Panel 10: Roles of local and indigenous knowledge in addressing climate change (Sponsored by IDS Knowledge Services)

Chair: Laban Ogallo (ICPAC)

Kenneth Odero: The role of indigenous knowledge in responding to climate change: local-global Perspectives

Stephanie Midgley: Integrating local and indigenous knowledge into river basin management for effective climate change adaptation

Annabella Abongwa Ngenwi: Climate change and adaptation strategies: lessons from women's indigenous knowledge practices

Hubert N'Djafa Ouaga: : La prévision saisonnière scientifique : Quel apport des connaissances traditionnelles?

Panel Summary

Introduction

Some call it local knowledge, others indigenous knowledge, while many prefer traditional knowledge. The Chair, Dr. Henry Mahoo from Soikone University, Tanzania, pointed out that whatever the terminology being used, it is understood that we are talking about knowledge held by local people, outside the formal scientific domain. This panel, funded by Knowledge Services at the Institute of Development Studies, highlighted different perspectives around validating and integrating indigenous knowledge with formal research knowledge around climate change.

What knowledge counts for communities on the ground?

With a specific interest in developing appropriate risk strategies for Kenyan communities in preparing for climate change impacts, Kenneth Odero from Climate X, is using an approach that focuses on developing case studies and documentary analysis of indigenous knowledge.

Kenneth has found that to help cope with the negative impacts of climate change, communities employ traditional, local and indigenous knowledge (TLIK) based practices. TLIK practices include: knowledge of indigenous plants, food preservation techniques, seed selection to avoid drought, disease control in livestock, among others. One important finding noted is that TLIK is the resource that is most readily available to smallholder farmers, pastoralists, fishing communities and forest dwellers in Kenya.

What are the policy implications for TLIK in the climate change arena? There is a wider issue around technology transfer/technology development with TLIK, including IPR issues. By definition, TLIK is considered to be sustainable and climate smart – how can it be better fit in within the wider adaptation and mitigation agenda?

Kenneth concluded that we need to rethink development with traditional knowledge and local indigenous knowledge being built into the process.

Storytelling – local knowledge being captured

Bonty Botumile, a writer of children's books, presented One World Sustainable Investments work on integrating local and indigenous knowledge into river basin management, which also needs to take climate adaptation into account. The presentation's specific focus was on the Okavango, a transboundary basin that lies across Namibia, Botswana, Zimbabwe and Angola. As part of this project, Bonty has been working with the communities who fill in the details around resource use. Using an interactive framework, it allows the community members to have a voice by sharing their knowledge and stories through storytelling, surveys, traditional festivals, etc.

She pointed out that these activities are part of a longer term learning process, which not only includes gathering indigenous knowledge from custodians and developing transboundary adaptation responses, but also increasing the communities knowledge on climate change issues.

One of the key challenges that was brought up was the scaling this process up to the basin level given the complexities of politics and institutions. In conclusion, Bonty discussed how IK needs to be open to public scrutiny, including at the community level, between villages. Communities also need to interact and work with different organisations that provide different forms of information.

Extending women's knowledge to the wider community

Annabella Ngenwi from the Institute of Agricultural Research for Development (IRAD) in Cameroon discussed lessons from women's indigenous knowledge practices in developing appropriate climate change adaptation strategies. Women make up almost 80% of the agricultural work force in the tropics and are increasingly vulnerable to climate change. Women have learnt to adapt to climate variability and their adaptation over time has been through indigenous knowledge practices. Annabella went on to say that these adaptations have undergone modifications through trial and error.

But why the emphasis on women and local knowledge practices? Successful projects on rural development and climate change adaptations that targeted women will provide valuable information to guide meaningful adaptations by both men and women.

Women have extensive knowledge of their communities, have good social networks within their own communities, and play an important role in managing resources for domestic use. As part of these roles, women need to be supported to enable them to become active participants in developing and designing adaptation strategies which will benefit the whole community.

Seasonal forecasting: the value and role of indigenous knowledge

Hubert N'djafa from the AGRHYMET Regional Centre/CILSS has been working with colleagues to develop effective seasonal forecasting strategies for rural communities by exploring how local/indigenous knowledge can be integrated with scientific information using a methodology called PRESAO (Prevision Saisononnaire en Afrique de l'Ouest).

Four indicators are being used in this project:

1. Astrological
2. Vegetation (e.g baobab, acacia) indicators
3. Birds (shift in the seasonal migration)

4. Wind

A database has been developed of different criteria and different indicators to form a holistic approach and picture of seasonal forecasting and climate change impacts. Hubert stressed that more time and money needs to be invested to develop a model of integration between indigenous and scientific knowledge.

Q&A discussion

One theme that came out strongly was the challenge of accessing climate change science knowledge for communities. One panelist asked the floor whether we, as development practitioners and researchers, know enough ourselves to make community decisions. How can scientific definitions be made more available in local languages? It was strongly emphasised that indigenous/local knowledge should not be left out of the equation. Indigenous knowledge can be validated by scientists, who in turn can enhance the science being used and decisions implemented on the ground.

Kenneth Odero

The Role of Traditional-, Local- and Indigenous-Knowledge in Responding to Climate Change: Local-Global Perspectives

Kenneth Odero

Climate XL

Abstract

Kenya is already experiencing negative impacts from a variable and changing climate. Some of the indicators climate change recurring weather variability, floods, droughts and temperature changes. To use temperature change, for example, analysis of both minimum and maximum temperatures based on the standard seasons of December-January-February, March-April-May, June-July-August and September-October-November (Kenya Metrological Department in Republic of Kenya, 2009) reveals that the rise in temperatures over the northern parts of the country is relatively higher than in other parts especially from October to February period. Similarly the decrease in minimum temperatures in the northern parts of the coastal strip is also relatively higher than in the southern parts of the coastal areas during the same period. Lamu in the north coast shows drop of 1°C from a mean of 24.5°C in the early 1960s to 23.5°C in the recent ten years. Whereas Mombasa in the south coast indicates a drop of about 0.3°C from 23°C in the early 1960s to 22.7°C in the recent ten years. The droughts of 2008/2009 and 2010/2011 have been described by the elderly as "the worst in living memory". To help cope with the negative impacts of anthropogenic climate change, communities employ traditional-, local- and indigenous-knowledge (TLIK) based practices. TLIK includes gender defined knowledge of indigenous plant and animal species, especially drought-tolerant and pest-resistant varieties; water harvesting technologies; water conservation techniques to improve water retention in fragile soils; food preservation techniques such as fermentation, sun drying, use of herbal plants, ash, honey, and smoke to ensure food security; seed selection to avoid the risks of drought; mixed- and or intercropping and diversification; soil conservation through no tillage and other techniques; use of early warning systems to predict short, medium and long term climate changes; transhumance to avoid draught and risk loss of livestock; herd accumulation; use of supplementary feed for livestock; reserving pasture for use by young, sick and lactating animals in case of drought; disease control in livestock and grain preservation; use of indigenous techniques in the management of pests and diseases; culling of weak livestock for food; and multi-species composition of herds to survive climate extremes. This knowledge, or parts of it, for example knowledge of local edible fruits has ensured survival of thousands of starving pastoralists, but not the loss of their animals, which more often than not have succumbed to

shortage of water and pasture. Such shocks and related loses come at a heavy price to affected communities as livestock is the mainstay of the local economy in the arid and semi-arid lands (ASAL) of Kenya.

ASAL constitute about 80 percent of Kenya's land mass, hosts about 10 million people and approximately 70 percent of the national livestock herd. The ASAL areas have the lowest development indicators and the highest incidence of poverty. Over, 60 percent of ASAL inhabitants live below the poverty line. The ratio of livestock to human population continues to decline due to recurring drought and resource-based conflicts. The Maasai, Samburu, Rendille, Pokot, Pokomo and Borana people occupy large parts of the ASAL. These pastoralists/agro-pastoralists communities own about 50 percent of the national cattle and small ruminant herd and 100 percent of the camel population. Over time, these communities developed complex human (language, indigenous technical knowledge, culture), natural (uniquely adapted breeds), and social (networks) capital, which has undergirded adaptation to their environment. This knowledge system, referred in this paper as traditional, local and indigenous, has been used by communities as a bulwark for adaptation and mitigation against the effects of a changing and increasingly variable climate. The Pokot, for example, have a lively and informed understanding of their environment and the possibilities it provides for living. The Pokot have long created a workable livelihood within several different ecological zones to satisfy their economic needs. They have also established economic specialization and regional trade, particularly in grain and livestock between farming and herding sectors (Potter and Sheppard, 1998).

Like hundreds of millions of women and men worldwide who depend directly on agriculture and related activities for their livelihood, diverse local communities in Kenya rely on TLIK systems for adaptation to and management of climatic risks. This gender-based knowledge, which and has evolved over the last 10,000 years with the domestication of plants and animals is critical for responding to climate change related risks at the local level (FAO, 2009; Agrawal, 2008; Thorne, 2008; United Nations Development Group, 2008; Arafa *et al*,. 2007; Nyong *et al*., 2007; Osman-Elasha and Downing, 2007; Republic of Kenya, 2007; Leautier, 2004 in Boko *et. al.*, 2007; and Otieno, 2002). In this context, my paper reviews relevant risk management strategies employed by Kenyan communities to prepare for, avoid or moderate, and recover from the effects of exposure to anthropogenic and or negative climate change. Case studies and documentary analyses of range management based system in Kibwezi; tree fodder for livestock system and conservation based agro-forestry system in Embu; high value tree crops system in the coastal humid zones; soil fertility based agro-forestry system in Maseno; species preference among the Olma and Mboni communities of Mpeketoni; the complex, rich and value-infused indigenous knowledge of the Ogiek who inhabit 100-mile long Mau highland forest along the western escarpment of the Great Rift Valley; cattle/animal husbandry practices of the Borana community in northern Kenya; use of indigenous techniques in the management of pests and diseases among the Tugen; and rain-making among the Luo Abasuba and Abaluhya communities of western Kenya, among others demonstrate that TLIK is the resource that is most readily available to smallholder farmers, pastoralists, fishing communities and forest dwellers to deal

with the negative impacts of climate change. The inevitable conclusion from this research is that the development of traditional-, local- and indigenous knowledge systems enhances resilience and adaptation to climate variability and change.

Key words: adaptation, traditional-, local- and indigenous-knowledge, community-led responses, vulnerability, climate change.

References

1. Agrawal, Arun, "The role of local institutions in adaptation to climate change". Paper prepared for the Social Dimensions of Climate Change, Social Development Department, The World Bank, Washington DC, March 5-6, 2008
2. Boko, M., I. Niang, A. Nyong, C. Vogel, A. Githeko, M. Medany, B. Osman-Elasha, R. Tabo and P. Yanda, 2007: Africa. *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge UK, 433-467
3. Nyong, A., F. Adesina, and B. O. Elasha. 2007. The value of indigenous knowledge in climate change mitigation and adaptation strategies in the African Sahel. *Mitigation and Adaptation Strategies in Global Change 12: 787-97.*
4. Nyong, A., F. Adesina, and B. O. Elasha. 2007. The value of indigenous knowledge in climate change mitigation and adaptation strategies in the African Sahel. *Mitigation and Adaptation Strategies in Global Change* 12: 787-97
5. Osman-Elasha, B. and T.E. Downing (2007); *Lessons Learned in Preparing National Adaptation Programmes of Action in Eastern and Southern Africa*, European Capacity Building Initiative
6. Otieno, Dorcas (2002): "An assessment of progress made in implementing Agenda 21: The Kenya NGO Position towards the Earth Summit 2002 and Beyond", Kenya Organization of Environmental Education
7. Porter, P.W., and Eric Sheppard (1998): “The Management of Tropical and Subtropical Ecosystems: The Pokot of West Central Kenya – An Indigenous Knowledge System” pp 263-303: In Philip Wayland Porter and Eric S. Sheppard, *The Worlds as Differentiated Resource*, abating)
8. Republic of Kenya (2007): *Medium Term Expenditure Framework 2007/2008-2009/2010: Report for the Agriculture and Rural Development (ARD) Sector*
9. Republic of Kenya, 2009: *Kenya Climate Change Response Strategy* (Nairobi: Government Printers

10. Thorne, Steve (2008): "Towards a framework of clean energy technology receptivity", *Energy Policy* **36**: 2831-2138

11. United Nations Development Group (2008) *Guidelines on Indigenous Peoples' Issues*

Stephanie Midgley

Integrating local and indigenous knowledge into river basin management for effective climate change adaptation

An extended abstract for AfricaAdapt

Bontekanye Botumile, James Cumming, Sabrina Chesterman and Stephanie Midgley

INTRODUCTION

Indigenous and local knowledge (ILK) should play an integral role in building climate resilience. Existing adaptive local practices can be harnessed and tailored to ensure communities are able to reduce their vulnerability to climate change. Across Southern Africa, local communities and institutions understand and experience climate variability and climate change differentially, informed by specific social and institutional contexts and histories of engagement with, and reliance on, their environment. ILK must not only be sought and recognized, but also integrated into local and regional knowledge systems and management plans if communities are to engage in effective adaptation and climate resilient development.

This paper focuses on specific case examples from across the Okavango River Basin in Southern Africa. Three villages in Botswana were utilised for the primary research. Their populations of mainly agro-pastoral farmers are directly dependent on natural resources, although each village comprises slightly different livelihood and vulnerability profiles. Research began in November 2010 and is ongoing. The use of key informant interviews, focus groups, and household semi-structured interviews have provided a robust basis to illustrate the intrinsic adaptive capacity and resilience that exists, which is embedded in indigenous knowledge systems. In addition, a meeting of the Basin Wide Forum was convened in Namibia in November 2010, and attended by 30 elected community leaders from the three riparian states sharing the Okavango River,

namely Angola, Namibia and Botswana. This was used to inform results within the transboundary perspective.

PRELIMINARY FINDINGS

The diverse livelihoods and interdependent nature of the large households that make up the communities of this area offer a relatively robust foundation of various types of 'capital'. Under current climate-development conditions this translates into a community perception of not being in an extremely vulnerable position currently. However, this is the perceived status quo or current position, and these perceptions are founded on a relatively stable situation: a variable climate, the bounds of which have been adapted to over long time scales. In the context of climate change and the medium- to long-term future, change and temporal scales are brought into the analysis. The question is asked: what if the climate-development situation was to change? Climate change is expected to bring increasingly hotter conditions, and a likelihood of increasing rainfall variability. Thus a focus was given to understanding, as elaborated by the communities of the basin, how projected changes in water provisioning as well as increased variability could potentially pose a risk to livelihoods.

The impacts of low river levels, drought and rainfall variability on agriculture and thus food and income security came out strongly, as expected. With almost all communities being purely reliant on rain-fed agriculture, strong warming and associated drying will have a severe impact on yields. Threats are also perceived to plague the tourism industry and the ability to harvest "bush products".

In terms of drawing on ILK in understanding adaptive capacity and to highlight potential adaptation solutions, a multitude of factors are shown to come together, that both enhance and weaken the adaptive capacity of the indigenous communities of the basin. In the case of Botswana, it is clear that the strength of the government in ensuring access to land, extension services and early warning systems are perceived as major assets by local communities (although there are age and gender inconsistencies). Some interesting weakening factors were identified by the communities. Of all stressors, wildlife-farming conflict came across most strongly in all interviews and focus groups. This factor is itself potentially exacerbated by climate change, in particular drought, which encourages wildlife to forage on farmlands. Gender imbalance in access to land and services, as well as differing intergenerational preferences and cultural change were also cited as serious problems, decreasing adaptive capacity.

Community recommendations for adaption strategies include: investment in adequate fencing for crop protection against wildlife damage; increased access to land and agricultural technology (including building dams for irrigation); the correction of gender imbalances; more inclusive governance; and revitalising the youth's interest in a rural existence and agricultural livelihood.

LESSONS LEARNT: TAKING AN ADAPTIVE MANAGEMENT APPROACH TO RESEARCH

- ILK is a complex epistemological system that often requires different informants to "decipher" it to point out its links and significance in terms of informing adaptation strategies – triangulation is essential, as is integration with conventional science.

- It is necessary to work with a wide range of informants, across age, gender and educational lines. The case of women deserves particular mention: The level of detail acquired in this study concerning livelihood structure, agricultural practice and governance is testament to the benefits of ensuring women are given a voice in the research process.

- Participant and community memory issues pose a risk to the focus of discussions regarding vulnerability, impact and adaption responses. Outlier events experienced in the recent past can be given more attention than the more representative climate-development system.

- Due to logistical and communication difficulties and the need to adhere to regulatory and cultural processes, generous time allocation and flexibility are beneficial to the research process.

- Folklore and traditional or religious beliefs are indigenous knowledge in the truest sense of the term, and must be captured effectively. This can have practicable implications for adaptation strategies by overlaying conventional science or development initiatives.

THE WAY FORWARD

This research is contextualised within the transboundary management of a river basin, given certain future climate and development plausible scenarios, and adaptive management which will be required at various scales, from Permanent Okavango River Basin Commission (OKACOM) to villages. For ILK to inform, and be informed by adaptation in a river basin management system, it must be flexible and cognisant of the different ecosystems, decision making processes

and religious and cultural practices that vary from one place to another. Where possible, transboundary forums (e.g. the Basin Wide Forum) must be engaged with or established as a way of validating an overarching tool. It will only be empowering and useful to vulnerable communities if it leaves room for them to adapt it to suit their needs and modus operandi. In light of these requirements, research will continue to be carried out in this area over the course of 2011. Innovative methods will be introduced such as storytelling, theatre and dance. Quantitative and qualitative surveys will be employed to add statistical rigour to the results. Finally, of key importance to this work is to establish a methodology for institutionalising a system that enables ILK to be integrated with other basin-wide knowledge systems, and be used as a resource in developing workable transboundary adaptation strategies.

Annabella Abongwa Ngenwi

Climate change and adaptation strategies: Lessons from women's indigenous knowledge practices

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Abstract

Women account for almost 80 per cent of the agricultural sector in Africa. Seventy per cent of the 1.3 billion people in the developing world living below the threshold of poverty are women. Although over the years women have developed various adaptation strategies to cushion the effects of climate change, they are still caught up in the vicious cycle of poverty and increased vulnerability. Future development plans should ensure that the consequences of climate change should not lead women into further deprivation. Indigenous or traditional knowledge has over the years played significant roles in solving problems, including climate change. This article argues that if climate change policy is about ensuring a sustainable future by combining agricultural development and environment issues, it must learn from and build on the experiences of women. The objective of this study was to identify how indigenous knowledge of women can be strengthened to better adapt to climate variability and change. This study reviewed indigenous knowledge practices of women in agriculture and

synthesized lessons on adaptation strategies and constraints to adaptation that would guide policy on gender and sustainable agricultural development. Because women are desperately trying to escape poverty they are motivated to be economically active. Lessons can be drawn from specific attributes of indigenous practices which include good social networking and sharing of new ideas, community participation, use of low-cost locally available materials in crop production and storage facilities, crop diversification and biodiversity conservation, caring abilities and high level of risk awareness. Constraints to effective adaptation are limited financial support, limited involvement in decision-making and religious/cultural barriers. For effective adaptation to climate change, women need to be supported so as to enable them to become active participants in developing and designing adaptation strategies which will benefit both men and women.

Introduction

Recent reports show that women, who make up almost 80% of the agricultural work force in the tropics, are increasingly vulnerable to climate variability and change (Denton, 2002). Poor social conditions they are exposed to and exacerbated by climate change place them (70% of the 1.3 billion people in the developing world) in the category living below the threshold of poverty. A phenomenon common in many developing countries is that women in communities generally do not own land and have

hardly any rights regarding the management of natural resources, despite often working in the fields (UNDP, 2010; Ngenwi et al., 2010; ISDR, 2009). Despite these odds, women have been able to cope with and adapt to the negative effects of exclusion from the control of resources they have right to and to climate change through indigenous knowledge practices. Traditional or local knowledge is strongly tied to local culture. This type of knowledge is also referred to as indigenous. All around the world, indigenous populations have lived in perfect harmony with nature. Over long period of times these populations have acquired knowledge about the inner workings of their immediate surroundings or environment. Accordingly, these populations have developed intimate knowledge on a wide array of topics ranging from environmental, biophysical, economic and social issues to spiritual knowledge (Sand, 2002). So much so that many authors refer to this type of knowledge as traditional knowledge systems. In these systems, knowledge is being continuously acquired by men, women and children in a given society or community. Grenier (1998) and McGregor (2004) present traditional knowledge as a collective memory that is conveyed with speech from generation to generation through songs or tales and also through actions and observations. Otto (2008) defines local knowledge as knowledge outside of the formal scientific realm held by local people in a specific geographic area.

The content of indigenous knowledge is not confined to one subject only but covers a wide range of diverse topics in a particular area. These include agriculture, animal husbandry, education, natural resources management etc. (Warren, 1991). By virtue of the numerous topics that are included under the concept of indigenous

knowledge and its use in local decision-making, it is deemed a vital resource for development initiatives and in many instances can be equal or superior to what is generally described as Western scientific knowledge (IIRI, 1996; Langill, 1999). Indigenous knowledge can provide currently constrained research and extension with low-cost solutions (Akegbejo-Samsons, 2009). More often these solutions are masked or hidden mostly because they come from women, whose voices are not heard and do not participate in decision-making. Women have taken a great interest in environmental resource management, and have generated a great deal of wealth in terms of indigenous knowledge (Denton, 2002).

We believe that the numerous projects on rural development and climate change adaptations that target women, which are considered successful should provide sufficient information to guide meaningful adaptations to climate change. Greinier (1998) observed that ignoring local circumstances, local technologies and local knowledge systems has wasted huge amounts of time and resources. With respect to this, the following questions require solutions? How different are adaptation strategies of men and women? If different, which factors can be implicated? Can we learn from the experiences of one group to assist the other? Which of the knowledge practices previously used by women are breaking down that require strengthening?

It is based on these questions that this study was undertaken to: 1. Compile adaptation strategies to climate variability and change employed by women; 2. Identify constraints to efficient adaptation; 3. identify areas of women's indigenous knowledge

practices that could be strengthened and used to increase adaptation to climate change at local and regional levels.

Methodology

A survey of literature on agricultural development projects in Africa in which climate change adaptations was integrated was carried out. Projects considered successful as well as those judged unsuccessful after evaluation were selected. In order to avoid bias in judgment, projects that were self-sponsored as well as those funded by national and multinational donor organizations constituted part of the sources from which information reported in this study was obtained. We used technical reports, peer-reviewed publications and gray literature representing experiences from Ghana, Nigeria, Niger Republic, Mali, Sudan and Southern Africa. A list of adaptation strategies in crop and animal production systems was compiled. Similarly, a list of constraints to adaptation faced by rural women was also compiled. Emphasis was given to presence or absence of the constraint(s) rather than to the magnitude of the constraints experienced by the women. The characteristics of the indigenous knowledge practices that qualified them as successful adaptations in food security and energy domains were synthesized as lessons that could be scaled up and out to strengthen adaptations by men and women to climate variability and change.

Results and Discussion

Rural women have adopted various methods to adapt to climate variability and change. These methods depend on the resources they are exposed to, level of education and indigenous knowledge. Adaptation strategies could be related to food production, storage, alternative sources of cooking energy, trade by barter and involvement in off-farm activities for income generation.

Table 1: Common adaptations – indigenous knowledge practices

Common adaptation practices by rural women to climate change
(a) Alteration of planting dates; (b) Alternative use of maize and guinea corn stalk and cow dung in place of firewood for cooking: These women indicate that the smoke from these materials affects the aroma of the food and also requires that the fire be attended to constantly. The latter takes much of the time of the woman and the girl child - a suitable assistant to the woman; (c) Mixed farming – In addition to arable farming, women in west and central Africa rear small ruminants and non-conventional livestock like snails in their backyards. (d) Storage of extra harvest for food supply separately from that destined for the market. Similarly planting materials for the coming planting season are separated from food reserves. Women have also adopted the use of local plant materials in protecting grains against weevils in storage.

(e) Crop diversification: It is a common practice to find many crop species on the same piece of land to guard against crop failure in times of adverse climatic conditions;

(f) Trade by barter: they often provide labour to large scale farmers who sometimes pay them with produce from their fields. They trade their labour for food;

(g) Off-farm income: This is critical to livelihoods and overall adaptive capacity.

(h) Alteration of planting dates.

Constraints to adaptation:

The under listed were common constraints reportedly faced by women to efficient and sustainable adaptations to climate variability and change. These constraints were reported in combination or in isolation in the different studies considered.

Table 2: Common constraints to adaptation to climate change experienced by women

Constraints to adaptation to climate change
Limited access to resources: land, livestock, tools and credit; Lack of information and access to information; Limited mobility – even though migration is a coping mechanism often used by men. In Niger for example, rural women are not allowed to move outside their villages (UNDP,

2010);

Limited roles in decision-making;

Much time spent in search of firewood and water:

The fact that women have been able to overcome some barriers to effective adaptation to climate change is indicative of some important lessons, which could be of benefit to the community in designing adaptation strategies.

Lessons learned from indigenous knowledge practices:

Extensive knowledge of communities

Although awareness about CC is generally low in North-Central and South-Eastern Nigeria (Agwu and Okhimamhe, 2009), women were found to be more knowledgeable than their male counterparts of the same age brackets, since they tend to live off the exploitation of the land. They keep record of events and are able to recall past extreme events that had drastic impact on the community. The attribute of being able to recall important events qualify them to be included in decision-making processes. UNDP (2010) view women as valuable contributors to adaptation work as they can be community leaders and natural resource managers who can help develop strategies to cope with climate-related risks. Certain community-based development activities, in

particular, those that are characterized as sustainable livelihoods (SL) activities, serve to build adaptive capacity in the face of climate-related shocks (Osman-Elasha et al., 2006). Women often have a strong body of knowledge and expertise that can be used in climate change mitigation, disaster reduction and adaptation strategies. It is in line with this that Denton (2002) noted that women are at the centre of sustainable development and that ensuring greater gender equalities in all sectors would mean that society as a whole will benefit.

Social networking

Dissemination of appropriate adaptation strategies is based on an efficient networking system which women credited for having. Weekly meeting groups and gatherings are common avenues for this exchange. This has been reported in Ghana (Gyampoh et al., 2008), in nigeria (Agwu and Okhimamhe, 2009) although recent reports of breakdown of communal nature of communities are common (Gyampoh et al., 2008). Strengthening of social networks would catalyze adaption to climate change in developing countries which lack access to improved ICT technologies for information dissemination. Non-climatic forces such as institutions, policies and social networks, clearly have significant implications for natural resources decision-making (Osman_Elasha et al., 2006; Nyong et al., 2007).

Caring abilities

Storage of food, separation of food from planting material are all practices that characterize the rural woman. The storage of surpluses is an effective risk averting measure that woman can undertake against future livelihood failures. Finally, the mobilization and formation of village or community cereal banks (CCBs) for food security and other benefits associated with banking the crops in this system are important measures. Although it is a matter of policy to guard against food shortages in many developing countries, implementation remains limited. During conditions of famine and food shortages, many developing countries rely on foreign food aid. The practice of women to store and secure food for use during poor seasons could be strengthened through training and provision of community storage facilities. A greater attention paid to post harvest losses and their subsequent reduction would reduce women and men's vulnerability to climate variability and change.

Alternative sources of cooking energy

Time spent in cooking food by women under scarcity of firewood has not been given much attention. The materials used by women for cooking are biodegradable and could be used in the production of biogas. Because of women's networking and sharing ability, they can easily come together for community collection of these materials for the generation of sufficient volumes of biogas. Alternatively, energy saving stoves can be developed from local materials like clay and briquettes produced from rice husk in rice growing communities to serve as firewood. A common practice is that rice husk is burnt

indiscriminately, increasing pollution and CO2 in the atmosphere. If briquettes and energy saving stoves are developed, this would reduce time spent to collect firewood, provide opportunity for the girl child to go to school and provide sufficient time for the women to engage in other activities. Denton (2002) reports on how women have to take shortcuts in food preparation as a result of energy poverty and have to resort to less nutritive meals in order to compensate for increasing fuel shortages.

Conclusion:

Lessons can be drawn from specific attributes of indigenous practices which include good social networking and sharing of new ideas, community participation, use of low-cost locally available materials in crop production and storage facilities, crop diversification and biodiversity conservation, caring abilities and high level of risk awareness. Constraints to effective adaptation are limited financial support, limited involvement in decision-making and religious/cultural barriers. For effective adaptation to climate change, women need to be supported so as to enable them to become active participants in developing and designing adaptation strategies which will benefit both men and women.

References

Agwu, J. and Okhimamhe, A. (2009). Gender and climate change in Nigeria: a study of four communities in north-central and south-eastern Nigeria. Heinrich Böll Stiftung (HBS). 71pp.

Akegbejo-Samsons, Y. (2009). Promoting local and indigenous knowledge in enhancing adaptive capacities under extreme events in Nigeria. IOP Conf. Series: Earth and Environmental Science 6, 412014 doi:10.1088/1755-1307/6/1/412014.

Balgis Osman-Elasha, B., Goutbi, N., Spanger-Siegfried, E., Dougherty, B., Hanafi, A., Zakieldeen, S., Sanjak, A., Atti, H.A. and Elhassan, H.M. 2006. Adaptation strategies to increase human resilience against climate variability and change: Lessons from the arid regions of Sudan. AIACC Working Paper No. 42. An electronic publication of the AIACC project available at www.aiaccproject.org.

Denton, F. 2002. Climate change vulnerability, impacts, and adaptation: why does gender matter? Gender and Development 10(2):10-20.

Greinier, L. 1998. Working with indigenous knowledge: A guide for researchers. Ottawa: International Development Centre. http:/www.idrc.ca/books/847.

Gyampoh, B. A., S. Amisah1, and M. Idinoba. 2008. Coping with climate change: how local communities use traditional knowledge in rural Ghana. Paper presented at: "Adaptation of Forests and Forest Management to Changing Climate with Emphasis on Forest Health: A Review of Science, Policies, and Practices". Umea, Sweden, August 25-28, 2008.

ISDR (2008). GENDER IN CLIMATE CHANGE ADAPTATION. Workshop for the development of policy guidelines on Mainstreaming Gender into Disaster Risk Reduction. Geneva 28-30 January 2008.

McGregor D. (2004): Traditional Ecological Knowledge and Sustainable Development Towards Coexistence, IDRC. http://www.idec:en:er-64525-201-Do_Topic.html.

Ngenwi, A.A., Tabi, F.O., Mafeni, J.A. and Etchu, K.A. (2010). Gender responsive agriculture: The way forward for food security in Africa. Paper presented at the International conference : Quelle agriculture pour un développement durable de l'Afrique, Ouagadougou 6-8 Decembre, 2010).

Nyong, A., Adesina, F., and Osman Elasha, B. (2007). The value of indigenous knowledge in climate change mitigation and adaptation strategies in the African Sahel. Mitigation and Adaptation strategies for global Change 12(5):787-797.

Hubert N'Djafa Ouaga

Titre : ***La prévision saisonnière scientifique : Quel apport des connaissances traditionnelles ?***

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Résumé

L'Afrique reste l'un des continents les plus vulnérables aux changements climatiques (GIEC, 2007). La mémoire collective se souvient encore des graves sécheresses des années 70-80 en Afrique subsaharienne. L'adaptation représente la seule alternative pour lutter contre les effets adverses des changements climatiques. Aussi, la communauté scientifique s'emploie-t-elle depuis plusieurs années à concevoir des outils, susceptibles d'aider à la prise des décisions pour la gestion des campagnes agropastorales. Parmi ces outils, figure en bonne place la **PRE**vision **S**aisonnière en **A**frique de l'**O**uest (PRESAO). Les paysans eux-mêmes disposent des pratiques traditionnelles ancestrales de prévision saisonnière des pluies perpétuées de génération en génération. En Afrique sub-saharienne, ces savoirs locaux guident les pratiques et les prises de décision par des fermiers de petite échelle qui représentent 70 à 70% des agriculteurs et plus de 60% de la population (Nakashima et Roué, 2002). Soucieux de prendre en compte ces savoir-faire locaux dans le processus PRESAO, le Centre Régional AGRHYMET a entrepris en 2009 une étude pilote dans la région du Liptako-Ngourma (Burkina Faso, Mali et Niger) pour collecter des données et mettre au point une méthode d'interprétation des indicateurs traditionnels de prévision des pluies en rapport avec les paramètres climatiques et météorologiques utilisés par les modèles statistico-dynamiques. Une base de données contenant 97 indicateurs traditionnels a été constituée et codifiée selon leur nature (indicateurs astraux, végétaux, animaux et physiques) d'où, sont extraits 16 indicateurs les plus pertinents et les plus couramment utilisés. L'observation de leur comportement permet aux paysans de déterminer le début, la qualité et la fin de la saison de pluies. Cette recherche se poursuivra dans le cadre du projet AfriClimServ, sur financement de la Banque Africaine de Développement (BAD) en vue de la validation et de l'intégration de ces indicateurs au processus PRESAO.

Mots clés : Liptako-Ngourma, Prévision saisonnière, Indicateurs traditionnels,

1. **Introduction**

Les variations interannuelles et intra-annuelles de la pluviométrie en zone sahélienne induisent des modifications de la pluviosité tant dans sa structure que de sa nature : la fréquence, l'intensité, la durée. De nombreuses recherches scientifiques, essaient d'apporter des réponses à cette perturbation climatique qui impacte la pratique des activités agricole. Il s'agit des travaux sur la prévision saisonnière du PRESAO. Par ailleurs, les sociétés sahéliennes disposent également des systèmes endogènes de prévision des pluies. Des travaux de Carla Roncoli, en

2001 au Burkina Faso ont montré que les paysans sont habitués à fonctionner dans de multiples cadres cognitifs et qu'ils désirent recevoir les prédictions scientifiques en raison du peu de fiabilité des prévisions locales dû à la variabilité croissante du climat. C'est dans le souci de prendre en compte ces savoir-faire locaux dans le processus PRESAO que le Centre Régional AGRHYMET a entrepris une étude pilote pour collecter des données et mettre au point une méthode d'interprétation des indicateurs traditionnels de prévision des pluies. Cette étude financée par l'Union européenne a été réalisée dans la zone du Liptako-Gourma autour du triangle frontalier entre ces trois pays : Burkina Faso, Mali et Niger (figure 1).

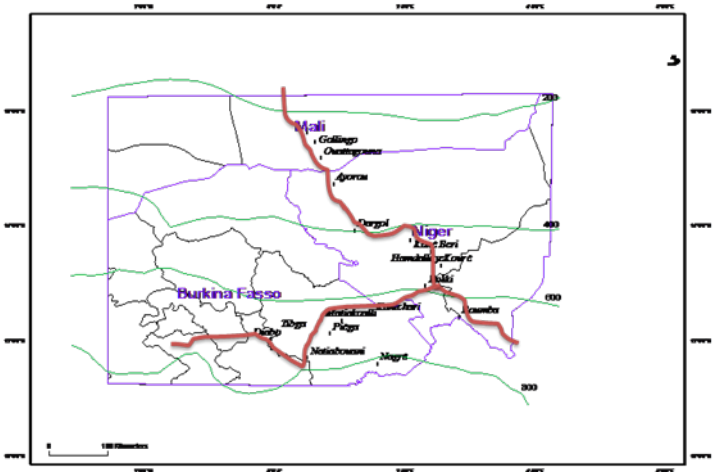

Figure 1 : Carte de localisation de la zone d'étude

2. Objectif de l'étude

L'objectif ultime de cette étude est d'influencer la production des informations climatiques du PRESAO par la prise en compte des systèmes de prévision traditionnels à la lumière des paramètres climatiques considérés les scientifiques.

3. Méthodologie

L'approche utilisée est basée sur la conception d'un guide d'entretien destiné à la collecte des données sur le terrain sous forme de focus groupes dans 19 villages retenus suivant deux transects (nord-sud et Est-Ouest). Sur la base de ce guide, il a été conçu un masque de saisie de données sous Access.

4. Résultats et Discussion

Au terme de cette étude, plus d'une centaine d'indicateurs traditionnels de prévision de pluies a été répertoriée et une base de données a été constituée. Selon leur nature, une typologie d'indicateurs a été constituée : astraux, biologiques et autres indicateurs physiques, tels que la température, les vents, la poussière, etc. La méthode traditionnelle de prévision des pluies est une combinaison d'observation des différents indicateurs traditionnels. L'observation de ces indicateurs est étalée sur plusieurs mois et prend impérativement fin au plus tard au mois d'avril de l'année en cours. Cette démarche paysanne semble être basée sur une sorte de modèle de

représentation du comportement des indicateurs par les paysans, comme étant des prédicteurs à la saison de pluies à courte échéance. Selon les indicateurs observés, nous présentons ici quelques résultats et discussions d'interprétations possibles faites par les paysans (H. N'Djafa Ouaga et al., 2009) :

4.1 Indicateurs astraux

Deux indicateurs astraux sont utilisés pour prévoir le début et la fin de la saison de pluies : la Grande Ourse (Grand Chariot) et des Pléiades. Ainsi par exemple, quand le grand chariot apparait vers le nord après le couché du soleil entre les mois de mai et juin, avec la forme d'une chamelle en position assise la tête regardant vers l'Est : cette position indique le début probable de la saison des pluies. Les paysans savent qu'il est temps de semer même si par ailleurs la pluie ne tombe pas et certains d'entre eux se donnent aux semis à sec. En revanche, quand le grand chariot apparait vers le nord-ouest après le couché du soleil entre les mois de septembre et octobre de l'année, avec la forme d'une chamelle en position debout cette fois, la tête regardant vers l'Ouest, ceci annonce la fin de la saison des pluies.

En ce qui concerne les pléiades, deux interprétations sont possibles : quand les pléiades disparaissent à l'Ouest après le couché du soleil : c'est le début de saison de pluies ; lorsque entre les mois de mai et de juin, les pléiades réapparaissent à l'Est vers l'aube c'est-à-dire vers 4 à 5 heures de matin : c'est le début de semis. En revanche, lorsqu'à l'aube on observe les pléiades au milieu du ciel vers 4 à 5 heures de matin, c'est la fin des semis et l'installation effective des pluies.

4.2 Indicateurs végétaux

Selon les résultats obtenus, cette typologie d'indicateurs est la plus répandue. Selon leur comportement, trois à quatre types d'indicateurs sont utilisés pour la prévision du démarrage et de la fin de la saison des pluies, de la prévision sur les régions les mieux arrosées, et la prévision sur la qualité de la saison de pluies. Par exemple, le Baobab ou *Adansonia digitata* et de bauhinia ou *Bauhinia rufescens* à travers la régénération de feuilles ; le Gao ou *Faidherbia albida* par la perte de feuilles, le Cassia ou *Cassia sieberiana* par sa floraison et le Prunier ou *Sclerocarya birrea* par l'arrivée à maturité de ses fruits sont des indicateurs de début de la saison de pluies. Quand le Karité ou *Butyrospermum parkii,* le Raisinier de singe (Bouleau d'Afrique) ou *Lannea acida*, le Néré ou *Parkia biglobosa,* et le Prunier ou *Sclerocarya birrea* durant la période de traditionnelle d'observation c'est-à-dire les mois de mai et juin, produisent abondamment des fruits, alors ceci indique une abondante pluviométrie pour la prochaine campagne agricole. Par contre, quand on assiste à l'assèchement de certaines espèces comme le Cram cram ou *Cenchrus biflorus*, à la régénération de feuilles de *Faidherbia albida*, et à la floraison de Kapokier à fleurs ou *Bombax costatum* dont une anecdote laisse comprendre que « la pluie ne tombe pas sur ses fleurs » ceci prédit la fin de l'hivernage.

4.3 Indicateurs animaux

Sous cette catégorie, sont regroupés les indicateurs tels que les oiseaux, les insectes, les vers, les poissons, les reptiles et les batraciens. Nous présentons ici quelques exemples d'utilisation de ces indicateurs traditionnels à des fins de prévision des pluies. Par exemple, si l'on note de façon générale l'arrivée des cigognes ou *Ciconia nigra* dans la zone, il faudrait s'attendre au démarrage de la saison de pluies. Toutefois, les paysans apportent quelques précisions à ce niveau. Ainsi, quand on note l'arrivée d'un petit nombre de *Ciconia nigra,* cela prédit une bonne pluviométrie et donc la saison sera favorable.

Par contre l'arrivée d'un grand nombre de ces oiseaux au village, annonce une mauvaise saison hivernale. Quant aux engoulevents, on en distingue deux types : l'engoulevent à longue queue ou *Caprimulgus climacurus* et l'engoulevent à balancier ou *Macrodipteryx longipennis* (cf. photo).

Engoulevent à balancier ou *Macrodipteryx longipennis*

Par exemple lorsque l'engoulevent *Macrodipteryx sp*, porte une touffe sur le dos (sorte de longues plumes) entre les mois de mai et juin, les agriculteurs savent qu'il est temps de semer. Selon une anecdote locale, le fait que l'oiseau porte ce long plumage, on dit que : "l'oiseau a pris la houe" (comme pour se rendre au champ pour semer). En revanche, s'il perd cette touffe de longues plumes entre les mois de juillet et août, les paysans savent que c'est la fin de semis de sorgho qui est la dernière spéculation à être semer, et donc la fin de tous les semis. Certains indicateurs comme les fourmis, les termites, les oiseaux, les lombrics ou les vers de terre ou *Lombricus terrestris*, les poissons, les camélions ou « *Damey* », les grenouilles ou *korboto* sont également cités. Par exemple, si les fourmis « *Kouadien* » s'activent « aller/retour » entre les mois de mai et juin, pour déplacer leurs œufs d'un endroit à un autre, ceci indique que la saison hivernale sera favorable, donc une pluviométrie importante. Quand les termitières sont pleines d'herbes entre les mois de mai et juin, cela voudrait dire qu'il y aura beaucoup de pluies durant la prochaine campagne hivernale.

Par contre, si les termitières renferment peu d'herbes, ceci est un indice de faible pluviométrie. Quand après les récoltes, les termites enveloppent fortement les troncs des arbres avec leurs constructions, alors ceci annonce probablement une mauvaise saison (famine sûre). Dans la

zone d'Ansongo au Mali, lorsqu'une espèce de poissons appelée « *somani* » est péchée en abondance, cela annonce le début de la saison des pluies. L'attroupement et le coassement des grenouilles ou *korboto* indiquent le début de la saison de pluies.

L'absence de coassement indique la fin de l'hivernage. Enfin, l'observation des traces des grenouilles le matin sur les chemins de champs indiquent aussi la fin de l'hivernage. Il en est de même pour les serpents.

4.4 Autres indicateurs

Outre ces typologies d'indicateurs traditionnels pour prédire la saison hivernale, il existe d'autres modes de prévision que nous n'avons pas pu classifier. Il s'agit des indicateurs liés essentiellement au temps et à certains phénomènes météorologiques observés (température (froid ou chaleur), vents, poussière, …) au courant de la saison de l'année écoulée et en cours. Par exemple, dans certaines régions du Burkina Faso, lorsque la saison sèche froide se prolonge, alors cela est un signe que la saison des pluies sera caractérisée par un début tardif et si elle est courte, il y aura une rentrée précoce de la saison chaude donc de la mousson avec l'installation de la saison des pluies. Le vent semble être l'indicateur le plus connu et le mieux utilisé par les agriculteurs de l'ensemble de villages enquêtés. En effet selon le comportement, la vitesse, la direction et le sens, il y a un consensus sur l'interprétation des types de vent. Cet indicateur est utilisé pour déterminer le début et la fin de la saison, voire la qualité de la saison de pluies.

5. **Conclusion**

Au terme de cette étude, on retiendra que les paysans disposent réellement d'un système de prévision des pluies basé sur l'observation d'indicateurs naturels qu'on pourrait qualifier de « modèle traditionnel de prévision ». Une base de données contenant au moins une centaine de bio-indicateurs traditionnels a été constituée et consultable au Centre Régional AGRHYMET. La mise en route de ce modèle traditionnel combine l'observation attentive et minutieuse des différents types d'indicateurs pour la prise de décisions dans la conduite de la campagne agro-sylvo-pastorale. Ces indicateurs, combinant plusieurs types d'indicateurs (biophysiques, astraux, spirituels…) très utiles à la prise de décision, fonctionnent donc comme un système d'alerte précoce social. Bien qu'empirique, ce système est transmis de génération en génération et occupe une place de choix dans la mémoire des hommes et toute introduction des produits de nouvelles approches de prévision scientifique de prévision s'heurte à ce savoir-faire traditionnel. Pour assurer la fiabilité et l'acceptabilité des produits du PRESAO par les paysans, cette étude conclut à l'impérieuse nécessité que le processus scientifique de prévision saisonnière considère la réalité des approches endogènes de prévision des pluies dans sa méthodologie de génération d'informations climatiques.

6. **Références bibliographique**

1. **Carla Roncoli, K. I. (2001) :** "Reading the Rain: Local Knowledge and Rainfall Forecasting in Burkina Faso." Society and Natural Resources 15: 409-427.
2. **D. Z Diarra. (1988) :** Contribution à la mise au point de méthodes d'Assistance Agrométéorologique Opérationnelle fondées sur des considérations empiriques et scientifiques. Niamey: 128.Mémoire d'Ingénieur en Agrométéorologie, Centre Régional AGRHYMET
3. **Hubert N. Ouaga; S. B. Traore, L. M. Amadou ; (2009)** : Valorisation des méthodes traditionnelles de prévision des pluies dans le cadre des activités de prévision saisonnière en Afrique de l'Ouest, 45 pages, Centre Régional AGRHYMET, Niamey Niger.
4. **, A. B. C. Ocholla-Ayayo (2003) :** Le savoir traditionnel sur les conditions au service de la production. Prévention des catastrophes en Afrique-SIPC Informations N°1. Nairobi: 22-24.
5. **I. Osseini, (1996) :** "Environnement du Niger : Les sécheresses au Niger: Clichés et Réalités." P17-29.
6. **Nakashima et Roué, (2002):** knowledge and foresight: the predictive capacity of traditional knowledge applied to environmental assessment; article published online, in international Social Science Journal, Volume 54, issue 173, page 337-347, September 2002.