drought year, and nearly doubles the amount at which these assets were sold during the drought year. Contrastingly, in case of agricultural produce such as food grains and fodder, the prices are quite high during the drought period and lower during the post-drought period. Thus, the extent of loss in the process is more than the sustenance income (Jodha, 1978).

Economic loss during drought leads to disinvestment, which adversely affects the asset creation of the farm households. It is identified in the literature that the farm households adopt different coping mechanisms to overcome the distress situation - the *ex-ante* and *ex-post* coping mechanisms are of different types depending upon whether they help to reduce the risk or reduce the impact of the risk. Some of the strategies are also identified as influential in handling the distress situation. The multiple coping mechanisms adopted by the households include cutting the quantity of meal, change in occupation, selling of assets, and migrating out (Nath, 2002; Mishra, 2007; Mworio and Kinyamario, 2008; Pandey and Bhandari, 2009).

Broadly, the literature identified two types of coping strategies among the peasant households in dryland areas to handle distress situations. Such mechanisms involve both activities undertaken in anticipation of rainfall variability, called *ex-ante* or risk management strategies, and response to drought, known as *ex-post* or crisis management strategies. The type of initiatives that a farmer takes before a particular climatic event (monsoon fluctuation or bad rainfall) is known as *ex-ante*. These risk management mechanisms are based on the expectations of the likelihood of the bad or good events, which are in turn primarily based on historical experience. These activities are called risk-reducing strategies. On the other hand the activities that take place after the event, i.e., *ex-post* activities, attempt to rearrange what has already occurred (Stern, 1999). If the risk-averse households are not able to achieve an entirely smooth consumption path

through *ex-post* mechanisms such as insurance, saving and credit transaction, they have an incentive to devote resources *ex-ante*, in an effort to secure a more stable income stream (Ramswami et al., 2004). The *ex-ante* coping mechanisms can also be called the "income smoothing mechanisms", and the *ex-post* mechanisms can also be referred to as "consumption smoothing mechanisms" (Bhandari *et al.*, 2007). It has been pointed out by Jodha (1981) that the *ex-ante* strategies are often identified as permanent features of the farming systems and therefore, their role in risk management is sometimes overlooked. The different types of *ex-ante* coping mechanisms include diversification of crops, relying on non-farm activities, investment/disinvestment in irrigation and fertilizers, accumulation of assets, purchase of crop or weather insurance, share cropping, arrangement to share with family, and diversification of income sources. The *ex-post* coping mechanisms include reducing inputs for production, changing crops, depending upon irrigation, buying or selling assets, receiving or providing transfer, seeking non-agricultural employment, and migration.

However, these coping mechanisms again differ from one region to another and also among the class structures. For example, the coping strategies of the large landholders vary from that of the small or marginal landholders. These coping mechanisms again have some opportunity cost involved. For example, the cultivators can shift from superior crop cultivation to inferior or traditional crop varieties; but that in turn reduces the income of the cultivators compared to the normal year, compared to the cultivators in other areas. These coping mechanisms often reduce the capital investment of the poor farmers. Again the poor backward farm households depend upon some non-market institutions for the credit to cope with drought. However, these are very costly, and this affects the long-term income growth of the farm households. Thus, these coping mechanisms adversely affect the asset creation of the backward households, and push them into poverty.

The various economic policies implemented for the development of dryland agriculture did not produce impressive results (Ramakrishna and Rao, 2008). The farmers in the dryland areas are poor, and thus extract less from the different macro-economic policies (Harriss, 1984; World Bank Report, 2006). It is necessary to understand the issues related to the drought-prone areas in order to achieve not only food security but also equity: for example, intensive irrigated farming is imperative for survival, as the income of the farmers in the dryland areas is much lower compared to that of the farmers in the irrigated areas (Jodha, 1989; Singh, 1989; Rao, 1991; Ninan and Chandrashekar, 1993).

In the rainfed semi-arid region, the variation in the amount and distribution of rainfall influences the crop production as well as the socio-economic conditions of the farmers. The farmers in the drought-prone areas have their routine plan for managing the

uncertainty associated with seasonal fluctuations and periodic drought-induced crises (Chen, 1991). The households have developed resilience under hardship, variability, and the risk that is based on historic and current adaptive knowledge and skills (Harriss, 1984). Such skills are increasingly recognised, though it is commonly claimed that such capacities are not sufficient to cope with the speed of change, especially in the climate. The strategies to cope with the seasonality and crisis again depend upon the specific location/region and the socio-economic condition of that particular area (World Bank Report, 2006; Gautam and Rao, 2007). Thus, the micro-level understanding of the specific problems in a particular rainfed semi-arid region might be helpful for strengthening the policy issue. The impact of the drought and the crisis is also different for the different cultivator groups (Rani *et al.*, 2007).

**In this backdrop the present project addresses the central question:**

What are the adverse effects of drought on the economic status of the poor households?  
What are the coping mechanisms adopted by the households in these areas in order to cope with the distress situation?

**Objectives**

1. To analyse the economic loss among the households due to drought at the aggregate.
2. To examine the impact of drought on the household level / on the different types of cultivators and the agricultural labourers (marginal, small, medium and large).
3. To analyse the farmers' coping mechanisms both for the short term and the long term.
4. To find out some alternative options for technologies and policy implications for a better management of drought situations.

**Research Questions**

1. What is the impact of the drought on the income of the agent in the dryland areas at the aggregate level?
2. Which section of farmers is more prone to risk in rainfed agriculture?
3. What are the different coping mechanisms adopted by the different classes of farm households?
4. What are the institutional support mechanisms available for coping with the adverse situation, and what section of farmers gain from that?

## Data and Methodology

In Odisha on an average drought occurs once in every five years (Panda, Panda and Sarangi, 2004). The workers engaged in the agriculture sector in the dryland areas constitute around 60 percent of the work force in Odisha, which would have implications on their livelihood patterns. The issue is more severe in the case of drought-prone areas where the yield is low and income is uncertain. Such a dilemma would definitely pose problems for the livelihood of the people who are directly linked to agriculture. This would also have its consequence on the regional linkages. In Odisha, three districts, namely, Kalahandi, Koraput and Bolangir witness frequent crop failure. According to Pradhan (1993), the reason for the drought in these areas is the cropping pattern adopted by the people, apart from the irregular rainfall. His study on the dryland areas of Kalahandi shows that out of the cultivated 762000 hectares, food grain is grown on 82 percent of the area. Paddy, which requires more water than other crops, is grown on 41 percent of the cultivated area. Approximately 40 percent of the cropped area is under drought-resistant and dryland crops such as jowar, *ragi*, and other millets that are grown along with pulses such as *mung* and gram. The study found that since the area under paddy crop has increased, drought has become more acute. Moreover, there is no mechanism for compensating occasional crop loss, which leads to an increase in the indebtedness of the farmers due to the inadequate investment for subsequent cropping. Thus, unemployment of agricultural workers increases, and there is an evidence of the land getting transformed to the non-agriculturists (Sarangi, 2002). Also the traditional sources of irrigation such as tanks and ponds are neglected in these areas. Thus, crop cultivation is observed to be traditional in these regions.

The present study has considered one of the KBK districts of Odisha, i.e., Bolangir. To understand the behaviour of the agricultural cultivators and labourers in the drought-prone areas of Bolangir District the study collected data from both secondary as well as primary sources. The secondary data was collected from the Directorate of Economics and Statistics in Odisha. This project conducted a field study for the collection of primary data from the selected study sites. Household survey was carried out to collect the quantitative data. The study conducted a survey in a dryland area of Odisha: Bolangir.

In order to examine the above objectives, a small sample survey was conducted in one of the semi-arid districts of Odisha. Bolangir comes under the rainfed semi-arid regions of Odisha. Two villages were selected randomly from the Titlagarh Block. Two major criteria were considered while selecting the sample villages: 1) distance from the town (the village should not have the effect of urbanisation); and 2) the size of the village - it should neither be too big nor too small (minimum number of sample households should be more than 150). Thus, two villages were selected, based on the information from the

Village Directories of Census, 2001, namely: 1) Mathanpalla; and 2) Jugirata.

Before starting the detailed sample survey an attempt has been made to understand the socio-economic-cultural scenario of the villages. Thus, the house listing was canvassed across all households in the two villages. The study tried to collect information about the households with respect to the size of the landholdings while conducting the house listing survey, which covered information regarding 364 households. The information collected during the house listing includes:

- 1) Name of head of household (with the house number)
- 2) Caste
- 3) Size of household
- 4) Landholding pattern
- 5) Main source of income

The sample was drawn on the basis of the information received from the house listing. It was found the villages are dominated by landless, marginal, and small landholding households. For a detailed survey, about 40 percent of the total number of households in each village was considered. The major criteria for selecting the sample households for the detailed survey were the landholding size: the categories of households were selected on the basis of the landholding size. More weight has been given to the landless and marginal farmers, based on the village economy, and lesser weight has been given to the larger and small landholding households. Out of the total 40 percent of the sample, 20 percent of the large and small landholding households, and 30 percent of the marginal and landless households were considered.

The study was conducted during January-February, 2010-11. The sample size from each category is presented in Table 1.2. There were instances where the appropriate households were not available in one category; in such case the samples from another category were collected, holding the total sample constant.

Table 1.2: Ideal and Actual Samples from each Village

	Ideal Sample Designed			Actual Sample Available		
	Mathanpalla	Jugirata	Total	Mathanpalla	Jugirata	Total
Large (above 10 acres) and Medium Farmers (between 5 - 10 acres)	18	16	34	6 (6.45)	7 (8.75)	13 (7.51)
Small Farmers (Between 1 - 5 acres)	18	16	34	22 (23.65)	20 (25.00)	42 (24.27)
Marginal Farmers (Below 1 acre) Farmers	28	24	52	22 (22.65)	24 (30.00)	46 (26.58)
Landless Households	29	24	53	43 (48.38)	29 (36.25)	72 (41.63)
Total	93	80	173	93 (100)	80 (100)	173 (100)

The sample was designed in the criteria of providing higher importance to the landless and marginal households and comparatively lesser importance to the large and medium cultivators. However, it was difficult to find the appropriate number of sample from each category. Under these conditions, the total sample was adjusted by providing more weight to the landless and marginal cultivators. The actual sample drawn from each category is presented in Table 1.2.

Structured questionnaires were prepared before the survey. A pilot survey was undertaken in the beginning of the field work. After receiving the feedback the questionnaires were restructured again for the detailed survey. The reference year for the survey was considered as the agricultural year 2009-10, which was a drought year, and the information was collected on that behalf. The information on the loss of income, loss of crop, and the change in assets has been collected in comparison to the agricultural year 2008-09.

The questionnaire includes the information on:

- 1) Details regarding the households' demographic information
- 2) Assets and change in assets (land, agricultural, and irrigation information)
- 3) Sources of income (for agricultural households and labour households)
- 4) Cropping patterns
- 5) Coping mechanisms during drought
- 6) Information of migration
- 7) Food security related information

A focus group discussion was also conducted in the presence of the Village Sarpanch, village secretary, Gram Sevak and the Panchayat Development Officer. The information was collected using a semi-structured questionnaire, which was mainly subjective in nature.

### **Chapter Outline**

The present paper has been divided into five different chapters. The problem of the study has been stated in the first chapter. After the introductory first chapter, the second chapter made an attempt to provide the agro-climatic, social and economic profile of the study area. The third chapter analyses the socio-economic sketch of the sample households. Different impact of drought and its coping mechanism are presented in fourth chapter. The fifth chapter presents the discussion and conclusion of the study.



## Chapter: II

### Profile of the Study Area

#### Profile of the District

Though Odisha is a land of natural resources and human resources, the economic condition of the state is not well developed. This is due to low per-capita income, low capital formation, inadequate exploitation of plentiful natural resources, and inadequate development of the socio-economic infrastructure.

During the 1960s Odisha was one of the economically weaker states in India. The per capita income was around 71 percent of the all-India average, while the per capita income of the median state during that year was 34 percent higher than Odisha's. Though during the latter part of the 1990s the per capita income in Odisha increased in absolute terms, it had slipped in relative terms to 61 percent of the all-India average, while the median state's per capita income was 54 percent higher than Odisha's (calculated from the various issues of *Economic Survey of Odisha*). Thus, over a period of four decades, Odisha actually underwent a process of moving further behind the other states, and it occupied the 16th position. Only during the 1960s, the overall economic growth record in the state was better than that of the country as a whole. In each of the following decades, the record of overall economic growth in the state has been poorer than that of the national average, and in relation to most of the other states of the Union. In the 90s, Odisha performed considerably worse relative to the national average and most other states (Economic Survey, 2001; Odisha Development Report, 2001).

Furthermore, the population of Odisha increased from 14.64 million in 1951 to 36.71 million in 2001. The density of population is 236 per sq km (Census, 2001) against 324 at the national level. The percentage of urban population to the total population is 14.97 percent (Census, 2001). Thus, nearly 85 percent of its population lives in rural areas. The urban population was 4.06 percent in 1951. Scheduled Castes and Scheduled Tribes, as per the 1991 Census constituted 16.20 percent and 22.21 percent respectively of the total population in the state.

The present district of Bolangir was in ancient times a part of South Kosals, which occupies the western part of Odisha and is situated between 20° 9' N and 21° 5' N latitudes and 82° 41' E and 83° 42' E longitudes. It is bounded by Baragarh District in the north, Sonepur, Boudh and a portion of Phulbani district in the east, Kalahandi

District in the south, and by Nawapara District in the west. The district headquarters is located at Bolangir. Its geographical area is 6575 sq km, which is only 4.22 percent of the total area of Odisha. It has three sub-divisions, six tehsils and 14 CD blocks (district profile of Bolangir, [www.odisha.gov.in](http://www.odisha.gov.in)). The detailed profile and the map of the district are presented in Table 2.1 and Map 1 respectively.

**Table 2.1: Profile of Bolangir District**

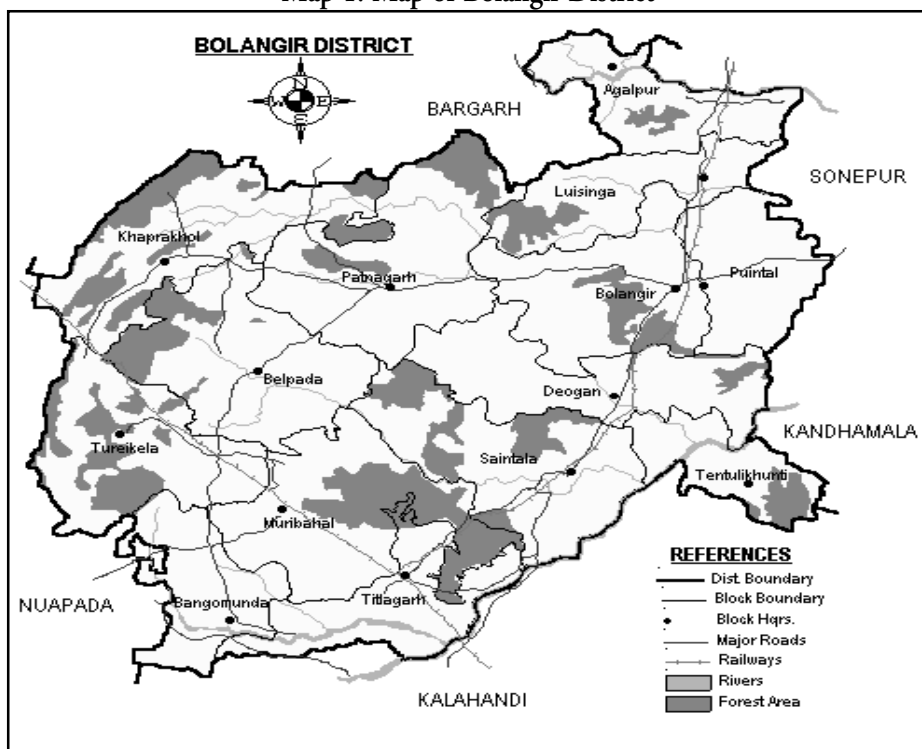
Indicators	Unit/Percentages
Geographical area in sq km	6575
No. Sub-Divisions	3
No. of Tehsils	6
No. of CD Blocks	14
No. of Municipalities & Corporations	1
No. of NACs	3
<i>Population (in 000' nos.)</i>	
Male	674
Female	663
Rural	1183
Urban	154
% of Rural Population	88.46
Population Density	203
% of District Population to State Population	3.63
No. of Literates in 2001 (in 000' nos.)	638
Male	413
Female	225
Literacy Rate	55.7
Male	71.67
Female	39.51
SC Population	226300
Male	114393
Female	11907
ST Population	275822
Male	137442
Female	138380
No. Villages Eletricified	1681

Source: Bolangir District Profile, [www.odishagov.in](http://www.odishagov.in), Village Directory, Census of India, 2001.

## Climate and Rainfall

The climate of the district is of extreme type. It has a dry climate except during the monsoon. There are large variations in the day and night temperatures: the temperature usually ranges between 4.5°C in winter (December) to 48°C in summer (May). The monsoon starts late in June and generally lasts up to September. About 90 percent of the rainfall is received between June and September. The normal rainfall in the district is about 1123.5 mm. However, there was high difference between the rainfall in the year 2000-01 (781.5 mm), and the year 2001-02 (1567.8 mm). Drought is a normal feature of this district, and the year 2002-03 was declared as a severe drought year by the Government of Odisha, with around 60 percent below the normal rainfall (reliefweb.int, 2002).

Map 1: Map of Bolangir District



## Geography

The district has two distinct physiographic regions, namely the rolling plains and the hilly areas of western and southern part of the district. The plain area can be further sub-divided into irrigated plains and non-irrigated plains. This region enjoys irrigation from the Hirakud canal system and a medium irrigation project. Forest occupies a

sizeable portion of the total geographical area (43761 hectares) in the district, and is mostly situated in the western and southern parts of the districts.

### **Soil**

The soil in the Mahanadi, Tel and Ong basins is alluvial in nature, and very fertile. These soils occupy the eastern part of the district. The soil in the southern and western fringes is mostly laterite in character. Starting from the hill ranges on the western and southern fringes, the terrain is undulating in character.

### **River System**

The River Mahanadi and its tributaries, viz., Tel and Suktel, are the principal rivers in the district. Suktel flows through Patanagarh, Bolangir and Loisingha blocks before meeting the River Tel. The flow of these rivers is confined to the northern and north-eastern parts of the districts. Except during the rainy season, these rivers go dry.

### **Population**

According to the 2001 Census, the total population of the district was 1335760, sharing 3.63 percent of the total population in Odisha; of this, rural population is 1181531. The total population of the Scheduled Castes and Scheduled Tribes is 189471 and 271511 respectively (1991 Census). The density of population is very low (203 per sq km) compared to state's density of population. According to the 2001 Census, about 561140 people out of the total population of 1335760 constituted the working force in the district.

### **Literacy**

According to the 2001 Census, about 733733, out of the total population (1335760) are literate, which means 54.94 percent of the total population is literate. The literacy rates of male and female are 70.36 percent and 39.27 percent respectively. In addition, the literacy rates of the Scheduled Caste and Scheduled Tribe people are 33.23 percent and 24.86 percent respectively.

### **Distress with Drought**

The economy of Bolangir District is basically agrarian. While scarcity of rainfall is common in Bolangir District, about 75 percent of the sown area is dependent on rainfall, without any irrigation facility. The year 2002-03 was declared as a severe drought year - the Government of Odisha announced 2002-03 as a drought year for 30 districts in the state, and Bolangir District was declared as a severely affected area under drought. Crop loss in the state was enormous during this period. According to the government's report, around 68 percent, with an estimated value of Rs.170 cr. was due to loss of paddy. The loss in terms of produce ranges between 52-94 percent in the districts,

which was nearly 3.54 MT. Next, the year 2009-10 was also declared as a drought year by the Government of Odisha.

### Block and Village Profile

The total geographical area of the Titlagarh Block is 356 sq km. The total number of households according to the 2001 Census was 23455, while the total population was 99934 of which 18.22 percent were SCs and 20.45 percent were STs. A total of 42 percent were workers, while 58 percent constituted the non-working population. The annual average rainfall of the block was 220 mm which was considerably lower than the state average during the year 2008-09. Total forest cover was around 25.84 percent. Rice is the major crop in the block, while wheat, maize, ragi, green gram, black gram, *til*, potato, and groundnuts are the other major crops grown in the block. The total land under irrigation was quite low in the block, constituting only around 13.3 percent of the total net sown area (Handbook of Bolangir, 2008).

### Village Profile

Two villages, Mathanpalla and Jugirata were considered for the analysis of the economic and social impact of drought on the households. Mathanpalla is located 21 km away from the block office at Titlagarh. It is connected with a *kaccha* road for about 4 km. The village is surrounded by natural forest.

The information with regard to the landholding pattern is presented in Table 2.2. It was observed from the house listing that the landholding pattern is skewed in the villages. The total proportion of households owning land out of the total study universe includes only around 41 percent, of which only around 18 percent of the total households owned land of any holding size in Mathanpalla, whereas in Jugirata a total of 23 percent owned any kind of land. It was observed that a major portion of the households in both villages were landless.

Table 2.2: Total Number of Households in the Two Sample Villages

	District	
	Mathanpalla	Jugirata
Large (above 10 acres) and Medium Farmers (between 5-10 acres)	6 (3.14)	7 (4.04)
Small Farmers (between 1-5 acres)	37 (19.37)	32 (18.49)
Marginal Farmers (less than 1 acre)	22 (11.51)	45 (26.01)
Landless Households	126 (65.96)	93 (51.44)
Total	191 (100)	177 (100)

Source: House Listing, Field Survey, 2010.

The total population in Mathanpalla Village is 763, of which 6.31 percent are SCs, while the ST population constitutes around 26.60 percent of the total population (House Listing, Field Survey). The literacy rate in the village is 46.26 percent; the total working population is 40.36 percent, while the remaining 59.64 percent is non-working population (Census, 2001). The total number of households in Mathanpalla is 191, of which 126 are landless households, 22 are marginal land owning households (less than 1 acre), 36 are small land owning households (between 1 acre to 5 acre), while 6 households own more than 5 acres of land (information from the House Listing). Thus, the landless constitute 65.9 percent, marginal land owning households owning less than 1 acre constitute around 11.5 percent, and households owning between 1 and 5 acres of land (small farmers) constitute 19.4 percent of the total households in village. It is observed that only 3.1 percent of the households own more than 5 acres of land. This shows that the village is dominated by landless households, which constitute around three-fourths of the total households in the village. As the village has only 6 households in the category of large farmers, the rest of the sample is collected from other categories, keeping the total sample size constant. Most of the houses in the two villages were kaccha houses. There were very few pakka houses in the village.

Jugirata Village is located 22 km away from the nearest town, i.e., Titlagarh. The village is situated beside the minor district road. The total number of households in Jugirata is 177 and the total population is 810. The village constitutes 31.52 percent SC and 55 percent ST population (Field Survey, House Listing). The literacy rate in the village is 44.27 percent. The working population in the village constitutes around 54.09 percent and the non-working population constitutes around 46.91 percent (Census, 2001). Of the total number of households, 93 are landless, 45 are marginal farmers, 32 are small land owners, and only 7 are large and medium farming households. Hence, the landless households constitute a major share (51.4 percent) of the total households. Households owning less than 1 acre of land constitute total 26 percent; households owning land between 1 and 5 acres constitute 18.5 percent, and only 4 percent of the households own more than 5 acres of land.

## Chapter: III

### Socio-Economic Profile of the Study Villages: Insights from the Detailed Sample Survey

The present chapter makes an attempt to represent the findings from the detailed sample field survey. An attempt has been made to analyse the impact of the distress situation and its coping mechanisms in the two sample villages and among the different categories of households. Though the structure of the rural economy is complex to analyse, an attempt has been made in this section to analyse the structure of the poor-rural-tribal economy.

#### Size of Households and Housing

The average size of a household, and the number of adult males and females was higher in Mathanpalla compared to Jugirata: the average size of a family in Mathanpalla was five whereas in Jugirata there were on an average around eight members in a family. The size of a family was quite large extending to 22 members in Jugirata, compared to Mathanpalla where the maximum size of a family was 12 members.

#### Main Occupation

Rural households earn their income from different types of economic activities. The households engaged themselves with different types subsidiary activities, apart from their main income-earning sources, in order to maintain their livelihood. The families get involved in more than one economic activity; thus, an attempt has been made to analyse the main income source out of the different types of income sources. The income profile shows that working as daily labour and migrant workers was considered as the main source of income in both the villages. The income as daily labour inside well as outside the village including the income from NREGA works was considered as one of the main occupations among the sample households. Around 32.26 percent of the households obtained their main income by working as daily labourers in Mathanpalla, whereas in Jugirata around 15 percent of the sample households earned their family's main income by working as daily labourers (Table 3.1). Income as migrant workers was one of the important earning sources among the sample households. Due to lack of work in the village and nearby towns the labourers migrated out of the village to different destinations, and the income generated from that source is considered as the main income for the whole year. Around 36.56 percent of the total sample households migrated out for their livelihood in Mathanpalla, and the income earned from that was considered

as the main source of income. In Jugirata, migration among the households was observed to be higher compared to Mathanpalla. It is interesting that in Jugirata the migration rate is quite high, and around 62.5 percent of labourers migrated; the income from that source was considered as the main income of the household for the whole year. Ownership of land was not found to be an important source of income among the sample households, as income from agriculture was quite low. Almost all the farmers were subsistence cultivators, and the income earned from farming was negligible for the small and marginal land owning households.

In Mathanpalla around 17.2 percent of households depended upon agriculture as their main source of income, while in Jugirata around 20 percent of the sample households depended upon agriculture as their main source of income. Another interesting observation was that in Mathanpalla, the dependence upon forests was high. The income from that source was considered as the major source of income among 5.39 percent of the households. Mathanpalla Village is situated near the forest. Thus, the dependence on forest for products such as wood and fruits was high among the villagers. During the slack season, when there is not much work in the agricultural field and outside, people go to the forest and collect "kendu" leaves and wood for a livelihood, which they sell in the market and gain some money out of that. Thus, dependence upon forest among the households in Mathanpalla was observed to be quite high. There were certain families whose main income was generated from the collection of kendu leaves and wood from the forest and by selling the same in the market in Titlagarh. However, such income was quite irregular and uncertain. The above discussion shows that with regard to the main source of income the two villages were different from each other.

**Table 3.1: Major Source of Income among the Sample Households in the Two Villages**

	Mathanpalla	Jugirata
Cultivators / Self Employed in Agriculture	17.20	20.00
Labour (Agriculture+ Non-Agriculture)	32.26	15.00
Migration Labour	36.56	62.50
Dependence on Forest	5.39	-
Self-Employed in Non-Farm	8.60	2.50
Total	100.0	100.0

*Source:* The Sample Survey, Field Survey.

The occupational structure across the categories of households according to different landholding patterns is presented in Table 3.2. The main source of income across the different landholding sizes provides an impression of the economic status of the family.



It was observed that most of the households owning more than five acres of land got their main income from cultivation. They engaged themselves in cultivation of paddy and earned the major income from that source for the whole year in both the villages. In Mathanpalla about 83.33 percent of the cultivators belong to this category. Similarly in Jugirata, 85.71 percent of the cultivators belong to this category. It was observed that ownership of small and marginal landholdings did not help the cultivators to earn maximum profit from farming. Hence, most of the small, marginal and landless households migrated out of village in search of jobs. Around 54.55 percent of the small land holders, 31.82 percent of the marginal land holders, and 34.88 landless households in Mathanpalla earned their main income as migrant labourers. The occupational pattern in terms of migrant workers was different in two areas: in Jugirata the proportion of households migrating out for survival was higher than in Mathanpalla. In Jugirata, around 83.3 percent of the marginal land holders, 60 percent of the small land holders, and 58.62 percent of the landless households migrated and the income generated from that source was considered as the major income. It is to be noted here that most of the migration work is seasonal by nature.

The rate of migration was observed to be higher in Jugirata compared to Mathanpalla. The reason for lower migration in Mathanpalla could be due to the higher dependence on forest in the village during the slack season. The forest eco-system supports the people in the village of Mathanpalla. Collection of different types of leaves, wood and fruits helps the families survive for a period of time. Marginal land holders and landless households usually go to the forest in order to collect some forest products. They either exchange that with some other products inside the village or sell the products in the market to earn some money. It was interesting to find that 11.63 percent of the landless households exclusively depended upon the forest as their major source of income. Most households depended upon the forest also for their requirement of fuel and food, while the income generated from the forest activity was considered as the major source of income for some of the landless households. This indicates the extent of distress situation prevailing among the households.

Engagement of households in self employment was observed to be quite low in both the villages. Very few households were engaged in activities such as driving, holding a small *kirana* shop, or jobs. Furthermore, both villages exist in a primitive economic situation where the income was substance.

**Table 3.2: Major Sources of Income across Categories of Households**

	Cultivators	Labour	Migration Labour	Dependence on Forest	Self-Employed in Non-Farm Activities	Total
		Mathanpalla				
Large and Medium	83.33	-	-	-	16.67	100
Small Landholding HHs	22.73	9.09	54.55	-	13.64	100
Marginal Landholding HHs	27.27	36.36	31.82	-	4.55	100
Landless HHs	-	46.51	34.88	11.63	6.98	100
Total	17.20	32.26	36.56	5.37	8.60	100
Jugirata						
Large and medium	85.71	-	14.28		-	100
Small Landholding HHs	35.0	5.00	60.00	-	-	100
Marginal Landholding HHs	12.50	4.17	83.33	-	-	100
Landless HHs	-	34.48	58.62	-	6.90	100
Total	20.0	15.00	62.50	-	2.50	100

Source: Field Survey.

### Land and Irrigation Profile

The land, irrigation, and the agricultural implement profiles of the sample households are provided in the Table 3.3. Land is the main asset among the rural households. Holding of land represents the economic status of a household. Both the villages are mainly dominated with small and marginal land owning households. Only six households in Mathanpalla and seven households in Jugirata own more than five acres of land. The total cultivated land in Mathanpalla was 107 acres, of which 54.5 acres (50.93 percent) was irrigated and the main source of irrigation was canal. Paddy is observed to be predominantly grown in the irrigated land during the Kharif season, while most of the land goes fallow during the Rabi season. Along with paddy other crops such as *til*, pulses and mustard are also grown. In Jugirata a total of 105.25 acres of land was under cultivation among the sample households, out of which only 15.5 acres of land was irrigated. This implies that only 14.72 percent of the total cultivated area was under irrigation. Most of the cultivated land in Jugirata is rainfed, i.e., fully dependent upon rainfall. Thus, cultivation during the Rabi season was nil, while during the Kharif season most of the cultivators grew paddy.

**Table 3.3: Land and Irrigation Profile of the Sample Households**

	Mathanpalla	Jugirata
Total Cultivated Land (in acres)	107 acres	105.25
Total Leased-in Land (in acres)	3 acres	5 acres
Total Area Irrigated (in acres)	54.5	15.5
Percentage of Irrigated Area	50.93	14.72
Main Source of Irrigation	Canal	Well
Area Cultivated in 2010 Kharif	98 acres	86 acres
Area Cultivated in 2010 Rabi	49.2 acres	0 acres
Percentage of Households Owning Agricultural Implements		
Electric Pump	0.0	0.0
Diesel	12.0	3.92
Tube Well	0.0	0.0
Tractor	8.0	0.0
Plough	90.0	78.43

Source: Field Survey.

Note: percentage calculated out of the total cultivating households.

It was observed that there was high correlation between ownership of land and the main source of income. Most of the households owning more than one acre of land, earned a major portion of their income from cultivating. However, marginal cultivators, i.e., those who owned less than one acre of land, though they engaged themselves in cultivation, earned a major portion of their income by working as casual labourers. Thus there prevails high correlation between land owning capacity and the main source of income of the households. It was also observed that irrigation and the main source of income of households was highly correlated. Land with some source of irrigation facilities obviously witnessed better farming practice and helped the family earn income from cultivation.

### **Livestock Profile**

Land and livestock are considered as the most important assets among the rural households in India. Holding different kinds of livestock is very common among the rural households. The ownership of different kinds of livestock among the households in both the villages is presented in the Table 3.4. It was observed that ownership of small livestock such as goats and sheep was higher among the households compared to cows and buffaloes. In Jugirata around 43.64 percent of the households owned goats or sheep, compared to Mathanpalla where around 60.21 percent of households owned

any of these animals. On the other hand ownership of wet animals such as cows was around 32.51 and 29.09 percent among the households in Mathanpalla and Jugirata respectively. There was no significant difference among the villages with respect to livestock ownership. The ownership of animals such as bullocks and owning of land witnessed high correlation. The households owning land are also likely to own bullocks, which were extensively used by the households for cultivation purpose due to the absence of any modern implements for cultivation.

**Table 3.4: Ownership of Livestock among the Households**

	Mathanpalla		Jugirata	
	Percentage of Households Owning Livestock	Total No. of Livestock	Percentage of Households Owning Livestock	Total No. of Livestock
Cow	32.51	19	29.09	11
Bullock	34.40	39	35.00	23
Buffalo	12.10	4	13.75	8
Goat/sheep	60.21	58	43.64	72

Source: Field Survey.

Both the villages present a picture of an economically underdeveloped society. Ownership of tractors for cultivation purpose was almost nil among the households; thus most cultivators owned ploughs and bullocks. It was also observed that cultivators, who did not own any kind of animal for cultivation, rented one from others. Such renting was observed to be quite normal among the cultivators. During ploughing, most people rented an animal from their friends and the rent was paid either in cash or kind. In most of cases, an average of Rs.100 was paid as rent per week. Also some people paid a small share of their output (mostly paddy) to the person who leased the animal to them. Renting of animals was observed to be higher in Mathanpalla compared to Jugirata. This might be because cultivation was higher in Mathanpalla than in Jugirata.

### **Cropping Pattern**

Cultivation of crops such as paddy and pulses was common in both the villages; almost all the cultivators in both the villages grew paddy. Apart from paddy, other crops such as mustard, *til*, sugarcane and *biri* (pulses) were also grown in Mathanpalla, while in Jugirata cultivation of pulses was higher, in addition to paddy. Some cultivators also cultivated vegetables during the Rabi season. However, cultivation of vegetables and other Rabi crops was quite minimal among the households. Vegetable production during the winter season helped the farmer make a small income through selling them in the

market near the village. However, this activity was observed to be more among some large farmers and among the irrigated farmers.

Most of the households engaged in multiple cropping during the reference year, in order to distribute and minimize the effect of risk. Both villages witnessed a subsistence economy. Most of the crop produced was used for self consumption. During the Kharif season, if rainfall was normal then the produced output was generally sufficient for a family to sustain for a period of six to eight months. Both villages practised barter system as a livelihood pattern. Households owning land used the labour hours of the landless or the marginal land owning people and in return they paid back, usually in kind. For example, during the Kharif season, labourers worked in the fields of other farmers and in return, they received payment in terms of kind, which was around 10 to 12 kg of rice for the labour hours.

The cultivation of local brand paddy needs a small amount of fertilizers and pesticides, but the inputs used for the production of crops was mainly local and of low quality. Use of seeds, fertilizers and pesticides was quite low among the cultivators. Hence, the output from the cultivation of locally owned seed was also observed to be very low.

Scarcity of rainfall and lack of irrigation facilities created unfavourable conditions for the farmers to take risk and cultivate other high value crops-most of the farmers were risk-averse cultivators, who did not like to take any risk by shifting to cultivation of high value crops. Thus, diversification of cropping pattern was quite low among them.

## Chapter: IV

### Impact of Drought and Coping Mechanisms at the Household Level

#### Drought in Recent Past in Odisha

Nearly, 62 percent of the cultivated land in Odisha is rainfed (Statistical Abstract of Odisha, 2008). Odisha, being a coastal state, is hit by various natural disasters such as cyclones, floods or droughts, almost every year. Odisha is an agricultural state, and the people depend on rainfed Kharif crops which occupy around 62 lakh hectares of crop area during the season. Paddy is the staple crop and covers 42 lakh hectares, of which only 14 lakh hectares are covered under irrigation (*Economic Survey*, various issues). Symptoms of drought were observed during agricultural operations such as weeding, gap filling, and while undertaking other inter-cropping operations and non-application of fertilizers in almost three lakh hectares of land in Bolangir, Jajpur, Sambalpur, Bargarh, Jharsuguda and Sundargarh. Due to heavy moisture stress and growth of stunted plants, districts such as Bolangir, Nuapada, Sundargarh, Jharsuguda, Bargarh, Deogarh, Sambalpur and Kendrapara suffer from total loss of paddy yield (Revenue Department, Government of Odisha, 2009).

Furthermore, due to erratic behaviour of monsoon manifested in irregular and scanty rainfall, the State of Odisha experienced severe drought during the year 2002 and again in 2009. During June 2009 rainfall in the state was deficient by 60.6 percent, and during July 2009, there was excess rainfall by 77.3 percent; and while there was 93 percent excess rainfall up to 21st July, from 22nd July onwards, the rainfall was deficient by about 63 percent. Finally, in August 2009, rainfall was deficient by about 20.3 percent. The state cumulatively received 31.5 percent less rainfall than normal. As per 'Paragraph 29' of the Odisha Relief Code, declaration of drought for a particular area was made by the Government, taking into consideration the crop assessment report submitted by the Collector, together with the views of the Revenue Divisional Commissioners and the Special Relief Commissioner. On the basis of the reports received from the Collectors, on 21st November, 2009, the State Government declared 3264 villages under 70 blocks and 41 wards under nine ULBs of 15 districts, namely Angul, Baragarh, Bolangir, Deogarh, Dhenkanal, Gajapati, Ganjam, Jharsuguda, Kalahandi, Kandhamal, Koraput, Malkangiri, Mayurbhanj, Nabarangpur, Nuapada and Sundargarh, as drought-affected, having sustained a crop loss of 50 percent or more for autumn paddy during the year 2009 (Govt. of Odisha, 2011).

## **Impact of Drought at the Household Level**

Bolangir District, which is one of the underdeveloped districts of Odisha, was declared to be a drought-prone area during 2009. The government records show that drought is a regular phenomenon in the selected study area.

The scarcity of rainfall during 2009, led to enormous crop loss among the cultivators in Odisha, and thus the Government of Odisha declared that year as a drought year. The agricultural production in the sample village also suffered due to the lack of rainfall during 2009. Most of the people in both the tribal villages depend either directly or indirectly upon agriculture. The major share of food for the whole year was collected either through self cultivation or by working as casual labourers in the agricultural field. Almost all the cultivators used the produced output for self consumption. Under normal rainfall conditions the average yield per acre of land was 11 quintals in Mathanpalla, and around 10 quintals in Jugirata. The provision of canal irrigation near Mathanpalla was the reason for the better produce there. The production of paddy during the Kharif was the main source of livelihood for the whole year. During a normal (such as during 2008 agricultural year) year, they cultivated paddy along with *til*, pulses and vegetables, as a practice of mixed cropping. However, during 2009 due to the bad rainfall the production loss was high among the farmers, and there was considerable loss of crop. Most farmers did not get any return from their cultivation. Thus they had to bear the whole input cost of production.

Crop response to moisture deficit depends on the timing and intensity of drought. Most of the Kharif crops are highly sensitive to moisture deficit during the grain formation stage of their growth. Thus, the drought during that period caused substantial production loss, though the intensity of crop loss was higher during the 2002 drought compared to the 2009 drought. During 2009, the total income loss incurred by the farmers and agricultural labourers, due to the loss of crop production was calculated with respect to the income of the family during a normal year such as 2007-08. It was found that the earning of the households dropped substantially due to the occurrence of the drought. The total income loss among the farmers due to the drought was calculated to be around 32 to 39 percent in Mathanpalla and Jugirata respectively in comparison to the income during the normal year (here the normal year refers to 2008). The calculation shows that the loss of income was higher among the households in Jugirata compared to those in Mathanpalla. The loss of income among the small and marginal land owning households was higher compared to the large and medium land owning households, and the loss of income was severe among the small land owning households-both the villages are dominated with small and marginal farmers. The adverse effect of drought led to the failure of crop production and in turn affects the overall income of the family.

As paddy cultivation was the main source of food security among the families, the crop loss laid a heavy burden on the family's income (money value of the total crop produced).

The immediate adverse effect of drought was observed on the food availability and consumption. As most farming households were self subsistence farmers, the loss of crop made a direct impact on their food security pattern. The poor households got their staple food from farming. On the other hand, they did not have enough resources to deal with food shortage. Hence, poor yield, even during a normal year, led to low storage of food grains for a crisis situation. The total output produced was generally enough to support a family for a period of six to eight months for the households during the normal year. Again the storage capacity among the poor households was not sufficient. Thus, the drought situation left the family in a high food insecurity situation, which worsened as the prices of basic food commodities remained quite high during the drought period.

The recent drought in 2009 adversely affected the food security of the households in both the villages. The poor and marginalised groups, who did not have enough resources and assets, faced a severe problem of food insecurity in the selected sample area. Besides, most of the land remained fallow during the study period due to the lack of irrigation.

The village community has its own strategies to understand the nature of drought and to prepare to face the unavoidable calamity. There are different levels coping mechanisms developed locally in the poor rural community. As both the villages are mainly dominated by tribal and marginalised communities, their resistance to cope with the drought situation was low. However, they adopted different mechanisms such as selling livestock and/or assets, reduction in food consumption, shift in occupation pattern, and migration.

It was observed that both villages were similar in terms of their economic condition. However, with respect to their geographical locality and social structure, they had differences, and hence, their coping mechanisms towards distress situation also might differ. Though the coping mechanisms in both the villages were not distantly different from each other, it can be largely said that in the first village, the people depended upon natural resources for their survival during the drought situation, whereas in the second village (Jugirata), the people preferred to migrate out of their village/district in search of work.

As one of the main objectives of the study was to understand the different coping mechanisms adopted by the rural economy during the drought, the study conducted enough enquiries to understand different coping mechanisms. They adopted multiple coping mechanisms to adapt themselves to the crisis situation; these details have been



discussed in the present section. Table 4.1 presents the multiple coping mechanisms adopted by the households in the two villages.

### **Reducing Food Consumption and Change in Food Pattern**

The main source of food for the households was either from own production, or from outside sources such as markets and government provision. The households owning land mainly produced their own food while the landless households either worked as agricultural labourers in those farms or purchased food from the market. The landless households worked in the agricultural fields, and in return, received a small share of paddy/rice from the cultivator. Thus, during the drought period food scarcity adversely affected all categories of households.

It was observed that among the different coping mechanisms, reduction in food consumption was the immediate measure. Table 4.1 shows that around 95.7 percent of the households in Mathanpalla and 97.5 percent of the households in Jugirata reduced their quantity of food consumption during the drought period to cope with the distress. They generally reduced the amount of food consumption and also the number of meals per day, which was observed to be the most commonly practised coping mechanism, irrespective of the landholding size or village. Rice being the staple food in Odisha, the consumption of rice per day was high in the state - generally people consume rice three times per day in the rural areas. However, during crisis, the adult females generally reduced their consumption of rice per day - the female members of the household sacrificed their meal for the sake of the head of the household, usually the male member, who took their full meal as they engaged in economic activities.

Along with a reduction in the quantity of food consumed, the households also changed their pattern of food consumption. This implies a shift in the food habits from normal to lower value products. Out of the total sample in Mathanpalla, around 63.44 percent ate broken rice (*khuda*), whose price is cheaper, instead of normal rice. The large and medium farmers generally reduced their consumption of ghee, milk, vegetables and fruits. There was also a shift towards cheaper foods. For example, in Jugirata some people informed that they purchased inferior quality potatoes and pulses during the distress period. Furthermore, during the drought period, the labour price was cheaper and the market price higher, forcing the poor rural households to cut their size as well as quantity of meal.

Apart from the reduction in food consumption, the families also reduced their expenditure on other non-food items such as clothing, household purchases, and cultural activities. The reduction in expenditure on non-food items was higher among the small, marginal and landless households compared to the large and medium land owning households.

**Table 4.1: Multiple Coping Mechanisms Adopted by the Households**

	Mathanpalla	Jugirata
Reduction in Food Consumption	95.70	97.50
Change in Food Pattern	63.44	76.25
Shift in Occupation	49.46	88.75
Migrating Out	39.71	68.00
Dependence on Forest	52.69	
Selling of Assets		
Livestock	33.33	57.50
Land	4.30	11.25
Suicide	1.08	0.00

*Note:* Based on multiple responses.

*Source:* Field Survey.

### **Occupational Shift**

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 results show that in Mathanpalla around 49.46 percent of the households shifted their occupation, whereas in Jugirata around 88.75 percent of the sample households shifted their occupation. Most of the small and marginal landholding cultivators informed that they shifted their occupation and worked in different activities such as in road making, construction, and as NREGA workers.

### **Dependence on Forest**

Dependence on forest was a common practice among the households during the drought period. As Mathanpalla Village is situated near the forest, during crisis most of the people collected forest products, which they either consumed directly or sold in the market to earn some money. The poor people in Mathanpalla went to the forest almost every week and collected products such as *kendu* leaves, timber, fire wood, *mahua* flower, *bantulsi*, *sal* seed, *harida*, and *bahada*. For the poor, plucking of *kendu* leaves is a major source of income and employment, especially since it coincides with the slack period of the agricultural cycle. *Kendu* leaves generate 150 million person days of employment during the agricultural lean season in Odisha, including the labour involved in making *bidis* (Saxena, 2003).

*Kendu* leaves are used for preparing *bidis*. The villagers collect *kendu* leaves and sell them in the market in Titlagarh. Along with the leaves they also collect *kendu* fruit and use that for consumption purpose. Sale of *kendu* fruit is not common but sometimes they were sold in the tribal weekly market. *Mahua* flowers are used to prepare liquor - consumption of *mahua* liquor is a common practice among the tribals in Odisha. Similarly, *sal* leaves are collected and used for preparing plates. Sale of the plates in the weekly market was a major source of income among the villagers - they are sold at Rs.20 per 100 plates. During the drought period, they tried to produce as many plates as they could, in order to earn a handful amount of money. The timber and fire wood collected from the forest is used for cooking. Sometimes, they saved the fire wood and sold it in the market during the drought period, which added to their income.

### **Selling of Assets**

Due to shortage of food in the family, and of lack job opportunities, the livestock was either sold or suffered from mortality. Thus, drought might reduce the holding of the livestock in two ways: directly by mortality, or indirectly through distress sale (Sweet, 1988). During the period of crisis the households sold their livestock in order to cope with the adverse situation (Mukherjee and Nayyar, 2011). Households possessing livestock either took a loan using their animals as collateral or sold their animals, depending on their evaluation of market prices (Mukherjee and Nayyar, 2011). Hence, households owning more number of livestock have a better chance to cope with the distress situation compared to those holding less or no livestock (Sweet, 1998). The holding of different types of livestock was observed to be higher among the tribals. The results show that about 33.33 percent of sample households sold their cow/sheep during the drought period in order to cope with the distress in Mathanpalla, whereas in Jugirata comparatively more number (57.5 percent) of households sold their livestock. This was due to the existence of forest resources near the former study village. During the drought, people in Mathanpalla depended mainly on forest for their daily requirements, while in Jugirata without the existence of natural resources and lack of other institutional arrangements, the families were forced to sell their pet animals in the market for their survival.

It was also observed that the sale of cows and small animals such as goat or sheep was higher compared to the others - selling of bullocks was lesser in both villages. During drought, it becomes difficult to feed the animals, as the provision of paddy straw and green grass is difficult, and moreover, the open grazing land also becomes dry during a drought year. Some of the families reported that they were forced to sell their animals for this reason. However, selling of animals during the drought was not profitable, as the amount they received during a distress sale was reportedly 30 percent lower than the normal price. Thus, they never received a good price for their product.

The sale of livestock was higher in Jugirata compared to Mathanpalla mainly because the existence of a dense forest close to Mathanpalla that helped the people to maintain their livestock in a better way compared to Jugirata. Another reason for the higher sale of livestock in Jugirata may be due to the high rate of migration from the village. Most people in Jugirata migrated out from the village in search of jobs; thus, they preferred to sell their animals. When the head of the household migrates out, they prefer to sell the animals in order to reduce the burden on the female member.

There were instances where the households were even forced to sell their land in order to cope with the drought. During the severe drought in 2002, when the crop loss was higher compared to the crop loss during the 2009 drought, around 4.3 percent of the farmers in Mathanpalla and 11.25 percent in Jugirata sold their land in order to cope with the distress situation. However, during the 2009 drought, one household in Jugirata sold one acre of land. The sale of land was higher among the small and marginal farmers compared to the large and medium farmers. This shows that there is a downtrend in the economy, where the landed households joined the group of landless labourers because of the drought situation.

### **Migration**

Rural poverty and natural calamity are obviously closely related (Todaro, 1989). The poor in developing countries reside primarily in rural areas, and are dependent on agriculture. Migration is often a direct response to cope with natural disorders and rural poverty (Lipton, 1989). The individual, family and the community adopt strategies for coping with drought, of which out-migration is an important one (Hill, 1989). Migration may be viewed as part of a household survival strategy even during non-drought years, whereby a family allocates part of its labour for non-farm work (Ezra, 2001). There are numerous evidences that the people from rural areas migrate out to other rural areas or nearby urban areas for survival (Sundari, 2005; Samita, 2008; SRRA, 2010; Keshi and Bhagat, 2012). Circular migration is a dominant form of migration among the STs in India. An estimate by Deshingkar et al. (2008), reported around 30000 labour migrants from Bolangir District in Odisha. In most of the villages in western Odisha the contractor fixes a contract for a period of four to six months and the labourers work as bonded labourers in activities such as brick making and construction. Such seasonal migration generally takes place during the post-monsoon season. However Deshingkar (2003) pointed out that seasonal migration is often linked to debt cycles and the need for money for repaying debts or covering deficits created by losses in agriculture, or other forms of loss.

The present study finds that migration is an important coping mechanism adopted by the sample households during the crisis. The result shows that around 39.71 percent of

the labourers migrate out in Mathanpalla, whereas around 68 percent migrate out in Jugirata, in order to cope with the distress situation - the rate of migration was observed to be higher in Jugirata compared to Mathanpalla. This is again because the latter village is situated near the forest; thus they depended mostly upon the forest for their survival during the drought. Most of the people in Mathanpalla informed that they preferred to depend upon the forest rather than migrating out.

Income from seasonal migration was observed to be a common practice among the households even during a normal year. It is considered 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.

The rate of migration was found to have increased in both the villages during the drought year - the incidence of migration increased by 15-17 percent among the sample households during the drought period. Enquiring about the fact whether there was any simultaneous increase in the number of working days, it was calculated that the number of working days also increased on an average by 10-12 days during the drought period. However, there are hardly any changes in the receipt of wages during the drought period compared to the normal years. In fact, they received lower wages during the drought period compared to the normal year due to the lower bargaining power during a distress period.

The seasonal migrants left their wives and children behind to take care of the land (in case of the small and marginal cultivators) and the house. They migrated out for a period of five to six months. It was revealed from the data analysis that around 32 percent of the people migrated alone, 24 percent with wives, and 11 percent migrated with the whole family in Jugirata. Similarly in Mathanpalla, around 20 percent heads of the families migrated alone, 11 percent migrated with their wives, and 8 percent migrated with the whole family (this information was obtained by asking the details about the migrants regarding 'who migrate'); however, most preferred to migrate alone (without the children and wife) because of the job uncertainty in the area of destination. On the other hand, when men migrated during drought, the female member became the head of the family, which increased their work burden - they usually engaged themselves in the labour work as well as in the household activities.

The people in the study area were observed to migrate out mainly to areas such as Raipur, Berhampur and Bhubaneswar inside Odisha; and to Hyderabad, Rajkot, Bhilai and Mumbai outside Odisha. In Jugirata, a total of 28 people migrated outside the state during 2009 in search of work (this information was obtained by asking the 'destination of the migrants').

It was observed that most of the people preferred to migrate to places where there are acquaintances or relatives at the place of destination. The presence of relatives, friends or acquaintances from the locality provides social security to the migrants. From the group discussion it was obvious that they ventured to migrate outside the state only when they had acquaintances in the area of destination. It was also obvious from the discussion that people from large families migrated more compared to the smaller families. This is because bigger or joint families provide a high sense of security - they feel safe to leave their wife and children with their family members.

### **Labour in Jugirata: Still Bonded**

During the last drought year, a set of around 25-30 people from Jugirata Village migrated to Hyderabad for a period of six months. During the drought period there were no other sources for getting money for survival. Most of them migrated with the help of a contractor. The contractor paid them in advance a total of Rs.6000 per person for the whole period of six months. Though they received the money before the "Nuakhai" the biggest festival in western Odisha, they preferred to migrate after the festival. The whole amount was received in advance; they spent one half on the purchase of food stock for the future and another part for the celebration of the festival. After receiving the advance amount they blindly fulfilled their obligation with the Sardar by going to the pre-determined destinations located in Andhra Pradesh. Thus, they went to Hyderabad, where they were engaged in brick-making kilns. During their stay in Hyderabad they were not allowed to have any contact with their family members and others. Their contract involved a condition, by which they could not quit the job under any circumstance, and though some of them fell sick during the period they were neither allowed to go back to their village, nor provided with proper health facilities. They could only return to their village after completing the period of the contract.

### **Other Important Coping Mechanisms**

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 village, and there were also instances of borrowing from landlords. They also borrowed from the contractor under whom they worked. The borrowing could be in the form of cash as well as kind, and under the condition to pay back the amount in terms of work during the next cropping season. However, when borrowing from the contractor, they had to work extra hours or days to repay the loan. The survey found that borrowing was a regular practice among the villagers, but the intensity of borrowing increased during the drought period when compared to the normal period.

There were some instances where people were forced to sell their gold/silver jewellery for survival - in the extreme situation, people in both villages were forced to sell their jewellery in the market. During the 2009 drought there were few instances of selling jewellery in order to purchase basic commodities. Even though the instances for selling jewellery were few in the sample villages, keeping gold/silver as collateral was observed to be higher among the villagers in Mathanpalla.

#### **NREGA Activities**

During the drought situation many people engaged in NREGA activities. However, there were complaints regarding not getting appropriate days of employment when needed. Even though the people were quite interested to work as NREGA labourers, they at best received only about 10 to 12 days of employment. Moreover, most people in Jugirata were not even aware about the program, which may be due to the lack of initiative of the village Panchayat. The non-availability of employment in the NREGA program during the drought period, forced the poor and marginalised community to migrate out.

## Chapter: V

### Conclusion

The adverse impact of drought lingers for years even after the termination of the event. Drought produces a complex set of highly differentiated adverse impacts that ripple through many sectors of the economy. It affects the biophysical, socio-economic, and environmental sectors of the region hit. Drought leads to food insecurity, malnutrition, starvation, poverty, disinvestment in human capital, and reduction in the financial resources. The present study attempted to analyse the adverse impact of drought on the economic condition of the people, and the different coping mechanisms adopted, at the household level. Understanding the impact of drought and the coping strategies might provide better inputs for the policy implication.

The present study provides the insides from two villages from Bolangir District, Odisha. The insides from the present micro-level analysis shows that the adverse impact of drought was felt on the consumption and expenditure pattern of the households. Crop loss was observed to be high in both 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.

There were local-level coping strategies adopted by the villagers to overcome the adverse affects of drought; these included sale of livestock and assets, shift in employment pattern, and migration. The existence of forest close to one of the study villages provided a source of livelihood during the drought period. Most people in one of the study villages lived in the forest eco-system, and there existed a primitive arrangement of barter system - they exchanged forest commodities among themselves in order to cope with the distress. However, the community in the other study village coped with the drought by migrating. This involved a distress-led migration rather than development-oriented migration. People with a few assets, such as smaller landholding size, absence of irrigation, and lack of other assets namely livestock, migrated more compared to the others. The other major coping mechanisms included selling of livestock and gold/silver jewellery, reduction and change in the consumption pattern, and shifting the occupation pattern. Generally the resource-poor farmers were forced to sell their assets during the distress situation.

Thus, it is prominent from the present study that the economic loss due to drought leads to disinvestment, which adversely affects the asset creation of the farm households. Poorer households have limited access to favoured coping options due to lack of capital, skills, or labour. The inability of the poorer households to adopt proper coping strategies



may increase their vulnerability and widen the gap between the rich and the poor. The poor and marginalised community in the backward regions do not have proper coping strategies, and the lack of provision of institutional arrangements, as well as assets pushes them into the poverty trap due to the occurrence of repeated distress situations such as drought. This leads to increase in the poverty level in the rural areas. The government takes different measures to overcome the adverse situation of drought, including provision of relief. However, this is a short-term phenomenon, and does not act as an effective method to deal with the long-term effects of drought. Hence, the emphasis should be on improving the agricultural practices by providing more irrigation facilities as well as farm implements. There should be better management of rainwater - so importance should be given to rain water harvesting and moisture preservation; there should also be provision for check dams and other water harvesting techniques. Furthermore, the cultivators should be given proper training for cultivating drought-resistant crops, as paddy is a water-intensive crop. Institutional arrangements such as provision of appropriate work through government schemes such as the NREGA program should be properly made. Conservation of rain water through storage, renovation tanks, and the creation of check dams could be done through the NREGA. Involvement of more and more marginal and landless labourers in such activities might create a constant source of income for the affected people during the drought period.

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