Drought and livelihood strategies in Andhra Pradesh, India

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Introduction:

Livelihood is the ability to live for the life. It includes the very basic needs of life, that is, food, clothing and shelter. Strictly speaking, a livelihood comprises the capabilities, assets (both material and social resources) and activities required for a means of living. It is sustainable when it can cope with and recover from stress and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base (Chambers et al 1992). The livelihood of people is largely determined by the local resource base and the ability to use it. Agriculture is the foremost livelihood activity in India. Similarly, in Andhra Pradesh agriculture is the principle source of livelihood for over 70% of population (GoI 2007). People in the rural areas practice subsistence farming to fulfill their basic needs. The subsistence farming depends primarily on the availability of rain. Alternatively, in the subsistence agriculture amount of rainfall determines its success and failure. Contrastingly, large part of the state is under the influence of rain shadow effect of the Western Ghats. Therefore, the region receives relatively less rain. The phenomenon causes failure of agriculture which jeopardizes lives of millions. In addition, the large part of the state is historically been most severely affected by droughts in India (The World Bank Report 2006). The reoccurring drought compels rural masses to adapt to sources of livelihood other than agriculture. Consequently, they adapt to various strategies like lending money (The World Bank 2011), migration (Pande et al 2008; Galab et al 2006), credit and eating less than usual (Khera 2004), etc. Besides, during protracted drought, which happens during the failure of the Monsoon, the competition between human and ecological water uses is sharply accentuated (Loaiciga, 2003), leading to aggravated situation with several associated problems.

Socio-economic consequences of drought: According to the World Bank Report, 2006, drought sets off a vicious cycle of socio-economic impacts beginning with crop-yield failure,

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unemployment, decrease in income, and erosion of assets, worsening of living conditions, poor nutrition, and, subsequently, decreased risk absorptive capacity. These intricately interrelated phenomena in association with each other increases the vulnerability of the poor to another drought and related shocks. In a similar way, the vicious cycle of debt accumulation takes place. In a typical case, once the poor household is affected by drought, it has to lend money from moneylender in the village. Prolonged drought at regular interval magnifies the impact and household has to lend money again and again for livelihood. One of the major repercussions of drought is the suicides of the farmers in Andhra Pradesh. This takes place because of the increasing debt of the farmers because of crop failure (Kumar 2005). As a result, drought has huge socio-economic impact on the households, particularly, the children. Children are doubly jeopardized. Firstly, they receive insufficient and low nutrient food that may lead to reduced growth and even short term or long term illness. Secondly, at times they have to leave school and, in certain conditions are left with nothing but to work in informal sector.

There is social segregation in India primarily based on ethnic grounds and economic status. Social segregation in the access to resources makes disadvantaged groups more susceptible to risk and less capable of adaption (Adger et al 2004; Smit et al 2006). Household consumption during the event of drought varies according to economic status. Rich household responds to shocks through consumption smoothing like selling of assets whereas, poor households smooth their assets like decreased consumption leading to human capital depletion (Hoddinott 2006). Besides, livelihood strategy also varies according to socio-demographic characteristics. Female headed household experience consumption reduction (Kim et al 2010). Human assets such as education and technical knowhow are important in promoting adaption capacity. Households with higher education have lower vulnerability to income shocks (Skoufias 2007; Silbert 2011). More educated individual may have more access to information and a better ability to interpret and evaluate (Jerit et al 2006) including drought risks and self-protection. Households with highly educated members are better prepared for the disaster. There is also a spillover effect of education, possibly through communication and information exchange among village members (Raya et al 2014). Also education indirectly affects adaptive capacity though income. The relationship between education and labour market outcomes are well establishes (Oreopoulos 2006; Riddell et al 2011).

Dynamic nature of livelihood strategy: Careful study of the contemporary literature reveals that human response to natural calamities like drought is a dynamic process. It changes with respect to various socio-economic, cultural and political settings. Even in the same geographical areas, the livelihood measures are different for different households. Alternatively, within countries, vulnerability is geographically and socially differentiated, and processes that mediate the outcomes of hazard events operate at the local scale (Brooks et al, 2005). However, coping mechanism is a distinct component of vulnerability and that understanding the dynamism of coping and vulnerability is critical to adaptation measures that support people as active agents (Eriksen et al, 2005). In addition, social capital, or networks of trust and reciprocity within society is also integral to livelihood mechanisms (Adger, 2000). Adaptation to adverse situation like drought occurs amid a complex set of economic (micro and macro), social and institutional circumstances which establish a location-specific context for human-environment interaction (Smithers et al 1997). There is spatio-temporal dimension of adaptation to drought. That is why, a variety of adaption measures have been reported by different authors at different point in time and at different locations. Some authors have opined that migration is the most common coping strategy during prolonged drought (Pande et al 2008). However, Eriksen et al, in 2005, extensively studied drought situation in Kenya and Tanzania. They found that causal labour, livestock selling, remittances sent by the family members, etc are principal coping strategy at different location in Kenya and Tanzania. They further concluded that there is no single principal strategy but, multiple complimentary activities are adapted by the drought victims. Similarly, Khera in 2004, studied the drought prone districts of Rajasthan in India. She found that resorting to credit is one of the most common ways of tiding over shortages that occur during the time of drought. At the same time, she opined that eating less and skipping meals are also a common practice in relatively poorer households. Finally she concluded that small and marginal farmers or landholders are the most vulnerable to drought.

There is uncertainty over the exact magnitudes of the global changes in temperature and precipitation. It is widely accepted that significant deviations in the variability of climate from its historical patterns are likely to occur (IPCC 2007). A small change in the climate phenomenon may lead to destruction of livelihood of millions of people in Andhra Pradesh. In the light of the apparent changes in the climatic and weather phenomena, response to these changes is extremely important to mitigate the effect. Since, coping strategies vary, not only across space and time but,

across different demographic and socio-economic realities too. Therefore, the study examines effects of drought on households, taking into account their socio-economic and demographic characteristics in Andhra Pradesh. Besides, we also explore diverse livelihood strategies household adapt to in response to drought.

Background of Andhra Pradesh: The demographic profile of the state shows that about 80% population lives in rural areas (NSSO 2007-08). The state is well endowed with a stable economic base which is to a great extent reliant on agriculture and livestock (India HDR 2011). However, agriculture in the state is characterized by less fertile land, low irrigation potential and acute land degradation (Rao 2008). Besides, drought is most important of all natural hazards in Andhra Pradesh and affect millions of lives. There are eight rain-shadow districts in Andhra Pradesh which are most affected by drought namely, Anantpur, Chitoor, Chuddapah and Kurnool in Rayalaseema region; Rangareddy, Mahbubnagar and Nalgonda in Telangana region; and Prakasam in Coastal Andhra region (Figure 1). These eight districts have historically been considered s drought prone districts in Andhra Pradesh. It should be noted here that the state of Andhra Pradesh has a population of 76 million of which approximately 35 million live in its eight drought-prone districts (Census of India 2011). Therefore, the failure of monsoon has an aggravated affect on the sizeable agriculture area of the state and most importantly, large sections of the people are affected since they are directly dependent on agriculture for their livelihood.

[Figure 1: About here]

Data and methods:

The study uses the second round of the Young Lives data, collected in the year 2005-06. The Young Lives is a long-term international research project investigating the changing nature of childhood poverty in four developing countries namely, Ethiopia, Peru, India (Andhra Pradesh) and Vietnam. In India, this study has been implemented in Andhra Pradesh in association with two organizations namely, Centre for Economic and Social Studies (CESS), Hyderabad, and Save the Children UK (India). Apart from information on several socio-economic and demographic characteristics, the data contains information at the household level about natural

calamities like drought for the last four years. In addition, various responses of the households at the time of the drought have also been collected. The study uses the information to analyse and explore various aspects of drought and human responses to it.

It is imperative here to mention that in the survey separate questions have been asked to each respondent about the occurrence of drought in the last four years starting from the most recent one. The respondent for all such questions are either father or head of the household, who is also a male member. The study has considered the most recent event of drought because there may be recall bias. Thus, out of the total households surveyed (1950) in Andhra Pradesh in 2005-06, 28% i.e 542 households reported that they have experienced most recent drought. For all practical purposes, the drought affected households (542) have only been considered. If the response of incidence of drought is found positive then only additional questions have been asked to respondents as what did your household do in response to this drought. There are eighteen different responses for this particular question. For the ease of the analysis, these responses have been merged into four groups namely used credit, insurance, savings, sold things and mortgaged; migrated to work and worked more; help received from either Government/ NGOs or relatives/friends or the community; and all others (Table 1). It is important to mention here that this classification has been done to make categories of dependent variable homogeneous. For example, used credit, insurance, savings, sold things and mortgaged are related to economic aspect of household. Similarly, migrated to work and worked more are associated with each other and named as worked more. In both these strategies, people work more than normal and both these processes are seasonal in nature. Although, the place of work performed may be in situ or somewhere else. In the case of third category, help received by any means have been integrated. Finally, all other categories are merged to form a fourth category. Moreover, this categorization has been carried out for better representation livelihood strategy and for the ease of analysis.

Thus, a dependent variable has been formed in which there are four categories as mentioned above. Multinomial regression analysis is performed to explain livelihood strategy arising out of drought with respect to potential socio-economic, demographic and other characteristics. We have carried out two different multinomial logistic models. In the first model only demographic and socio-economic characteristics of household have been controlled. In the second and final model, along with demographic and socio-economic characteristics, social and community level

variables have also been controlled. Apart from that, for the generation of the wealth index, principal component analysis has been carried out considering eighteen household assets[3]. Thereafter, households have been categorized as non-poor and poor. Similarly, other background variables have also been categorized when found necessary.

[Table 1: About here]

Results and Findings:

The finding reveals that during the most recent period of drought, 28% of the household are affected in Andhra Pradesh (Table 2). It is also evident that drought is largely a rural phenomenon since out of total households in rural areas 36% are affected by drought; whereas, merely 4% drought affected households lie in urban areas. Simultaneously, the event of drought in Andhra Pradesh is a regional phenomenon which is historically been considered (The World Bank 2010). For example, in the Rayalaseema and the Telangana regions, 47% and 30% of households are affected by drought respectively. On the other hand, Coastal Andhra region has much less drought affected households (10%) since the region has river beds and river delta which replenishes soil water balance. The major economic activity of the householdis categorized into three groups namely agriculture, causal labour and all other economic activities. All other activities include economic activities related to semi-skilled to skilled nature.we have found that household practicing agriculture as a main economic activity are most affected by the recent drought (39%), followed by causal labour. Causal laboures are those who are engaged in informal sector like daily wage earners. It has been also found that about one third of households affected by drought have either of the parents illiterate. Also, little more than one third of households have both parents up to primary educated; whereas only 20% fathers and 13% mothers are hogher educated where drought has hit. There is a well established social stratification in India. The Schedule Castes (STs) and Scheduled Tribes (STs) are at the lowest part of the ladder; and the middle part is represented by Other Backward Classes (OBCs).

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[3] For the generation of wealth index twenty households assets have been used namely, type of house, type of water facility, type of toilet facility, fridge, electric oven, table and chair, sofa, working fan, bed-sheet, type of fuel use, tractor, water pump, sewing machine, television, radio, car, motor cycle and, mobile phone.

Finally, all other caste groups are in the upper part of the socio-economic ladder. The stratification is based on socio-economic consideration. The analysis has found that about two-third of all drought affected households belong to OBCs and, a little more than one-four are from SCs and STs category. The other caste group, occupying the upper strata of the society, is considerably less affected (19%). The result also indicates that poor households are more affected by drought (39%) as compared to non-poor households (12%) during the recent event of drought.

One-fourth of the household practicing scientific agriculture are affected by the event of drought. On the other hand, two-fifth of the households having domestic animals is affected by the recent event of drought. The households which have received social security or subsidy, 48% among them have suffered from drought. Similarly, of the total households which have received money goods or food aid from the Government or NGOs, 30% among them are affected by the event of drought. It is important to mention that of the total households having serious debt, 23% are affected by drought. Also, the recent drought has hit little more half of all the households registered under the NREGA programme, which guarantees at least 100 days of employment in a year to at least one member of each household in every village.

[Table 2: About here]

Livelihood Strategies drought victims: Use of credits, savings and insurance as a livelihood strategy is by far the most important approach to fight drought in Andhra Pradesh. Alternatively, savings, credits and insurances of one third drought victims are invested to fight drought. Closely followed by the first strategy, about 30% of drought victims worked more to mitigate adverse effects of drought. The drought victims worked more either in their own village or town, or migrated for employment opportunity during the event of drought. Similarly, only 16% drought victims received any kind of help either from either from Government/NGOs or relatives/friends or community. The help received may vary from monetary to all other kinds of help. This indicates that the support provided by the Government/NGO is not uniform and only a handful of drought victims received it.

Livelihood Strategies and socio-economic characteristics of drought victims: We have examined selected socio-economic and demographic variables to have an understanding about the background of use of different livelihood strategies of drought victims. In the rural areas, one-third of the drought victims adapt to use of credit, insurance and savings as a livelihood strategy. About 30% of them in rural areas either work more or migrate to work. There 38% in the Rayalaseema region who use credits, savings and insurances as the most important livelihood strategy followed by worked more (30%). But, in Telangana region, about 30% households use both credit, saving and insurance; and work more as livelihood strategies. On the contrary, in the coastal Andhra region, the prime livelihood strategy against drought is to rely on help from either the Government/NGOs or friends/relatives or community. Although, 36% drought affected households use other strategies to fight drought which is not well defined. Based on the age of the household heads, household have been classified into younger household heads (24 to 34 years) and older heads (35 years and more). It is found that the about four-fifth of the younger household heads work more for livelihood during drought. Older household heads, in contrast, primarily use credits, savings and insurances as main livelihood strategy followed by work more. In the relatively smaller households with two to four members, people work more to fight drought. But, as the household size increases from five to seven members and more, credit, savings and insurances are largely used as most important livelihood strategy. More than two-fifth households, with up to four members depend on help received from different sources during the most recent drought.

We found that irrespective of the economic status of households, use of credit, insurance and savings are important livelihood strategy. Poor household members work considerably more as compared to non-poor households. In case of both poor and non-poor households, 16% rely on help received from various sources. The household practicing agriculture as a primary economic activity, four-fifth of them are using credit, saving and insurance as the most important livelihood strategy to sustain lives. In case of causal labourers, 42% are working more and use this as the most important livelihood strategy to fight the recent drought. It appears that educated mother and father decide to use credit, saving and insurance as the most important livelihood strategy. On the contrary, work more is the prime strategy for fathers and mothers who are not educated. On the basis of caste groups, four-fifth of the upper strata of the society in terms of economic and social status i.e other castes use credit, saving and insurances as most important

livelihood strategy during the recent drought. In the case of relatively lower strata of the society i.e other backward castes (OBCs), scheduled castes (SCs) and scheduled tribes (STs), 31% work more during recent event of drought; whereas, only 21% of drought victims from the other caste work more and use it as a strategy to fight drought.

In Andhra Pradesh, domestication of animals is one of the important practices. Domestic animals can be used during bad times like drought. The most important strategy of the drought victims having domestic animal is work more (337%). In contrast, use of credit, saving and insurance is the prime strategy to fight drought for household having at least one animal. During the event of drought in Andhra Pradesh, government and non-government bodies distribute several items to the drought victims like money, goods, and food aid. In addition, there are some social security and subsidy offered. Although, households have received these helps from government and non-government organization, nevertheless, use of credit, saving and insurance is the most important strategy for them. This suggests that the help offered by said bodies is not sufficient to meet the needs of the people. Therefore, there are only 16% households that have obtained money/goods/food aid and their livelihood strategy is help received either from government/NGOs or from friends/relatives or from community. Likewise, households that have received social security/subsidy, 42% among them used credit, saving and insurance as the main livelihood strategy to fight drought. Again, among such households, only 6% use help received from different sources as a livelihood strategy. It is evident from Table 2 that one third of drought affected households have serious debt. The households having serious debts have considered work more as the first strategy to fight recent drought, closely followed by use of credit, saving and insurance. The household having serious debt, one-third among those uses both credit insurance and saving; and work more as livelihood strategies. Household members, registered under the National Rural Employment Guarantee Act (NREGA), are working more (30%) and using it as a livelihood strategy during recent drought. It should be mentioned here that among all other objectives, NREGA is enacted to reduce the rate of migration from villages to towns and cities by providing at least 100 days annual employment in the same village. Even after registered in the programme, household members are either migrating to work or working more.

[Table 3: About here]

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Determinants of livelihood strategy in Andhra Pradesh: We have carried out two different multinomial logistic models to explore the livelihood strategies of drought affected households in Andhra Pradesh with respect to selected explanatory variables. Multinomial logistic models have been performed because of the fact that the predictor variable is of four categories namely use of credit, saving, insurance; migrated to work and worked more; help received from either Government/NGOs or friends/relatives or community; and, all others. It needs mention here that model building has been carried out to see the behavior of socio-economic and demographic variables after the inclusion of other contextual variables like social and community characteristics. Results of multinomial logistic regressions are presented in terms of adjusted percentages of predicted probabilities of livelihood strategies with respect to selected explanatory variables in Table 4.

Working more as livelihood strategy: Working more during the recent event of drought has been used as a livelihood strategy to mitigate effects of drought. In the first model in comparison to Coastal Andhra, the predicted probability of household members working more during drought in the Rayalaseema region is significantly less (31%) as compared to 38% households where credit, saving and insurance is used. When other predictors are controlled in the second model, there is not much of a difference in this strategy as a livelihood activity. In the Telangana region, the predicted probability of working more during drought is 30% which is statistically significant in both the models compared to use of credit saving and insurance. The adjusted predicted probability of working more compared to use of credit, saving and insurance is the highest in the Rayalaseema region followed by the Telangana and Coastal Andhra region (Figure 2A). Similarly, the pattern of adjusted predicted probability for use of credit, savings and insurances as a livelihood strategy is highest in Rayalaseema region followed by the Telangana region. Similarly, in the rural areas compared to urban areas, when all explanatory variables are controlled, the predicted probability of working more as a livelihood strategy is little less (30%) than use of credit, saving and insurance (34%). But, compared to first model, the degree of significance level reduced from 1% to 10%. Households, where household head is more than 34 years of age, the predicted probability of working more during drought in such household is 27% which is statistically significant, compared to 36% household where credit, saving and insurance is use as a livelihood strategy. When household size is considered, again it is found that predicted

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probability of working more as a livelihood strategy in the final model is low and is statistically significant (28%) compared to 33% households where use of credit, saving and insurance is excised as a livelihood strategy to mitigate the effect of drought. Similar is the case with poor household compared to non-poor household. It should be noted that there is not much difference in the predeicted probabilities of livelihood strategy from Model I to Model II. The main economic activity of household is one of the important determinants of working more as a livelihood strategy to fight recent drought in Andhra Pradesh. Households where main economic activity is causal labour, the predicted probability of working more during the event of drought is more than household where use of credit saving and insurance is used as a livelihood strategy. Both uneducated father and mother is statistically significant predictor of working more during the event of drought. Although it appears from the result that uneducated father is more important than uneducated mother when it comes to working more during drought as a livelihood strategy. The adjusted predicted probability for working more is the highest households where causal labour is main economic activity. This is followed by othr economic activity which includes semi-skilled to skilled work, followed by agriculture. It should be noted be noted here that in case of adjusted predicted probability of agriculture, the confidence interval (C.I) is less compared to other to two categories (Figure 2B). Unlike the adjusted predicted probability of working more the pattern of adjusted predicted probability for use of credit, saving and insurance is opposite. The adjusted predicted probability for use of credit, saving and insurance is the highest in agriculture followed by other activities. The households where credit saving and insurance is used as a livelihood strategy, adjusted predicted probability is the lowest, with low CI. The probability of working more as a livelihood strategy is higher (35%) and statistically significant, in households with serious debt compared to use of credit, saving and insurance (33%). Other important significant predictors are households belonging to OBCs, STs and SCs which are considered from lower socio-economic strata of the society compared to other castes; household that received no help from various sources compared to households that received help; households that have serious debt compared to households with no debt; and, households where at least one member is enrolled in the NREGA.

[Figure 2A & 2B: About here]

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Help received from different sources as a livelihood strategy: Help received either from Government/NGOs or relative/friends or community is third most important strategy of the drought victims in Andhra Pradesh. The percentages of predicted probabilities shows that help received from various sources is much less than credit savings and insurances in all categories of explanatory variables. In the Rayalaseema region, predicted probability of help receives from various sources is 16% and is statistically significant compared to credit, savings and insurances (38%). Similarly, in the rural households with respect to urban households the predicted probability of help received during drought is half as compared to use of saving credit and insurance during drought. The predicted probabilities of receiveing help by households with 5 to 7 members is less than half than the use of credit, saving and insurance as a livelihood strategy. Fourteen percent household where causal labour is main economic activity compared to agriculture, received help to fight drought as compared to 24% households where use saving, credit and insurance is used as a livelihood strategy. The adjusted predicted probability of help received during drought is the highest in Coastal Andhra, though the CI is also highest (Figure 2B). The adjusted predicted probability for help received as a livelihood strategy in Rayalaseema region is less than the Coastal Andhra and is the lowest in Telangana. Likewise, th e adjusted predicted probability help received during drought and using it as a ;livelihood strategy is the highest in case of household where agriculture is main economic activity followed by household where causal labour is main economic activity. Other statistically significant predictors for receiving help are uneducated father compared to educated; households where help from social security and subsidy is not received compared to household where it is received; and, households where there is serious debt.

[Table 4: About here]

Discussions:

Parts of Andhra Pradesh is historically been seen as a drought prone area. Drought, here, has been persistent for the last hundred years. Since the economy of the state is largely based upon agriculture, drought hits the backbone of the economy. It is the rural area where the effect of drought is largely seen. The urban areas are relatively untouched. This may happen because most of the Government resources are centered towards the development of urban areas. In addition

people are primarily dependent on service sector and there is little direct dependence on agriculture. Apart from that it is observed that the event of drought is regionalized in Andhra Pradesh. The Rayalaseema region is badly hit by recent drought since one in two household is affected. Little less one third of the households in Telangana is affected by drought. On the other hand, only one tenth households have suffered by drought in Coastal Andhra region. Historically, the whole of Rayalaseema and three out of the nine districts of Telangana are considered as drought prone areas (The World Bank 2011). On the other hand, the effect of drought is more on households with more household members. During the event of drought, limited resources are difficult to distribute among households members therefore, the effect of drought may more discernible on large households. Similar is the case with poor households where there is limited resources to manage during drought. Drought actually aggravates miseries of the poor.

It should be noted that unlike flood, the onset of drought is relatively slow process and its occurrence is largely determined by delay, less intensity, and early withdrawal of the Monsoon rains in Andhra Pradesh. Therefore, measures at the beginning are different than that of fully established drought (Jasper et al 1995). There are about one third drought affected households using credits, saving and insurances as a livelihood strategy to fight drought. This is also the most important livelihood strategy irrespective of different socio-economic, demographic and community characteristics during the recent drought in Andhra Pradesh. Otherwise credits and savings could be used for other welfare activities of households.

The second vital strategy to mitigate the effect of drought is working more during the event. Working more than normal during drought is possible either in the villages or after migration in towns and cities. In the situation of drought, it may be difficult to find reasonable employment opportunity in villages. Therefore, household member migrate for employment thus, sustains lives. Migration decision taken under conditions of environmental stress is often initiated by at the household level. The migration process may be seen as situated with the broader range of adaption practices and strategies potentially available to households exposed to environmental risk. Therefore, it is responsive to perception of potential risk, diversification of livelihood strategies, social networks and capitals, access to economic resources and a range of other factors believed to influence adaptive capacity and migration behavior (Gilbert et al 2010). Migration in response to the impacts of climate variability and change may therefore be seen as one potential

form of adaptation within the broader set of possibilities (McLeman et al 2006; Perch-Nielsen et al 2008; Tacoli 2009). But, this is not the most important strategy in Andhra Pradesh as mentioned in some other studies too (Pande et al 2008). The multinomial regression results depicted that people migrate to work or work more in areas where the effect of drought is severe. It also shows that causal labour and people belonging to lower socio-economic strata of the society are working more and use this as a livelihood strategy. Although such migration may fulfill immediate monetary needs but, it has other socio-economic impact on the household. Our study indicates that working more during drought is potent livelihood strategy. But, it should not be considered as those who work more are all migrated to work, although significant proportion of household members may migrate to work more.

Therefore, it is found that the livelihood strategy adapted by the households in Andhra Pradesh is not uniform but is a dynamic process. There are large differences in drought affected households in different regions and according to different socio-economic backgrounds.

One of the important repercussions of drought is debt-trap. The debt trap starts when the standing crop is affected during drought. There are household that practice scientific agriculture. The input cost of scientific agriculture is more than that of traditional agriculture therefore, there is extra cost burden. The people, particularly those who practice scientific agriculture, are left to opt for lending debt in case of crop failure due to drought (The World Bank 2008). The immediate person in the village to lend money is the moneylender who lends money at relatively higher rates (Khera 2004). The persistent drought results in regular crop failure leading to increase in the debt each year. Finally, poor farmers commit suicides, which have severe socio-economic consequences. Farmer suicide in Andhra Pradesh has increased considerably from 1097 in the year 1997 to 2490 in 2005 (NCRB 2006). Therefore, one of the serious repercussions of drought is suicide of farmers in rural areas of Andhra Pradesh. The situation becomes worst when the earning member of the family commits suicide (Kumar 2005). Suicide of farmers during and after the event of drought is on account of the fact that they are stricken by serious debt. On most occasions, the suicide of the breadwinner takes place, resulting into devastation of the whole family. There are Government sponsored schemes to support the farmers during bad times but, those schemes are not properly implemented at the grass root level.

Conclusions:

There are increasing evidence that the impacts of climate change, which include the increasing frequency and intensity of droughts and storms, and rising sea level, are already being felt in Asia and the rest of the world (Diffenbaugh et al 2005; Solomon et al 2007; Fransisco 2008). In Andhra Pradesh too warming in the order of 0.3^0 C during the 20th Century was observed for the whole of Andhra Pradesh but, significant regional differences exist (Sotake et al 2008). In addition, hydro-meteorological hazard causes tremendous destruction. They account for 85% of all natural disasters and caused 75% of all economic losses from natural causes from 1980 to 2005 (Golnaraghi 2006). In these instances, land-use practices can either create a drought situation (e g., agricultural or hydrological drought) or make an existing one worse (Vogel et al 1993). Therefore, it is important to consider a wide range of socio-economic variables which have rendered these rural communities vulnerable to drought. These include an historic understanding of changing pattern of resource management, human settlement, land use and agricultural production (Susanne et al 2010). Although climate change adaptation research is still in its infancy stage. Nevertheless, an increasing body of research shows that climate change takes expression in local processes such as increased climatic variability; climatic risk is managed in relation to other risks in agricultural households; and adaptation is an everyday social process as much as a question of new crop varieties. Understanding how farming households experience the interactions of climatic variability, multifaceted risk, adaptation, and everyday social processes is crucial to informed policy development (Lesley et al 2011). Moreover, Monsoon failure is likely to become more frequent and severe if predictions on climate change turn out to be true. We need to put in place an effective early warning system for extreme events like a drought and also improve the capacity to provide credible, usable and specific forecasts at a disaggregate level. And it is self-evident that water conservation and efficient use of water should be a crucial part of medium- and long-term strategies to deal with monsoon failure (EPW 2009).

There are some very important findings coming out of this study. Firstly, drought is largely hitting the traditional and historical drought prone areas of Andhra Pradesh i.e Rayalaseema and Telangana. Secondly, use of credits, savings and insurance are the most important strategy to fight with the incidence of drought. This strategy is largely practices in the Rayalaseema region and by the causal laboures. Thirdly, people from lower socio-economic strata and causal laboures are working more either after migration to other places like town or cities or in their villages. Last but not the least, there is wide variation in the livelihood strategy with respect to

different socio-economic and demographic characteristics. It is generally believed among researchers that the adverse impact of climate will be even more serious in the decades to come. Keeping this in mind, the Government of India and the State Governemnt of Andhra Pradesh should work in multifaceted directions. The Government should provide easy loans to farmers and should also provide insurances for crops which are destroyed by drought. Debt is one of the serious repercussions of drought causing lives of farmers. Therefore, measures should be taken to keep the farmers out of the vicious cycle of debt trap. Finally, the community participation and social security schemes are very important to successfully implement any intervention at the grass root level.

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Figure 1: Enlarged map of Andhra Pradesh from India showing historically considered drought prone districts (dark shades) in agro-climatic regions, according to the World Bank Report, 2010.
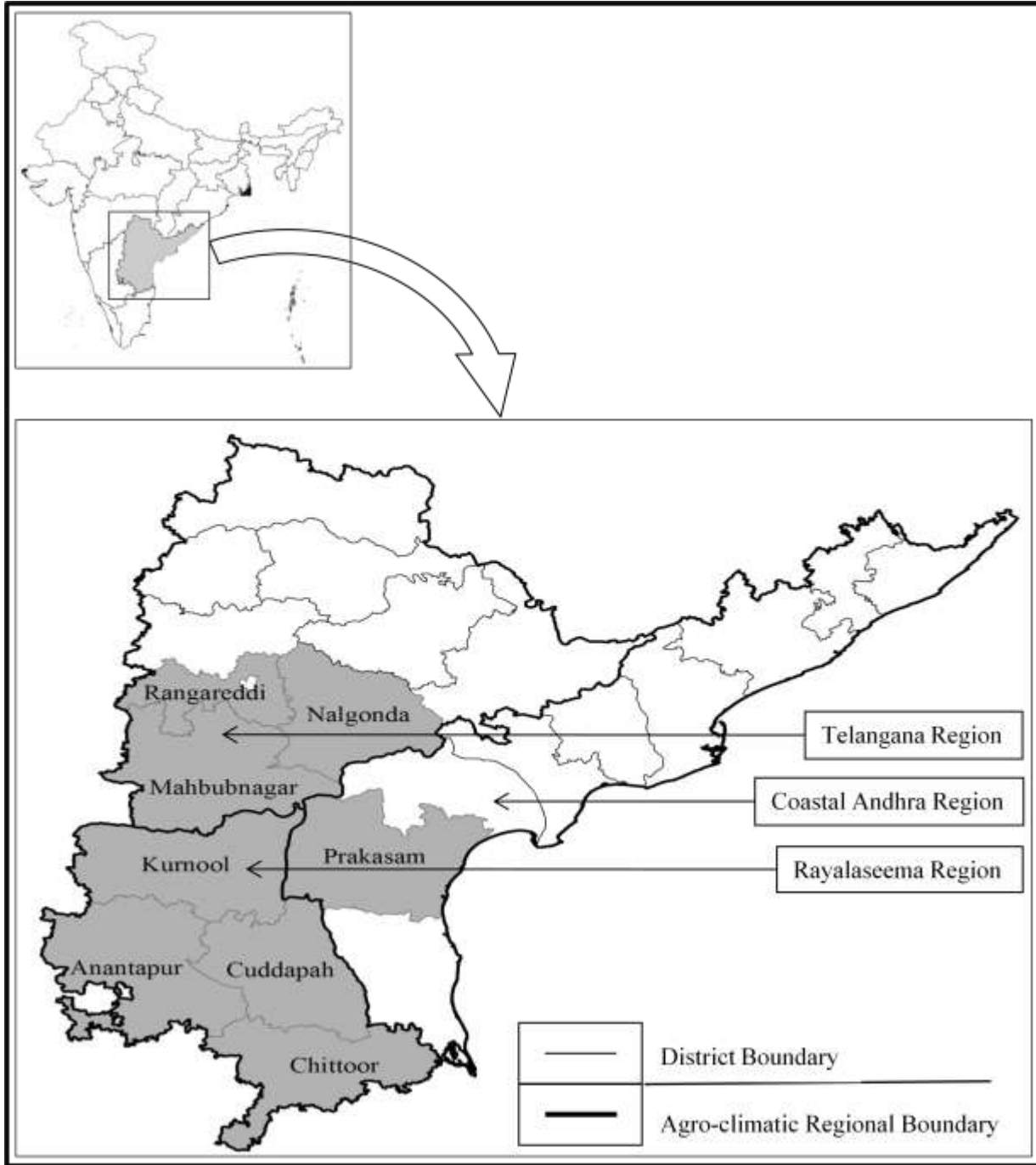
Note: Map not to scale.

Figure 2A and 2B: Adjusted predicted probabilities for each category of livelihood strategies by different regions and economic activities in Andhra Pradesh, India.
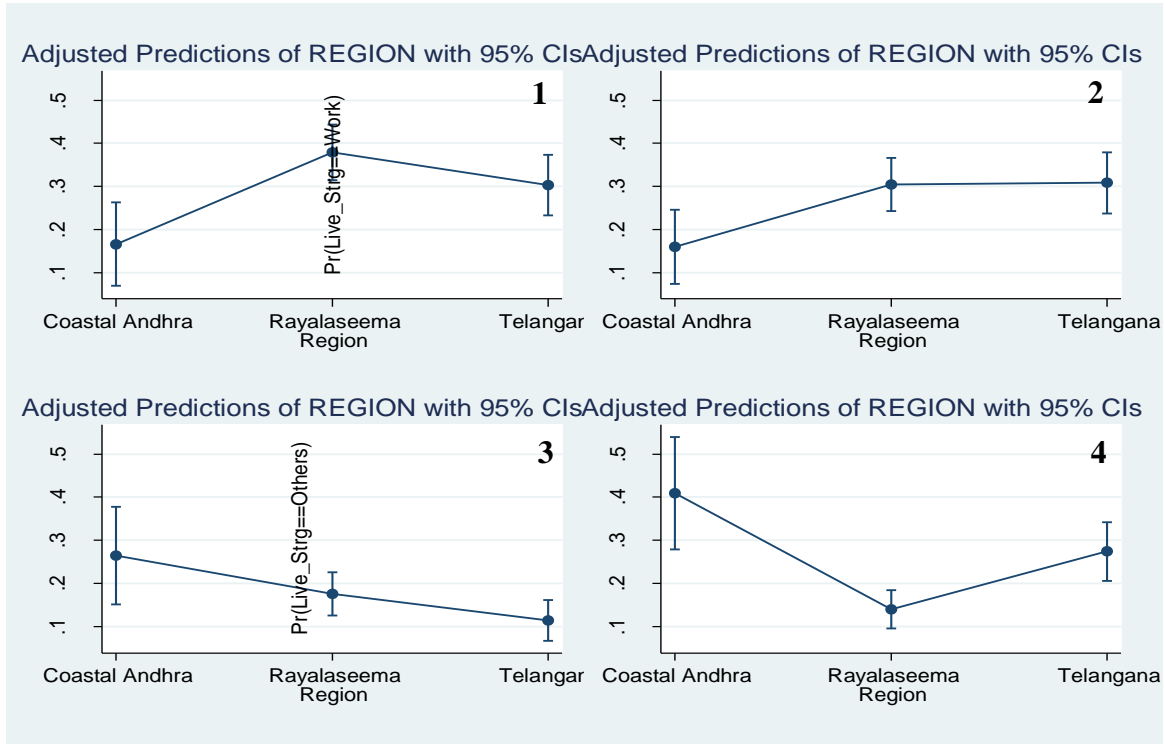
Figure 2A
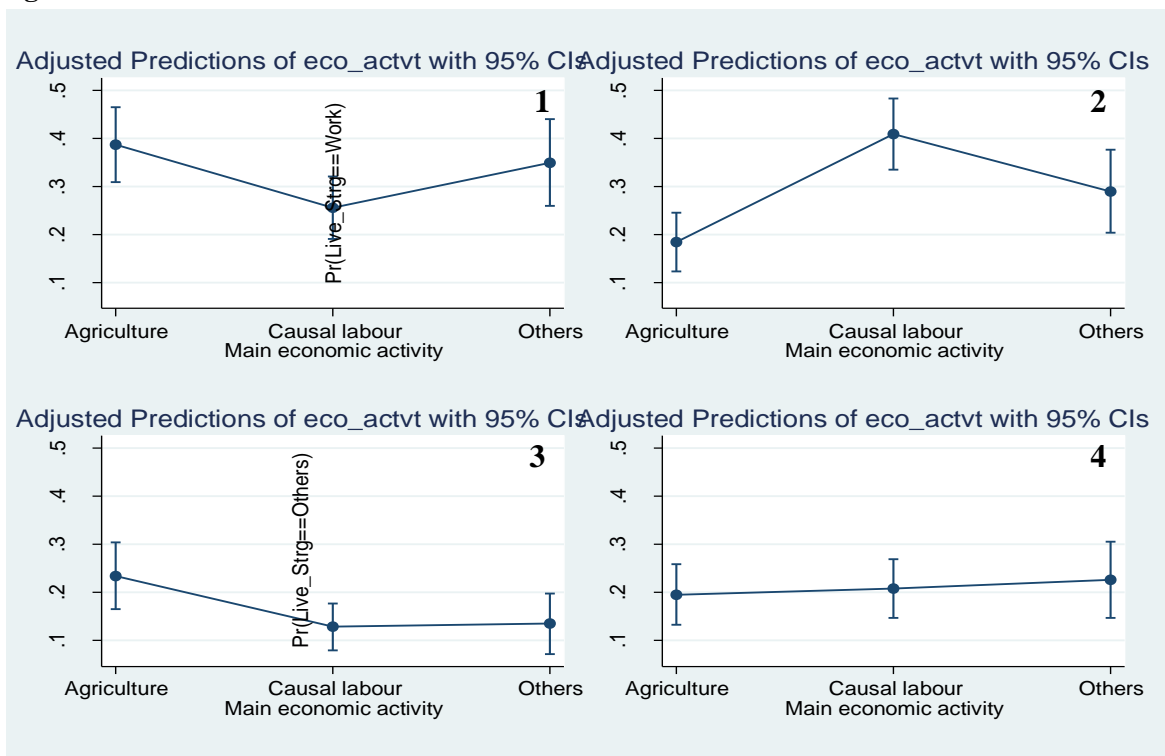
Figure 2B

Note: 1= Use of credit, saving and insurance; 2= Migrated to work and work more; 3= Help received from Government/NGOs or Friends/relatives or Community; and, 4= Others.

Table 1: Different responses to drought as reported by respondents and categories of predictor variable made from these responses with sample size		
Different responses to drought given by respondents	**Categories of predictor variable after merging different response to drought**	**Sample size of each category of predictor variable**
Credits (125); Savings (21); Insurances paid (23); sold thins (2) and; Mortgaged (4)	Credit, savings, Insurance, and mortgaged	175
Migrated to work and worked more (93)	Worked more	160
Help receive from Government /NGOs (23); Help receive from friends/relatives (45); and Help receive from the community (21)	Help received from Government/NGOs/ friends/relatives	89
Ate less (15); Bought less (34); Destruction of livestock (1); Sent children to relatives/friends (2); sent children to work (1); took children out of school (1); Did nothing (59); and others (5)	All others	118
	Total	**542**

Table 2: Percent distribution of drought affected households and their selected characteristics in Andhra Pradesh, India, 2005-06.		
Background Characteristics	N	% of HH affected by drought
Total	**542**	**27.8**
Place of residence		
Urban	22	4.4
Rural	520	35.8
Region of residence		
Coastal Andhra Pradesh	68	9.9
Rayalaseema	271	46.8
Telangana	203	29.9
Age of household head		
24 to 30	184	33.8
>30	358	42.7
Household size		
2 to 4	163	21.9
5 to 7	283	29.7
> 7	96	38.2
Wealth index		
Non poor	90	11.5
Poor	451	38.6
Main economic activity		
Semi skilled work	49	21.1
Agriculture	184	39.2
Causal labour	218	36.0
Others	87	14.0
Educational status of father		
Primary to higher education	167	20.1
Up to primary education	171	36.3
No education	204	31.6
Educational status of mother		
Primary to higher education	73	13.2
Up to primary education	137	34.6
No education	332	33.3
Caste groups		
Other Castes	79	19.3
OBCs	301	32.2
SCs and STs	162	26.9

Table 2: Continued ….

Any relative in the community		
Yes	490	28.1
No	52	25.4
Use scientific agriculture		
Yes	367	24.7
No	175	37.9
Have domestic animals		
Yes	307	40.2
No	235	19.8
Received help from social security/subsidy		
Yes	124	47.9
No	418	24.7
Received money/goods/food aid		
Yes	488	29.6
No	54	18.0
HH has serious debt		
No	235	22.9
Yes	306	33.4
Any HH member registered in NREGA		
Yes	359	53.9
No	183	14.3

Table 3: Percent distribution of different livelihood strategies of drought victims according selected background characteristics in Andhra Pradesh, India 2005-06.

Background characteristics	Credit, insurance and saving	Worked more	Help received	All other
Total	32.6	29.3	16.6	21.0
Place of residence				
Urban	18.2	40.9	18.2	22.7
Rural	32.9	29.0	16.3	21.7
Region of residence				
Coastal Andhra Pradesh	14.9	20.6	27.9	36.8
Rayalaseema	38.1	30.3	17.0	14.4
Telangana	31.0	31.5	11.8	25.0
Age of household head				
24 to 34	26.4	38.9	16.1	19.1
>34	35.8	31.7	17.2	15.6
Household size				
2 to 4	24.5	38.7	22.1	14.7
5 to 7	33.7	26.9	12.7	27.2
> 7	42.7	21.9	17.7	17.7
Wealth index				
Non poor	38.9	21.1	16.7	23.3
Poor	30.8	31.3	16.4	21.5
Main economic activity				
Agriculture	41.3	16.8	20.1	21.7
Causal labour	22.9	42.2	14.7	20.2
Others	35.3	26.5	14.7	23.5
Educational status of father				
Educated	35.8	25.7	17.5	21.0
No education	26.7	35.8	14.7	23.0
Educational status of mother				
Primary to higher education	37.6	24.3	19.5	18.6
No education	28.9	32.8	14.5	23.8
Caste groups				
Other Castes	40.5	21.5	17.7	20.3
OBCs, STs & SCs	36.7	30.9	16.2	20.2
Any relative in the community				
Yes	32.6	17.1	18.1	18.8
No	32.7	19.2	1.9	42.3

Table 3: continued ….

Use scientific agriculture				
Yes	31.7	30.2	16.9	21.3
No	33.7	28.0	15.4	22.9
Have domestic animals				
Yes	32.8	24.1	17.9	25.7
No	32.4	36.6	14.5	16.6
Received help from social security/subsidy				
Yes	41.9	28.2	6.4	23.4
No	29.4	29.9	19.4	21.3
Received money/goods/food aid				
Yes	32.4	29.9	16.0	21.7
No	31.5	25.9	20.4	22.2
HH has serious debt				
No	31.2	24.3	15.7	28.6
Yes	33.0	33.7	17.0	16.3
Any HH member registered in NREGA				
Yes	36.2	31.5	14.8	17.5
No	24.6	25.7	19.7	30.1

Table 4: Percentages of predicted probabilities of different categories of livelihood strategies with respect to selected background characteristics in Andhra Pradesh, India, 2005-06.

Background characteristics	p_1		p_2		p_3		p_4	
	M I	M II	M I	M II	M I	M II	M I	M II
Region of residence								
Coastal Andhra Pradesh [®]	16.5	22.1	16.2	18.8	26.8	24.4	40.3	34.6
Rayalaseema	37.5	38.9	30.7***	30.8***	17.3*	16.1*	14.3***	13.9*
Telangana	30.8	28.8	30.0***	30.1***	12.2	13.5*	26.8**	27.4*
Place of residence								
Urban [®]	20.4	21.1	44.2	47.1	20.8	19.0	14.5	12.6
Rural	33.2	33.8	28.6***	28.9*	16.4	16.2*	21.6**	20.9*
Age of household head								
24 to 34 [®]	25.5	22.1	31.9	30.6	20.3	18.8	22.8	28.8
>30	33.2	31.1	28.4***	26.0	18.4*	22.3	20.6	21.1
Household size								
2 to 4 [®]	26.3	27.1	36.7	37.7	22.9	21.3	13.9	13.8
5 to 7	33.3	33.4	25.3***	25.3***	13.1***	13.4**	28.0***	27.6**
> 7	29.5	41.3	26.4***	27.3	17.0	16.4	16.9	14.8*
Wealth index								
Non poor [®]	32.2	34.7	24.8	25.1	15.8	14.8	27.0	25.2
Poor	32.7	33.0	30.1***	30.5**	16.7	16.6*	20.3	19.7
Main economic activity								
Agriculture [®]	39.6	42.5	18.2	18.8	22.5	21.1	19.5	17.4
Causal labour	24.2	24.1	40.6***	39.9***	14.1***	13.9***	20.9***	21.9***
Others	36.4	35.9	28.7***	29.8*	12.8	13.3	21.9***	20.8**
Educational status of father								
Educated [®]	**33.7**	34.2	26.3	26.5	16.9	16.6	22.9	22.5
No education	30.8	31.5**	34.2***	35.1**	16.1	15.6	18.7	17.5
Educational status of mother								
Educated [®]	35.6	36.1	26.3	25.2	19.0	18.6	18.9	19.9
No education	30.8	31.4	31.0	32.5*	15.2*	14.9	22.9**	20.9**
Caste groups								
Other castes [®]	35.1	35.9	27.4	28.5	16.2	15.3	21.2	20.1
OBCs, STs & SCs	32.3	32.9	29.5***	29.8***	16.7*	16.5	21.3*	20.7
Use scientific agriculture								
Yes [®]		32.2		29.1		16.6		21.8
No		35.7		30.4		15.6		18.1
Have domestic animals								
Yes [®]		29.4		26.5		17.9		26.1
No		38.1		33.1		14.1		14.6*

Table 4: Continued ….

Received help from social security/subsidy				
Yes [®]	32.7	30.2	16.1	20.7
No	38.8	23.9*	18.2**	19.0***
Received money/goods/food aid				
Yes [®]	32.7	30.2	16.1	20.7
No	38.8	23.9	18.2	19.0
HH has serious debt				
No [®]	32.7	22.2	16.0	28.9
Yes	32.8	35.5***	16.1*	15.4*
Any HH member registered in NREGA				
Yes [®]	29.4	27.3	17.2	25.8
No	35.3	30.5***	15.8	18.2**

Note: 1. $*P<0.1$, $**P<0.05$, $***P<0.01$.

2. p_1, p_2, p_3, and p_4 are use of credit, saving and insurance; migrated to work and worked more; help received either from Government/NGOs or relatives/friends or community; and, all other respectively.

3. M I and M II are two different multinomial logistic models

4. HH = Household

5. [®] = Reference category.