

## **RURAL LIVELIHOOD DIVERSIFICATION SYSTEM AS COPING MECHANISM TO CLIMATE CHANGE IN MAKADI, SOUTHWEST BABURA, JIGAWA STATE, NIGERIA.**

*Ahmed Abubakar<sup>1</sup>, Ahmed Ibrahim Maigari<sup>2</sup>, Samir Shehu Danhassan<sup>3</sup>, Shehu Idris Umar<sup>4</sup>, Mukhtar Khalifa Usman<sup>5</sup>, Ismaila Abdullahi Hadejia<sup>6</sup>, Bashir Babura Sabo<sup>7</sup>, Aminu Hussaini<sup>8</sup> and Haruna Ummulkhair<sup>9</sup>*

*<sup>1,6</sup>Sule Lamido University, Kafin-Hausa, Nigeria.*

*<sup>3,4</sup>Jodhpur National University, India.*

*<sup>5</sup>Usman Danfodiyo University, Sokoto, Nigeria.*

*<sup>2,7,8,9</sup>Bayero University, Kano, Nigeria.*

*[Abubakar8550483@gmail.com](mailto:Abubakar8550483@gmail.com)*

*+2348032679791*

### **Abstract**

*Climate change is the biggest threat to humanity with implications for food production, natural ecosystems and health. The reality and impacts of climate change now accept, understood and documented. The objective of the study is to examine the rural farming community's perceptions on climate change impacts on socio-economic activities and the environment as well as numerous livelihood diversification systems. Data were generated through In-depth interview, FGD and PRA sessions and observations in the area. The results indicate that there is erratic rainfall, decrease in yield, migration, loss of livestock and employment opportunities. Other environmental impacts include increase in temperature and pasture degradation and deterioration of water quality were reported. There is need for urgent steps in adapting and mitigating the impacts of climate change to safeguard food security in the area as well as managing the physical geography of the area.*

## Introduction

Disparity of literature coming from different disciplines confirmed that rural people in Africa and Asia do not normally specialize in animal and crop production to the total exclusion of other income generation activities (Karim et al, 1998). Meanwhile historically, rural people in Africa and Asia diversified their production activities to compliment other productive areas. Motivations for such diversification are multifarious, linked with wide range of possible activities, and associated with both positive and negative outcomes. This recognition has led many researchers to represent rural livelihoods as constructed from a portfolio of resources, or activities (Adams and Mortimore, 1997; Dercon and Krishnan, 1996; Ellis, 1996; Unni, 1996).

There is consensus that climate change will strongly affect the African continent, and will be the hindrance for future development particularly in the drier part of the continent (Adger et al, 2007). Climate change will result in an increase in frequency and intensity of extreme events like drought, flood and erratic rainfall and increase in temperature in the drylands. In the context of Africa, rural households are involved in agricultural production especially rainfed farming as the major source of livelihood and also engaged in different types of activities apart from farming to sustain their lives due to uncertainty in crop production either climatic variability and seasonality and or market fluctuations (Barrett et al, 2001), higher temperature which brings drier conditions and shorter more intense rainfall events. Reducing the vulnerability of drylands communities to climate change will require to increase the diversity livelihood options, reduce pressure on natural resources and restore and protect dryland ecosystems through sustainable management practices. Rural households are forced to developed strategies to cope with increasing vulnerability associated with agricultural production through diversification, intensification and migration in search of labour (Ellis, 1996).

Livelihood diversification refers to attempts by individuals and households to find new ways to raise incomes and reduce environmental risk, which differ sharply by the degree of freedom of choice (to diversify or not), and the reversibility of the outcome. Livelihood diversification includes both on- and off-farm activities which are undertaken to generate income additional to that from the main household agricultural activities, via the production of other agricultural and non-agricultural goods and services, the sale of waged labour, or self-employment in small firms, and other strategies undertaken to spread risk; included in this are what has been termed 'activity or environment diversification' in agriculture (Carter 1997), or more radical migratory strategies (Stark and Levhari, 1982).

In a recent paper, Ellis (1997) defines livelihood diversification as 'the process by which rural families construct a diverse portfolio of activities and social support capabilities in their struggle for survival and in order to improve their standards of living'. Ellis (1997, p5), pointing out, rightly, that livelihood diversification is not necessarily synonymous with income diversification.

The causes of the vulnerability of Nigeria to climate variability and change include very high dependence on rain-fed agriculture, which is very sensitive to climate variability and change, also the under-development of water resources, low health service coverage, high population growth rate, low economic development level, low adaptive capacity, inadequate road infrastructure in drought prone areas, weak institutions, lack of awareness, etc. Vulnerability assessment based on existing information and rapid assessments carried out for this study indicated that the sectors most vulnerable to climate variability and change are agriculture, water and human health. In terms of the livelihoods approach, smallholder rain-fed farmers and pastoralists are found to be the most vulnerable.

The tendency of rural households to engage in multiple occupations is often remarked. In the past it has often been assumed that farm-output growth would create a lot of non-farm income earning opportunities in the rural poor settings. However, this assumption is no longer tenable, for many rural poor families. Farming on its own is unable to provide a sufficient means of survival.

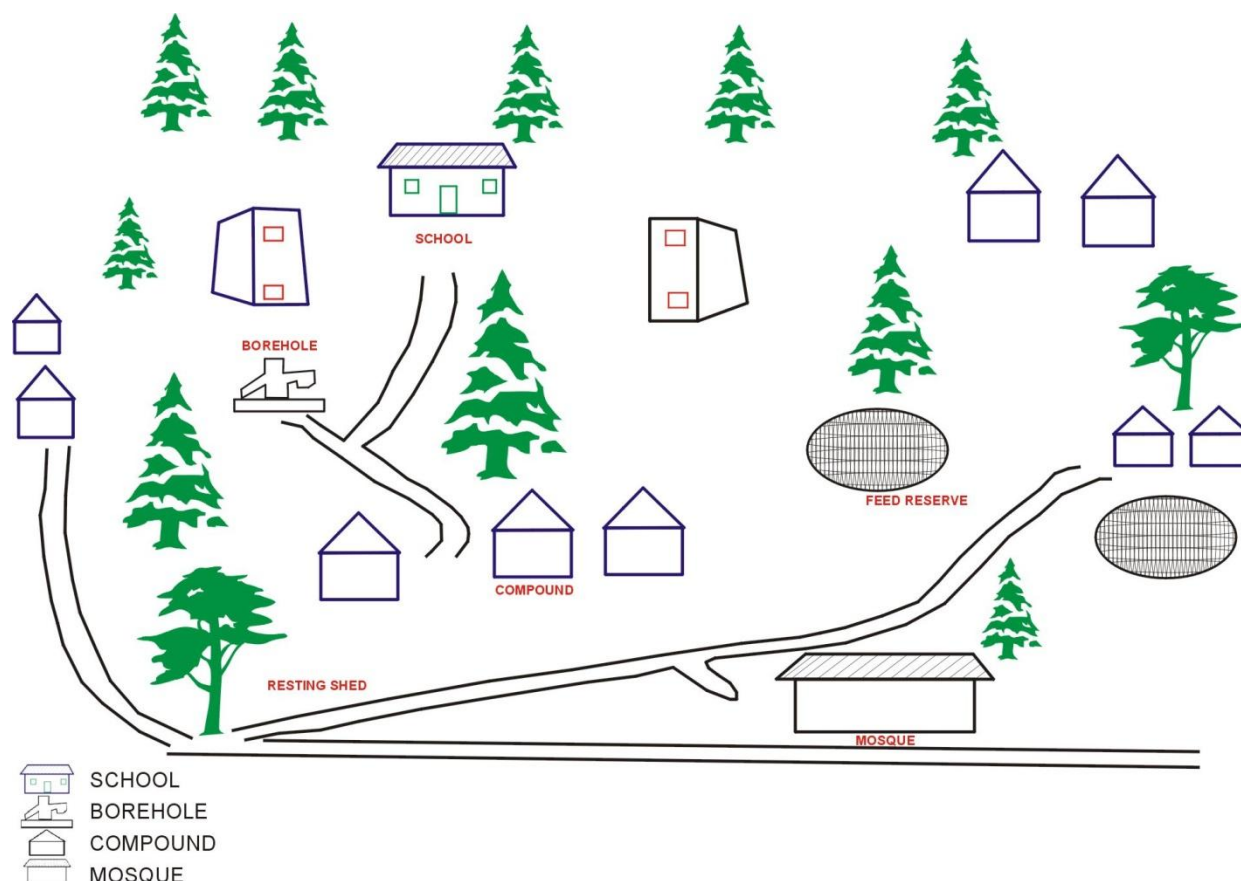
Amid widespread poverty and increased human pressure on the fragile resource base, the coping strategies are becoming insufficient in reducing people's vulnerability. Unsustainable farming, grazing and wood fuel gathering have led to dryland degradation and desert encroachment, fuelled by conceived policies and insufficient governance structures, desertification already affect 70 per cent of the world's drylands.

## **Material and Methods**

### **The Study Site**

The study area is located in the Southwestern Babura, Jigawa State, Nigeria. The area is sparsely populated with population of about 750 people with disperse settlements made up of thatch and mud houses with one primary school (Nomadic School) and four teachers, and egg hatchery where they generate income for the school during wet season. The study area feature unfavourable environmental conditions with erratic and uneven distribution of rainfall. The soil is sandy and poor in nutrient contents and quality and often land degradation. These soils are all generally of low fertility and many are highly erodible. The dominant vegetation is dry bush (Yamusa, 2011). The district receives about 500 mm of rainfall per year and average temperatures range from 25 to 33°C (Oladipo, 1993a). Besides these adverse biophysical environmental conditions, there are others which include poor education, lack of social infrastructure among others. The farmers are generally subsistence and grow rainfed crops in the rainy season around (May-October). The main food crops are guinea corn, Millet, Groundnut, Beans and Sesame. The main livestock kept in the study area include cattle, sheep, goat, and chicken.

Plate 1.A Sketch Map of Community Natural Resources in Makadi Village, Southwest of Babura, Jigawa State, Nigeria.



Source: Field Survey, 2018

### Methodology

The study used extensive information generated from the respondents. Data were gathered through field observations, focus group discussion, and participatory rural appraisal. The justification for these methods was that the target populations were rural people and there was a need for the research methods to be appropriate to their context. Many poor people realities are local, complex, diverse, dynamic and unpredictable. Participation and mutual respect enable poor people to express and analyze their individual and shared realities (Chamber, 1997). Therefore, PRA and FGD enable the researcher to capture real life data in social setting and the flexibility of the methods. They also reveal information about the subject that may not be brought by the researcher and also involved the rural communities in analyzing their livelihoods and to provide information about their priorities for coping and dealing with environmental challenges and livelihood adaptation strategies (Sally et al, 1999)



Plate: 2: FGD and PRA sessions at Makadi Village, Southwest Babura, Jigawa State, Nigeria

Source: Field Survey, 2018

### **Data Analysis**

FGD and PRA results were transcribed and translated from Hausa to English and then analysed qualitatively which basically involved establishing the categories and themes, relationships/patterns and associations of different themes.

### **Farmers Perceptions about Climate Change**

Several questions have been asked about climate change. The response indicates that the farmers are much aware of climate change owing to their indigenous knowledge of their immediate environment as well as the experience in farming and day to day monitoring of weather. However, radio plays a vital role in informing them about the state of the environment as well as weather prediction. These are the most important sources of information about climate change, drought and desertification. More so, the participants attest that they have the knowledge of climate change and they have heard about it several times over radio.

### **Perceptions on rainfall and temperature changes**

Entirely, the participants confirmed that the amount of rainfall received has dramatically reduced, not only that the rainfall is erratic and inconsistent compared to the last ten years.

*Last year there was a situation in which you are working in your farm while it rains in your neighboring farms and also it (Rain) jumps to other farms and rains over there at the same time, you see the condition is changing (FGD).*

Despite the rainfall variability the farmers stick to the old variety crops growing over that area. None of them has ever tried improved variety of crop and animals, the ancestral ones that have been used by forefathers for decades are still the crops used now in the area. The prominent among them are Pearl millet and guinea corn, sesame and groundnut.



Plate: 3 Crops grown in Makadi Village.

Source: Field Survey, 2018.

Even though these crops do not require much rainfall and are typical example of cereals grown in the drylands of Nigeria, in terms of temperature changes, the participants show significant knowledge about increase in temperature owing to their observations of the immediate environment.

*Bushes are drying, no feed for animals and the soil is becoming weak and water sources are drying quickly, after wet season before you get water now is difficult, some wells are drying, we have to use camels to draw water (FGD)*

Drying well



Using animal to convey water



Plate: 4 Sources of water

Source: Field Survey, 2018.

## **Effect of Climate Change on Rural Livelihood.**

### **Water Availability and Food Security**

Climate change is a threat to water and food security, according to Food and Agriculture Organization (FAO, 2015), food security reports that about 24 per cent of the total populations in Africa are undernourished. The majority of the victims of food security in the region are the poor inhabiting the drylands who depend heavily upon natural resources for their livelihoods, either by growing crops or managing livestock. Increased temperature adds to water problems by causing additional loss of moisture from the soil. The poor crop yields associated with change in climate, results in hunger and mass poverty as agriculture is the mainstay of the study area. The poor households that are affected by climate change do not have adequate resources to deal with food shortages leading to food insecurity and hunger.

Climate change influences water resources as it has been reported by the participants that the amount of rainfall received has reduced and in combination with the soil (Sandy) characteristics the water quickly drained into the soil or as runoff. Therefore, the ground water is no longer available for plants use and before reaching table water you have dug about 60 meter for a borehole. This means that Makadi has no sufficient water resources to maintain daily domestic uses.

### **Biodiversity and Diseases prevalence**

The impacts of climate change manifested in the depletion of biodiversity. The richness of plants and animals species has drastically reduced, only the resistant ones are able to survive the extreme climatic conditions. The predominant tree species include; *Acacia albida*, *Acacia nilotica*, *Adansonia digitata*, *Azadirachta indica*, *Balanites aegyptiaca* e.t.c while the shrubs includes; *Guiera senegalensis*, *Leptadenia hastate*, *Piliostigma reticulatum*, *Cassia obtusifolia*, *Tapinanthus* spp e.t.c. grass is only available during wet season. Therefore, climate change has had serious impacts on richness and diversity of plants and animals species, unpalatable species dominate and total biomass reduced. The trees and shrubs found in Makadi village are xerophytes.

The diseases prevalence has increased. It has been attested by the participants that during the months of March-May there is outbreak of cough and measles among children and women which affect school enrollments and day to day activities and in the months of September-October there is outbreak of fever and liver diseases by working age and elderly men which has been associated with crop maturity especially millet.

### **Rural Livelihoods Diversification Systems**

Empirical evidence from a variety of locations suggests that rural households indeed do engaged in multiple activities and rely on diversified income (Ellis, 1999). In sub-Saharan Africa a range of 30-50 per cent reliance on non-farm income source is common. In infinite variety of livelihoods diversification strategies of rural people who operate in environment

which are diverse, complex and risk prone (Chamber et al, 1989) are able to construct productive strategies in spite of the challenges.

Table: 1 Livelihoods diversification Systems and Management of Seasonal Calendar in Makadi Village

Months	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall					+	+	++	+++	+			
Agricultural labour					+	+	+	+	+++	+		
Off-farm labour	+	+	+	+	+	+	+	+	+	+	+	+
Food availability										++	+++	
Water availability							+	+++	++			
Human diseases			++	++	++				++	++		
Animal diseases						+	+	+	+			
Fuel wood collection	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++	+++

Source: Field Survey, 2018.

+ =Less

++=Moderate

+++=High

The management of seasonal calendar goes with farmer's indigenous ecological knowledge as well as experience in farming and other activities. Agricultural activities start from May the onset of the rainy season with its peak in July and August.

### Migration and Remittances

Migration plays crucial roles in diminishing vulnerability and lessening poverty in low income countries (de Haan, 1999; Skeldon, 2002). Migration may be seasonal (e.g. to participate in harvests), circular (involving periods away and periods at home), rural-urban (with a degree of permanence) or international (cross-border and distant migrations). Recent literature has emphasised the significance of remittances in international financial flows to developing countries (Nyberg et al., 2002); as well as the complex social as well as economic ties that bind migrants to the livelihood circumstances of those they leave behind (de Haan & Rogaly, 2002; Kothari, 2003).

Migration also involves important interactions with land, land tenure and the use made of land. Those left behind by migrants act as stewards and retainers of land that in the absence



of secured ownership rights might otherwise be in jeopardy of being lost to the family. In the absence of a rental market, this land may be poorly utilized. Alternatively, migrant earnings can enable improved agricultural practices and raise yields. It was reported by the respondents that the youth at the age of 30-45 years migrate in search of jobs to areas of Zaria (Nigeria) and some parts of southern Nigeria.

The main reasons for migration is the lack of sustainable income source and the failure of existing livelihood system to support their food security and cash requirements. Yearly, employment is affected by climate change which leads to uncertainty in crop production. Regular cases of migration from Makadi village have been reported by the participants. The number of youth migration is in constant increase due to the wealth and the change in life style by some return migrants, therefore, the rest of the youth eager to imitate them.

However, remittances were sent either in form of money or food stuff to support the extended family at home. This form of temporary migration takes place throughout the year unlike those days whereby during wet season the migrants returned home for crop production.

*In those days the migration was temporary before and after rainy season but in these days the migration is throughout the year, be it rainy or dry season. Our children are in south (Southern Nigeria) about 2/3 of the population in this village (Makadi) went for search of employment. (FGD).*

### **Collection and Selling of Fuel wood**

The collection of fuel wood from forest that exceeds sustainable yield causes degradation. Forest degradation in turn leads to fuel scarcity and a variety of adverse consequences including loss of biodiversity, deterioration of water sheds functions, release of carbon dioxide into the atmosphere and soil erosion (Pandey, 2002).

Despite the growth of energy use in other sectors, rural household consumption still dominates the energy budgets of many developing countries, particularly in the poorer nations of Africa and South Asia. Fuel wood accounts for more than 75 percent of the energy used in countries such as Nepal, Bangladesh, Ethiopia, Burkina Faso, and even oil-rich Nigeria (Soussan 1988). Cooking consumes most of this energy, and most of the energy is supplied by fuel wood. These fuel woods are usually gathered freely from the local environment, and their production and use cannot be readily separated from other aspects of land resource management within rural economies.

Because rural people rarely fell trees for fuel use and generally depend on trees near their homes, trees outside the forest, within the agricultural landscape, are the main source of fuel for rural people. The reliance on local land resources means that tenurial arrangements are important as in rural areas, most fuel wood in cities is used in the household sector (although the use of fuel wood in small industries such as restaurants, bakeries, and brick kilns can be significant locally).

Fuelwood use certainly contributes to the degradation of land resources in agricultural regions where more general resource pressures are felt. This form of degradation, however, is far from universal; indeed in most rural areas, fuelwood gathering for local use has only a marginal, if any, impact on land resource quality. It is a problem precisely where the rural economy and environment is most vulnerable; in localities where the resource base is already under threat and where the community has the fewest resources to counter this threat. Many case studies illustrate this form of environmental stress (Saxena, 1987, Moench, 1989, Singh et al., 1984, Christianson, 1988, Johnson and Tompkins, 1989).

In more comprehensive studies, Smil (1983) cites local fuelwood use as a contributory factor to land degradation in China, and Ryan (1990b) presents a preliminary analysis linking the degradation of woodland resources in many parts of India to the pressures of growing fuel demand. When local fuelwood use does contribute to land resource degradation, it is not the sole, or even the main, cause of this stress. Fuelwood use contributes to this degradation because it is an integral part of the rural economy and environment relationship, and it is the general pattern of rural development in poor, environmentally vulnerable areas that creates stress, not fuelwood use alone (Pandey, 2002)

Collection of fuel wood is another livelihood diversification option in the area. Excessive cutting down of trees, most especially the branches and in some cases uprooting some plants like *Piliostigma reticulatum*, *Guiera senegalensis*. The wood is arranged, tied and piled on different prices and are taken to various neighbouring towns to be sold, so as to buy some food stuff from there and return home with something tangible for the family.



Plate: 5 Fuel wood collection

### **Selling of Labour and Assests**

Those at home engaged in agricultural labour especially weeding in neighboring towns around the months of June, July and August and also engaged in harvesting and stacking of grains around the months of September-October. Selling of labour help them in diversifying income source which they answered that right from there they buy Garri, Rice, Maggi and Salt among others to bring home and support the family.

Out of agricultural labour throughout the year, they engaged in small businesses like selling of herbal or traditional medicine, construction labourers and during politics got some income from those seeking to be elected. Around the months of September and October well sell off the cash crops such as sesame, groundnut and Habiscus flower.

*After harvesting we sell sesame, groundnut and rose of Habiscus sabdariffa to the market and buy some livestock and other types of food that are not produced here (Interviewee 3)*

When the condition is unfavourable, persistent hunger, no food, no money, the next alternative is to sell livestock. Towards the rainy season when the food is scarce and there is need for money to invest in agriculture, a lot of livestock are taken to the market to generate income for food and daily household maintenance.

### **Conclusion**

Climate change has severely affected the agrarian economy of Makadi village and significantly affects the livelihood options in the area. Farmers were generally aware of climate change as well as the socio-economic and environmental impacts of climate change. Failure in terms of agricultural productions were noted which leads to migration, lack of employment, poor yield, prevalence of diseases as well as unhygienic drinking water and death of animals due to increase in temperature and scarce pasture which weakens the financial institutions and worsen the livelihood situation.

### **Recommendations**

There should be special social interventions by government and non-governmental organizations to empower youths and able bodies with skilled and unskilled employments to live beyond poverty level. There is need for education for sustainable development and sustainable ecosystem management and wise use of the natural resources to avoid exploitation for the use of future generations. However, there is also need for extension services so as to introduce new or improved varieties of crops that can thrive well and survive the adverse climatic conditions as well as introduction of methods and techniques of farming beyond relying on rainfed farming such as water harvesting and irrigation. There is also need for setting up community based natural resource management organization which will regularly oversee the natural resources and especially control the indiscriminate cutting down of trees and encourage afforestation.

## References

- Adams, W.M. and Mortimore, M.J., 1997, 'Agricultural intensification and flexibility in the Nigerian Sahel', mimeo, Department of Geography, University of Cambridge.
- Adger, W.N., S. Agrawala, M.M.Q. Mirza, C. Conde, K. O'Brien, J. Pulhin, R. Pulwart, B. Smit, and K. Takahashi, 2007: Assessment of adaptation practices, options, constraints and capacity. In: *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Parry, M.L., O.F. Canziani, J.P. Palutikof, P.J. van der Linden, and C.E. Hanson (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, pp. 717-743.
- Barrett, C.B., Reardon, T., Webb, P., Nonfarm income diversification and household livelihood strategies in rural Africa: concepts, dynamics, and policy implications. *Journal of Food Policy* 26 (2001) 315–331
- Carter, M. (1997) 'Environment, Technology, and the Social Articulation of Risk in West African Agriculture', *Economic Development and Cultural Change*, 45(3): 557-591.
- Chambers, R., 1989, 'Editorial Introduction: Vulnerability, Coping and Policy', *IDS Bulletin*, Vol.20, No.2, pp.1-7.
- Chambers, R., 1997, *Whose Reality Counts?: Putting the First Last*, London: Intermediate Technology Publications.
- Christiansson, C. 1988. "Degradation and Rehabilitation of Agropastoral Lands: Perspectives on Environmental Change in Tanzania." *Ambio* 17:144-52.
- Dercon, S. and Krishnan, P., 1996, 'Income portfolios in rural Ethiopia and Tanzania: choices and constraints', *Journal of Development Studies*, 32(6): 850-875.
- Ellis, F., 1997, *Household Strategies and Rural Livelihood Diversification*. Paper submitted to the *Journal of Development Studies*.
- Ellis, F., 1996, 'Policy implications of rural livelihood diversification', mimeo, Overseas Development Group, University of East Anglia, Norwich.
- FAO, (2015). *Regional overview of food insecurity: African food security prospects brighter than ever*. Accra, FAO.
- Frank Ellis (1998) *Household strategies and rural livelihood diversification*, *The Journal of Development Studies*, 35:1, 1-38, DOI: 10.1080/00220389808422553
- Frank Ellis (1999) *Rural Livelihood Diversity in Developing Countries: Evidence and Policy Implications*. Overseas Development Institute

- Frank Ellis (2000) the determinants of rural livelihood diversification in developing countries. *Journal of agricultural economics*, 51:2, 289-302 DOI:10.1111/j1477-9552.2000.tb01229
- Ids Working Paper 69
- IPCC (2007) Working Group II—Chapter 9: Africa
- Johnson, V., and K. Tompkins. 1989. "Fuelwood Scarcity in Swaziland." *International Journal of Ambient Energy* 10:59-102.
- Karim Hussein And John Nelson (1998) Sustainable Livelihoods and Livelihood Diversification
- Moench, M. 1989. "Forest Degradation and the Structure of Biomass Utilization in a Himalayan Foothills Village." *Environmental Conservation* 16:137-46.
- Oladipo, E.O. (1993a). Some Aspects of Spatial Characteristics of Drought in Northern Nigeria. *Natural Hazards*. Kluwer Academic Publishers, Netherland, 8:171-188.
- Pandey., D. (2002). Fuelwood Studies in India: Myth and Reality. Center for international Forestry Research.
- Ryan., P., 1990b. "India: Woodfuel Supply Situation." Washington, D.C.: ESMAP, World Bank, processed.
- Sally, S., Karel, C., Bernd, S., (1999). Conducting a PRA Training and Modifying PRA Tools to Your Needs, FAO.
- Saxena, N. 1987. "Commons, Trees and the Poor in the Uttar Pradesh Hills." ODI Social Forestry Network, Paper 5f.
- Singh, J., U. Pandey, and A. Tiwari. 1984. "Man and Forests: A Central Himalayan Case Study." *Ambio* 7 3:80-87.
- Smil, V. 1983. "Deforestation in China." *Am&E* 12:22&31.
- Soussan, J. 1984. "Fuelwood Strategies and Action Programmes in Asia." Bangkok: AIT.
- Soussan, J. 1988. *Primary Resources and Energy in the Third World*. London: Routledge.
- Stark, O. and D. Levhari (1982) 'On Migration and Risk in Less Developed Countries', *Economic Development and Cultural Change*, 31:190-196.
- Unni, J., 1996, 'Diversification of economic activities and non-agricultural employment in rural Gujarat', *Economic and Political Weekly*, August 17: 2243-2250.
- Williams, J. Y. (2011). A case Study of Desertification in Haiti. *Journal of Sustainable Development*. Doi:10.5539/jsd.vn4n3.p20

Yamusa, A.M and I .U Abubakar (2011): Mitigating the Effects of Drought on Agriculture Nigeria. Proceedings of the International Conference of the Nigerian Meteorological Society, Ahmadu Bello University Zaria 2011, Pp. 194-205