Man In India, 94 (4-II) : 741-753

CLIMATE CHANGE AND ITS EFFECFTS ON LIVELIHOODS OF TRIBES IN EASTERN GHATS OF ANDHRA PRADESH

V. Subramanyam, K. Rama mohan and B. Veerabhadrudu

Eastern Ghats is considered as abode for tribal communities in Andhra Pradesh state. About 27 hill tribes inhabits in the Eastern Ghats forest environment, largely depending on forest resources for subsistance and survival. The hill tribes' population meets their subsistence requirement from shifting (*podu*) and settled cultivation in addition to Non-Timber Forest Produce (NTFP) collection. Over exploitation of forest resources in Eastern Ghats by both the indigenous aboriginals and external agencies for a long period of time resulted to degradation of forest environment. The practice of age old method of shifting *(podu*) cultivation also caused for deforestation in Eastern Ghats to some extent. Ultimately it resulted to climate change and adversely affected the livelihoods of adivasis, specifically the traditional shifting (*podu)* cultivators mostly belong to the vulnerable tribes like Khond,Konda savara, and Konda reddi.

The research paper explains about the effects of climate change on the livelihoods of *'adivasis'* in specific and other populations of Eastern Ghats forest environment in general . it also discusses about the future plan of action from administration, academics and NGO's or activists for sustainable livelihood and development of adivasis, who are currently living in degraded forest environment of Eastern Ghats high altitude zone in Andhra Pradesh state. The empirical research of this contributions stress the urgent felt need of protection, conservation and regeneration of forests with the participation of *vanavasis* (forest dwellers) or adivasis, and also to arrest the threats from various external agencies to Eastern Ghats forest environment. There is an immediate need to 'save the Eastern Ghats' natural environment in order to reduce Green House Gas emissions and to ensure sustainable living for tribal communities in specific and other non-tribal populations in general.

Keywords: Eastern Ghats environment, Tribals, Climate change, Livelihoods, Global warming, Conservation of forest environment

Introduction

In general the adivasis, who dwell in tropical forests and mountains directly dependent upon forest flora and fauna, for their subsistence and survival. They collect the Non-timber forest produce (NTFP) items, apart from practicing their traditional agricultural systems of shifting (*podu*), settled and terrace cultivations, as well as horticulture and kitchen gardening. The economy of these traditional societies being driven by bio-diversity, both natural and human managed; climate change related impacts taken along with other anthropogenic impacts on ecosystems will threaten their immediate livelihood concern with long-term impacts on

Address for communication: **V. Subramanyam,** U.G.C Emeritus Fellow, Department of Anthropology, Andhra University, Visakhapatnam – 530003, **K. Rama mohan,** Assistant Director, CSSE & IP, Andhra University, Visakhapatnam – 53003 and **B. Veerabhadrudu**, Research Scholar and Project Fellow, U.G.C Major Research Project, Department of Anthropology, Andhra University, Visakhapatnam – 530003.

sustainable development of the region (Ramakrishnan, 2001). The impact of climate change in a larger context will also be felt in terms of coping with environmental uncertainties, arising out of polar and high mountain ice cap melt and sea level rise.

Climate change, popularly known as global warming, has today become a major issue of international negotiations. Accelerated climatic changes in the global atmosphere emerged as a major concern at the Earth Summit (United Nations Conference on Environment and Development – UNCED) held on Rio-dejaneiro in June 1992. The issues involved in it have serious implications for India, particularly the marginalized communities like tribals. The potential impacts of climate change are likely to include extreme weather conditions, greater intensity of floods and droughts, upsurge of diseases such as malaria, and dengue fever, asthma and other respiratory illnesses due to global warming and air pollution. Other possible impacts are inundation of coastal and low-lying lands due to sea level rise, adverse effects on agriculture due to changes in soil condition, water supply and water quality and damage to mountain and wetlands ecosystems (Walter Fernandes and Nafisa Goga D'souza, 2001).

The term global change is often misunderstood and inter-changed with climate change, as if the two were synonymous (Rama Krishnan, 2001). Climate change is perhaps the best publicized component of global change. The enhanced 'green house effect' due to trapping of long-wave radiation emitted from the earth's surface which in turn changes the heat balance on the surface, is due to increasing concentration of C- and N-based gases ($CO_{2,}$ CH_4 and N_{20}). In this increase, industrial activities of human s are implicated. Though global warming as a phenomenon is well documented and human activities are linked to this change, its precise impact at a local/regional scale is still uncertain, due to the difficulties involved in teasing out natural climatic variability from the observed trends. There is also some uncertainty about relating climate change with human influences, as climate is subject to natural variability, and the difficulties in separating human induced impacts from the background noise of climate fluctuations (Walker, et, al, 1999). However, on the basis of a large body of available evidence and predictive modeling analysis, the inter-governmental panel on climate change (IPCC, 1996) concludes that these exists discernible human influence on global climate.

With a predicted temperature change in the range of 2 to 3 °C, Hulme and Viner (1998) suggest the following changes in the Indian sub-continental region: an increase in rainfall, in some areas up to 50%, a possible reduction in the dry season length by several months, and decreased rain in other areas. Drying may be occurring in many parts of the Amazon basin and Southern and Western Africa. Though the authors conclude that we are still ignorant about the implications of global warming for tropical cyclone activity, some theoretical and model evidence for tropical cyclone intensification and increased frequencies is suggested. However,

it must be understood that with rainfall changes, even the broader patterns show considerable variability from model to model. Local variability is even more difficult to predict. The uncertainties on the impact of climate change will get further complicated through interaction between other global change related elements. It is in this context that the effects on climate change on livelihoods of tribes in Eastern Ghats ecosystem of Andhra Pradesh state have been investigated in anthropological holistic perspective and presented briefly in this research paper, much concern to the focal theme of this national seminar on 'Climate Change: Effects on Sustainable Livelihoods' organizing by the Center for Study of Social Exclusion and Inclusive policy, Andhra University. The research paper discusses the issues of climate change and its consequences on the livelihoods of adivasis with field work based empirical evidences of a case study, conducted among hill tribes of Eastern Ghats in Andhra Pradesh. This research paper forms the part of major research project report "Environment and Sustainable development: An anthropological study among the tribes of Eastern Ghats in Andhra Pradesh", sponsored by Indian Council of Social Sciences Research, New Delhi.

Study Area and Tribal People

The study was carried out in the tribal habitats of nine scheduled districts of Andhra Pradesh state, and majority of the field villages located in the Eastern Ghats high altitude forest environment. The Eastern Ghats are a series of discontinuous low ranges running generally North-East, South-West parallel to the coast of Bay of Bengal. These Ghats are a long chain of broken hills and elevated plateus, running about 1750 kilometers with an average width of about 100 kilometers between Mahanadi Vagai Rivers along the Indian East Coast through Orissa, Andhra Pradesh and Tamil Nadu. This ecological zone has a complex geography with various mountains, dales, valleys, plains and a variety of plant and animal species. These Ghats are located between 77°, 22| and 85°, 20| east longitudes and 11°, 22| north latitudes in the tropical region. Its' Northern boundary is marked by river Mahanadi basin, while the Southern boundary in the cauvery and Tamil Nadu uplands and passes through fourteen districts of Andhra Pradesh.

In Andhra Pradesh state, the hilly region in the districts of Visakhapatnam, Srikakulam, Vizianagaram, East Godavari, West Godavari, Khammam, Guntur, Krishna, Prakasam, Kurnool, Nellore, Ananthapur, Chittoor and Kadapah form the Eastern Ghats. The altitudes range from 330^{m} – 1500^{m} above MSL. The highest peak in these Ghats is Sambari Konda with the elevation of 2527^{m} near Gudem Village in Visakhapatnam district. The Northern portion of Eastern Ghats includes Godavari, Sileru-Machkund basin and covers the district of Visakhapatnam, Vizianagaram, Srikakulam, East Godavari, West Godavari. The Southern Eastern Ghats portion covers districts of Guntur, Prakasam, Kurnool, Nellore (Veligondas, Palakonda, Nallamalais, Erramalai, Papikondalu, etc. and Amarbad plateus of

adjoining Mahaboobnagar districts) and extends to the adjoining Kadapah and Chittoor districts of Seshachalams.

The Eastern Ghats of Andhra Pradesh can be broadly divided in to three climatic and environmental zones, where a large majority of the tribal habitats are located. They are 1. Nallamalai's of Kurnool, prakasam and Mahaboobnagar districts, characterized by low rain fall and deciduous forest. Here, the highest elevation reaches not more than 200 feet. This is the land of most vulnerable tribe Chenchu and also a few Yanadis inhabits 2. It consists of forest areas of East Godavari, West Godavari and a part of Khammam districts. The area is characterized by the main water source of Godavari River, medium rainfall and vegetation in the high ranges and deciduous forest in the lower regions with considerable topsoil. The highest elevation in the zone is not more than 400 feet; the two principal tribal groups inhabiting this zone are Reddis of Bison hills and the Koyas 3. This zone spreads over the part of three districts of Visakhapatnam, Vizianagaram and Srikakulam. The area characterized by high rainfall, semi-deciduous forest with evergreen trees on the higher ranges. Elevation at some places reaches more than 5300 feet. The top soil is of considerable depth. About eighteen tribal communities inhabits in this zone. The major tribes found in this tribal zone are Bagata, Valmiki, Gadaba, Khond, Konda dora, Kotiya, Nooka dora, Mali, Porja, Manne dora, Jatapu and Savara. The districts Warangal and Adilabad are also known for the habitats of tribal population. Tribal areas of these two districts also fall in the scheduled area of Andhra Pradesh state, and located adjacent to Eastern Ghats where Lambada, Koya, Kolam, Gond and Thoti tribes inhabits. Eastern Ghats are rich in both flora and fauna, and also it is considered as abode for tribal population in the state of Andhra Pradesh.

Tribal Population

Tribes in India constitute the second largest population in the world, next to Africa. India represents 533 tribes with the population of 104,281,034 (8.60%) as per 2011 census, which accounts one fourth of the world tribal population. Tribal population is distributed all over the country except in the states of Punjab and Haryana with different levels of concentration. The state Andhra Pradesh consists of 35 tribes with the population of 59.19 (6.99%)lakhs. Geographical and environmental factors are very much reflects on the livelihoods of tribal population in the study area.

Based on the ecological and geographical background of various tribes in Andhra Pradesh has been broadly classified into two categories, namely 1. Plain tribes and 2. Hill tribes. The plain tribes comprises of Lambada or Sugali, Yerukula and Yanadi. Large chunk of these tribes population found in the plain areas of rural villages and they have functional and symbiotic relationship with the peasant, artisan and service castes. The second category hill tribes consists of 32 aboriginal

groups like Andh, Bagata, Bhil, Chenchu, Gadaba, Gond, Goudu, (in the agency tracts), Hill reddi, Jatapu, Konda Kammara, Kattu nayakan, Kolam, Konda dora, Konda kapu, Konda reddi, Khond, Kotiya, Koya, Kulia, Mali, Manne dora, Nooka/ Mooka dora, Nayak (in the agency tracts) Pardhan, Porja, Reddi dora, Rena, Savara, Thoti, Valmiki, Nakkala/ Nari korava and Dulia/Mulia/Paiko. Among the hill tribes, eight principal tribes are classified as vulnerable tribes, viz 1. Chenchu 2. Gadaba 3. Kolam 4. Konda reddi 5. Khond 6. Porja 7. Savara and 8. Thoti. These vulnerable tribes are characterized by pre-agricultural stage of economy with low literacy rate, stagnant or diminishing population and most economic backward condition. The vulnerable tribes' settlements are mostly found on hill tops and slopes of interior forests which are of small and scattered homesteads in nature. Still large majority of these tribes population mainly depend on the physical environment of forest flora and fauna, in addition to shifting (*podu*) cultivation for meeting their subsistence requirement.

The hill tribes' population is mostly concentrated in the nine scheduled districts like Srikakulam, Vizianagaram, Visakhapatnam, East Godavari, West Godavari, Khammam, Warangal, Adilabad and Mahaboobnagar. All these districts fall in the sub-plan areas of Andhra Pradesh state. In Andhra Pradesh, the tribal sub-plan areas cover the scheduled areas as well as the adjoining non-scheduled villages with 50% of entire sub-plan jurisdiction. The entire sub-plan area of A.P consists of 6686 villages, out of which 5936 are scheduled villages and the rest 750 are Non-scheduled villages. Forest environment is the dominant ecological feature of the scheduled areas, large extent of which falls in the Eastern Ghats forest climatic zone, where the aboriginal people live centuries together by establishing symbiotic relationship with the forest ecology.

In general, the tribal population is sparsely distributed in a wider geographical area of forests and hill tracts. The density of population in tribal areas is 125 persons per square kilometer as against 194 per square kilometer in the plain areas. The population growth rate is also low in certain vulnerable tribes like Chenchu, Konda Savara, Kolam and Porja. The literacy rate among the scheduled tribes population in Andhra Pradesh state is 48.3%[1] and where as at national level, tribal literacy rate is 61.61 %. About 50% of scheduled tribes' population in Andhra Pradesh state stands below poverty line. It is noted that more than 60% of the vulnerable tribes' population stands at below poverty line and live in extreme backward conditions.

The table 1 shows the predominant tribal groups and population in tribal sub-plan areas of Andhra Pradesh. As per 2001 census[2] from the table it is noted that high concentration of tribal population found in Khammam (26.47 per cent), followed by Adilabad (16.74 per cent), Visakhapatnam (14.55 per cent), Warangal (14.10 per cent), Vizianagaram (9.55 per cent), Mahaboobnagar (7.93 per cent) Srikakulam (5.96 per cent), East Godavari (3.91 per cent) and West Godavari

(2.54 per cent). The total tribal population in the tribal sub-plan areas are 30, 47,389 which constitutes 10.45 per cent to total population of these nine districts.

TABLE 1: TRIBAL POPULATION DISTRIBUTION IN SUB-PLAN AREAS OF ANDHRA PRADESH

S. No	*Name of the district*	*Predominant tribal groups*	*Population*		*Total Males and Females*	*% to total Population*
			Males	*Females*		
1	Srikakulam	Savara,jatapu,gabada, konda dora	75284	75965	151249	5.96
2	Vizianagaram	Savara, jatapu, gadaba, konda dora	106079	108760	214839	9.55
3	Visakhapatnam	Bagata, gadaba, konda kammara, konda dora, kotiya, khond, mali, mannedora, nookadora, reddidora, rena, porja, konda kapu, kulia, dulia/mulia, paiko	278399	279173	557572	14.55
4	East Godavari	Koya,konda reddi, konda kammara, konda dora	95234	96327	191561	3.91
5	West Godavari	Koya, konda reddi, yerukula, yanadi	47887	48772	96659	2.54
6	Khammam	Koya, kondareddi, sugali or lambada	344027	338590	682617	26.47
7	Warangal	Koya, lambada	235451	222228	457679	14.10
8	Adilabad	Gond,kolam, andh, pardhan, thoti, lambada, naikpod	209586	206925	416511	16.74
9	Mahaboobnagar	Lambada, chenchu, yerukula	143115	135587	278702	7.93
Total 10.45				1535062	1512327	3047389

Source: 2001 Census
(District wise tribal population is not available as per 2011 census.)

Geography and Climate of Tribes

The issue of climatic change and its effects on livelihoods of tribes in Eastern Ghats is presenting in this paper specifically considering the geo-ethnic variations of different hill tribes inhabiting in Eastern Ghats forest environment. On the basis of geo-ethnic characteristics' the hill tribes' habitats falls in to four geographical regions as follows:

1.	Chenchu Region	:	Tribal areas of Nalgonda, Mahaboobnagar, Prakasam, Kurnool Rangareddy and Guntur districts (Nallmalai forest area).
2.	Khond –Savara Region	:	Tribal areas of Visakhapatnam, Vizianagaram and Srikakulam Districts (North Coastal Andhra)
3.	Gond-Kolam Region	:	Tribal areas of Adilabad district (Gondwana region)
4.	Koya – Konda reddi Region	:	Tribal areas of Karimnagar, Khammam, Warangal, East Godavari and West Godavari districts (Papikondalu).

The traditional habitat of Chenchus is found in the contiguous forest tracts of Nallamalai hills. Most of the Chenchu gudems are located in the interior forest areas of Prakasam, Kurnool and Mahaboobnagar districts. Once they were the foragers and now they are in transitional stage from food gathering to food producing. They subsisted on food gathering and hunting quite a long period, when the forests, were intact. At present they are struggling for their survival due to degradation of forests and climatic change.

The Khond - Savara region constitutes those tribal areas, which are part of the Eastern Ghats spreading across forest and hill tracts of Srikakulam to Vizianagaram and Visakhapatnam districts. The origin of the Khond, however, is unclear. In the Visakhapatnam district manual of 1869, they are recorded as owners and cultivators of the soil- khonds are divided into two groups, namely Dongria(jungle) khonds and Desya khonds. The origin of Savara is traced to the ancient sabaras who are migrant from the lower reaches of the river Ganges. The Savara's have two sub-groups namely 1. Kapu savara who dwell in plain areas and 2. Konda savaras' or Jati savaras' who consider themselves to be superior to their counter parts Kapu savaras, are settled cultivators and economically dominant group. Konda savaras' inhabit on hill tops and slopes of interior forests and practice shifting (*podu*) cultivation and subsist on it largely.

The region of Gonds, constitute the tribal areas of Adilabad district in the extreme North Andhra Pradesh. This is a part of the Gondwana region adjoining the district of Adilabad, Sileru and Maharastra state. This district has one of the richest forests amounting to 42.43 per cent of the total geographical areas. Gonds are the major tribal community in this region. They are further divided into five groups namely 1. Raj gond or Gond 2. Pardhan 3. Thoti 4. Dadve and Gowari. All these are endogamous in nature. Kolam is one of the vulnerable tribes of Andhra Pradesh, chiefly found in Adilabad district.

Koya- Konda reddi region includes areas along the Godavari gorges, tribal areas of Karimnagar, Warangal, Khammam, West Godavari, and East Godavari

districts. The Koyas' are found along the Godavari River from Karimnagar. The Konda reddis' are inhabiting either side of Godavari banks from Bhadrachalam area of Khammam distrit to Devipatnam and Polavaram areas of East and West Godavari respectively. Although they are spread over a large area, the majority are concentrated in Maredimilli and Addatheegala of East Godavari district. In general the hill tribes live in high altitude zone of Eastern Ghats of cold climatic condition.

Plain tribes like Yanadi, Yerukula and Lambada found to live in rural villages along with the caste communities. These three groups have been recognized as scheduled tribes in the Andhra region from 1956 and in Telangana from 1976. The Yanadis' are concentrated in the Coastal Andhra region mostly in Nellore district, the Yerukulas are distributed throughout the state, and Lambadas concentrated mainly in the Telangana region. The main source of livelihoods of Yanadi's is fishing and field rats catching. The Yerukulas' are now intermingled with non-tribal groups. In origin, they are mainly pig rearers and basket makers. The Lambadas' were once pastoral nomads, but at present many of them have settled down as prosperous cultivators. Still a few of them are herdsmen.

Forest Environment and Livelihoods of Tribes

In India tribals are the indigenous people and they mostly inhabit in forest environment. The forest dwelling tribal population in our country is estimated around 68 million. Still large majority of the tribal population depend on the natural environment of forest flora and fauna in order to eke out their livelihood. They are very much attached to forest ecology and adapted to it and its' cold climatic conditions. At present, the problem of deforestation directly affected the livelihood of tribals and creating food insecurity, poverty and food insecurity are the major problems to them which are intertwined with the forest environment in which they inhabits centuries together.

Deforestation is an environmental issue which received much attention globally from anthropologists, planners, administrators, natural scientists and social scientists. Currently, a serious debate is going on this issue at National and International levels. The government is also initiated the aforestation programmes with different strategies to regenerate the forest cover in order to maintain natural balance. Protection and conservation of forest-bio-diversity, regeneration of forest cover and better management of forest resources with community participation are considered to be the best solution for this problem in accordance with the researchers of varied disciplines, who carried studies on this issue in different forest zones of our country. It is observed that the tribals are the worst affected people due to forest degradation. It definitely creating survival problem to the indigenous tribal people and adverse effects on their livelihoods. It is observed that climates as the main influence in the development of whole civilizations, including characteristics such as religious beliefs and rituals as well as material

culture: Walter Fernandes, Geeta Menon and Philip Viegals (1988), were investigated the problem of deforestation on the lives of tribals in Orissa state. They pointed out the linkage of deforestation within impoverishment and marginalization among the aboriginals who dwell in the forests.

Deforestation at National Level

At National level large extent of deforestation has taken place since colonial rule in India. The report of the National Remote Sensing Agency (NRSA) released in mid 1984, has some very disturbing revelations to make. Based on the interpretation of the satellite data it shows that while in 1972-75, 16.89 per cent of the total land area of the country was under forest cover, by 1980-82 , it had dwindled to 14.10 per cent that is a lost of 16.25 per cent in the seven year period. In other words, the total tree cover in 1972-75 was 55.52 million hectares, while in 1980-82 it comes down to 46.35 million hectares, i.e., a total loss of 9.17 million hectares. This indicates that India has been loosing on an average 1.3 million hectares of forests every year. This incidentally, is as much as eight times the figure of 0.15 million hectares a year claimed by the forest department. Further, according to the NRSA which breaks downs the forest cover into closed forest, open or degraded forest and mangrove forest, between the two periods (1972-75 and 1980-82) the closed forests had declined from 14.12 per cent to 10.96 per cent, the open forests have increased from 2.67 per cent to 3.06 per cent and mangrove forests dropped from 0.099 per cent to 0.081 per cent. This means a loss of 10.4 million hectares of good closed forest have been converted into degraded forest. The NRSA evidence showed that deforestation was most in Madhya Pradesh (18 lakh hectares) followed by Maharashtra(10 lakh hectares), Orissa (9 lakh hectares), Andhra Pradesh (9 lakh hectares), Jammu and Kashmir (8 lakh hectares) and Arunachal Pradesh (7 lakh hectares). At present the situation of deforestation is much worst than 1980's.

In Andhra Pradesh state, large extent of denuded forest is seen in Eastern Ghats, where most of the tribal communities inhabit. Forest cover has almost disappeared in and around the most of tribal settlements, located in Eastern Ghats of Andhra Pradesh. Deforestation definitely created survival problem to large majority of the tribal population. At present, the Chenchus are at cross-roads. They lost their energy base of flora and fauna of Nallamalai forest. The traditional *podu* groups like Khond, Konda reddi and Konda savara are enforced to change their hereditary calling in view of protection, conservation and regeneration of forest as laid down in the 1988 forest policy. But, the forest department is unable to resist the external threats for the damage of natural forest environment. The government initiated rehabilitation programmes are mostly temporary measures which may not provide food security permanently to these *podu* groups.

Shifting Cultivation and Deforestation

The practice of shifting *(podu)* cultivation is still found in the agency tracts of Eastern Ghats. It is knows as *podu* in coastal areas of Andhra Pradesh, and *vagad* in *Kolam* and *Padaka* in Gondi dialect of Adilabad district. This method of cultivation is practiced all over the world, especially, in tropical forests and mountain tracts. This form of cultivation appears to have been well established during the Neolithic period more than 10,000 years ago. It was mostly suitable for the humid tropical forests where vegetation regenerates very fast.

Shifting (*podu*) cultivation is practiced on the hill slopes, where in some places fertile soil exists for the growth of crops raised under this method of farming; certain extent of forest cover cleared which leads to degradation of forest and there is possible of soil erosion. However, as with erosion forest regeneration, the size and method of clearing determines the vulnerability of the soil to erosion. If the clearing is small, no more than 2 or 3 hectares and surrounded by forest, vegetation will quickly reappear and loss of soil to erosion will be minimal. If the area is large the soil will quickly decline in nutrients and be vulnerable to erosion. But even a small area can experience severe run off and erosion if a highly disruptive method of clearing is used.

The indigenous people use the traditional method of clearing forest cover for podu cultivation purpose. Clearing the forest by traditional or natural means results in less severe soil erosion than occurs on land cleared by mechanized means, especially tree pushers. The method of clearing with the least run off and erosion is the "traditional " in which machetes and axes are used, the method that has the highest rate is the tree pusher/root rake. The differential rates of erosion are the result of what remains at the site after the forest is cleared. Traditional methods leave tree stumps and untouched roots systems with little disturbance of the forest litter. While the full protection of the forest cover is gone, there are still roots to bind to the soil and litter to buffer the impact of the rain splash. Tree pushers clean a field by pushing the trees cover and pulling the roots out of the ground. What is left after clearing is an area of no roots, little litter, and a highly disturbed broken soil surface. On such a site there is severe runoff and erosion with almost 70 times the amount of runoff and a loss of 1700 times the soil as the some area under traditional clearing.

The actual number of shifting cultivators in the world estimated around 300 million. About 5% of the population makes its living. Usually the shifting cultivators are distributed in the high altitude forested zones, and adopted to agro forestry ecosystem. Shifting (*podu*) cultivation is the most wide spread type of tropical soil management techniques. Various types of shifting cultivation are currently practice on 30% of the world's exploitable soils. Shifting (*podu*) cultivation can be classified under paleo-technic forms of peasant ecotypes. Three major forms of shifting cultivation found across the world, such as 1. Long-term fallowing systems 2.

Sectorial fallowing systems and 3. Short term fallowing system. This form of cultivation is also otherwise known as swidden, slash and burn cultivation. In the past most of the *podu* cultivators largely confined to long-term and sectorial fallowing systems when large extent of forest cover areas available for this method of farming. Through these two methods, of farming the *podu* cultivators have maintained the ecological balance with more greenery patches in and around the *podu* fields. Now majority of the *podu* cultivators resorted to short-term fallowing system, due to stringent measures of imposing new forest policies on the adivasis or forest dwellers as well as degraded and denuded forest environmental conditions. We agree that the practice of shifting cultivation by the adivasis is causing for deforestation in some extent. But large scale of forest degradation is taking place due to commercialization of forests since colonial rule in India.

The government of Andhra Pradesh, Tribal Welfare Department launched a massive scheme called Andhra Pradesh Tribal Development Project for rehabilitation of 63,371 shifting cultivator families with total outlay of Rs. 77.97 crores in the districts of Srikakulam, Vizianagaram, Visakhapatnam and East Godavari, where shifting cultivation was widely practiced. This project was largely funded by International Fund for Agricultural Development (IFAD), Rome. This scheme was also not properly implemented by the concerned authorities of Tribal Welfare Department of Andhra Pradesh. Horticulture programmes, Social forestry, farm forestry and joint forest management (JFM) or community forest management (CFM) programmes were also initiated in the tribal areas of Eastern Ghats by the Forest Department and Tribal Welfare Department for discouraging *podu* cultivation but still considerable number of tribal peasants practicing *Konda podu thorra podu* with the method of short term fallowing system; especially in Visakhapatnam, Srikakulam and East Godavari districts. Majority of *Podu* cultivators in these three districts belong to Khond, Konda savara and Konda reddi respectively.

Climate Change and Livelihood Problems of Tribes

Degradation of forests in Eastern Ghats resulted to depletion of forest resources and decline of rainfall and snow fall. It is also creating food insecurity and acute drinking water problems to large majority of the tribal people. Due to degradation of forests literally the tribals lost their permanent energy base of forest flora and fauna. The incidence of malnutrition, morbidity and mortality is also increased enormously among aboriginals since last one decade. Large majority of the people , especially among vulnerable tribes like Khond, Porja, Gadaba, Konda reddi, Konda savara, Kolam and Chenchu are facing the problem for their subsistence and survival.

The tribes in the Eastern Ghats associated with the wild life and they identify more than sixty animals, which they encounter as a part of their daily life. Their classification of wild life in to animals, birds, reptiles, snakes, scorpions, rodents

etc, are particularly oriented. They know the sub-groups of each animal their possible hideouts, general behavior, reproductive cycle and the use of animal parts as medicine. They are aware of possible diseases that affect the wild animal and the remedies for some of them. They can identify 30 variables of snakes, along with their hideouts characters (prisoners or non-prisoners), their eggs, and most interesting is some of their habit of sucking milk from lactating mothers and cows. Rats are edible animals for most of the tribes, which prompts them to know details of the rats and squirrels. They also identify seventy varieties of birds in the forest. They collect 42 varieties of medicinal herbs in the forests and sell those herbs to Girijan Cooperative Corporation. In addition to these they also collect other Non-Timber Forest Produce items in the forests, which is another source of income to them.

Their knowledge of wild animals and their behaviors help them in devising appropriate hunting techniques. Animal hunting festival (*etum* or *etikala*) is very common to almost all the hill tribes in Eastern Ghats. This festival is observed in the month of April or May in every calendar year. However, they also hunt any time they encounter a game. Generally the tribal men carry bow and arrow, whenever they enter into the deep forest in search of food material. Some of the tribal men also catch fish in streams, ponds, tanks, and canals located amidst of forest environment. It clearly indicts, that the tribes in Eastern Ghats are very much attached to the ecology of forests and exploit the forest resources primarily for their subsistence and survival. Over exploitation of forest resources by the indigenous tribal people and other outside agencies resulting to degradation of forest environment and creating livelihood problem to large majority of the aboriginals. The tribal people are directly affected by the climate change of Eastern Ghats. However, even the rural and urban dwellers of adjoining Eastern Ghats are also indirectly affected with the problem of climate change and perturbations of natural forest environment.

Conclusions

Bio-diversity depletion in Eastern Ghats is resulting to climate change and adversely affecting the livelihoods of indigenous tribal people. Since bio-diversity linked land use dynamics is the key for the sustainable livelihood of traditional societies (societies living close to nature and natural resources) such as those in Eastern Ghats, the uncertainties derived from climate change will adversely impact upon bio-diversity and thus will have serious ecological and economic consequences for them. There, the need for linking bio-diversity conservation with economic development of tribes needs no further justification. We felt that there is an immediate need of save the Eastern Ghats bio-diversity from the external threats of over exploitation of its resources. Protection, conservation and regeneration of natural resources like land, forest, water and minerals by the tribal communities of

Eastern Ghats, definitely pay way for their sustainable livelihood in the years to come. Traditional ecological knowledge and indigenous knowledge systems of aboriginals to be promoted in order to protect, conserve and regeneration of forest bio-diversity of Eastern Ghats with a view to ensure sustainable livelihood and development among the most vulnerable, marginalized, deprived, impoverished and excluded tribal people of the study area in specific and other tribal areas in general.

Notes

1. Data presented as per Government of India, National Sample Survey Organization, Primary data 2009-2010.
2. Tribe wise population analysis has not done by Census of India so far with the available/ collected 2011 census data. Hence, tribal population distribution in nine scheduled districts shown as per 2001 census in this research paper in order to depict the concentration of aboriginals in Eastern Ghats forest environment of Andhra Pradesh state.

References

Hulme M. and D. A. Viner, (1998). Climate Change Scenario for the Tropics, Climate Change, 39, pp 145-176.

Rama Krishan P. S., (2001). Ecology and Development, New Delhi. Book Trust of India.

Subramanyam V., (2006). Environment and Sustainable Development: An Anthropological Study among the Tribes of Eastern Ghats in Andhra Pradesh, Major Research Project Report (unpublished) New Delhi, Indian Council of Social Science Research.

Walker , B. W.Steffen, J. Canadell and J. Ingram, (1999). The Terrestrial Bio-sphere and Global Change: Implications for Natural and Managed Ecosystems, Cambridge: Cambridge University Press, Synthesis volume IGBP Book series. 4.

Walter Fernandes and Nafisa Goga D. souza (ed), (2001). Climate Change and Tribal Sustainable Living: Response from the North-East Guwahati, North-Eastern Social Research Centre.

Walter Fernandes, Geeta Menon and Philip Viegals, (1998). Forests, Environment and Tribal Economy: Deforestation, Impoverishment and Marginalization in Orissa, New Delhi, Indian Social Institute.