ILCHAMUS PASTORALISTS' INDIGENOUS KNOWLEDGE AND ITS USE IN COPING WITH AND ADAPTING TO CLIMATE CHANGE IN MARIGAT, BARINGO- KENYA

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ABSTRACT

In view of present and future changes in weather and climate, documenting how pastoralists use their indigenous knowledge (IK) in coping with and adapting to climate change in their localities is increasingly important, as this knowledge may inform climate adaptation policies and practices. The objectives of this study were: 1) to document the Ilchamus pastoralist IK about weather and climate; 2) to establish how the Ilchamus acquire, share and transmit their IK over generations; and 3) to investigate how their IK informs Ilchamus decision-making in their livelihood production systems.

I conducted four focus groups discussions and administered a questionnaire to 331 households in Marigat Sub-County, Kenya in 2011. Findings show that the Ilchamus possess rich traditional knowledge on weather and climate, and use a variety of physical and biological indicators to detect likely environmental change. They observe changes in these indicators, and attribute many of the changes to climate change and other environmental natural processes. Results show that indigenous knowledge is not evenly distributed in the community, and Ilchamus often consult local experts in addition to using their experiential knowledge. This knowledge is passed from parents to children though daily interactions and folklore, and is shared within the community through social networks and organizational structures. Traditional means of IK transfer remain intact, but face a challenge from young and educated members of the community, who disregard or dismiss IK and value foreign cultures and practices over local traditions and lifestyles. However, the elders also support formal education for the community's children, which they see as providing more livelihood options for the future. Ilchamus use a number of customary coping and adaptation strategies to deal with a variable and changing

climate. They are aware of the possible consequences of climate change on their production systems and make livelihood decisions based on this knowledge coupled with their experience. However, a majority fail to take timely action in response to changing conditions.

This study demonstrates that Ilchamus community members hold extensive indigenous knowledge of weather and climate and that this knowledge has been used over time to inform livelihood decision-making in the community. I therefore recommend that the Ilchamus indigenous knowledge system be recognized by scientists and policy makers for its potential value as a source of adaptations in the face of climate change.

INTRODUCTION

Indigenous/traditional/local knowledge (IK/TK/LK) is a body of knowledge held by a group of local or indigenous people, unique to a given society, and acquired through generations by living in close contact with nature and is transmitted orally (Agrawal 1995, Berkes & Berkes 2009, and MacGregor 2006). Berkes & Berkes (2009) defined TK/IK/LK collectively as "*a cumulative body of knowledge, practice, norms, values and belief, evolving by adaptive processes and handed down through generations by cultural transmission*". Research on indigenous knowledge and its use in different disciplines has in recent years elicited a lot of interest by various disciplines both in support and criticism of it (Agrawal 2002; Barnhardt 2005; Berkes 2012; Briggs 2005, Drew 2005, Davis & Wagner 2003; Mauro & Hardison 2000; Orlove *et al.*, 2010). It is this knowledge here I argue and propose to use in addressing some of the climate change coping and adaptation challenges groups like pastoralists and agro-pastoralists face even though indigenous knowledge systems are being eroded by social and technological changes (Ayal *et al.*, 2015; Brodt 2001; Ross 2011).

Available evidence from atmospheric science point to the reality of climate change, but what is missing is exact impacts and considerable amount of uncertainty exist about the rate and extent of the environmental effects in specific regions (IPCC 2001; Schlenker and Lobell 2010, Thornton *et al.,* 2009). Such knowledge gaps may be bridged if we expand our scope of inquiry to include indigenous/traditional knowledge (IK/TK) systems to augment western scientific understanding of climate (Klein *et al.,* 2014; Riedlinger & Berkes 2001). Western science provides global and regional perspectives on what to expect, while local knowledge systems provide area specific changes observed over time. Synergizing the two will give us a better understanding of changes associated with weather and climate. In this study, I argue that the local indigenous knowledge held and used by Ilchamus agro-pastoralists of Kenya provides a unique source of local climatic knowledge that can help bridge the gap in knowledge about local climate change impacts on environment and livelihoods. Ilchamus indigenous knowledge may provide local-scale climate history, knowledge of environmental indicators, and traditional coping mechanisms that may be useful to formulating climate change adaptation strategies.

Environmental changes caused by global warming require the development of innovative mitigation and adaptation strategies (Smit & Pilifosova 2003, Klein *et al*., 2005 and McCarthy 2001). The strategies should reduce the community vulnerability associated with negative impacts of climate change (Nyong, *et al.,* 2007). To this end, I studied how the Ilchamus agro-pastoral community in Kenya lives under a changing climate, using its traditional knowledge and experience to overcome experienced and possible environmental challenges (Adger *et al*., 2003, Galvin 2009, Nelson *et al*., 2007 and Tyler *et al.,* 2007).

The objectives of this research were

1. To document the Ilchamus pastoralist community's indigenous knowledge on weather and climate, the indicators observed, and the sources of this information
2. To document how indigenous knowledge is acquired, stored and passed from generation to generation over time
3. To document the historic and current coping and adaptation mechanisms used in response to changes associated with weather and climate

Materials and methods

Study sites

The study was done in 2011 in four (4) administrative locations of Marigat Sub-County, Baringo County, Kenya: Ng'ambo, Salabani, Ilng'arua and Kiserian. The study's focus group discussion participants and household survey samples were drawn from these four locations.

Sampling design and data collection

We held four focus group discussions and surveyed 331 household heads distributed proportionally according to locational populations. Focus group members were selected with the help of local leaders, while household heads were randomly selected using households lists held by local chiefs from every location. Focus group discussions were held in every location after the surveys were completed. Stratified sampling using expertise in local knowledge, gender and age was used in selecting focus group participants with the help of traditional institutions like peer groups (*Ilamal*), local elders, opinion leaders, village headmen and government administration chiefs.

Data collection process

Researchers explore individuals' stories through various methods including interviews, focus groups, observation, and creative expressions (Rubin & Rubin 1995; Chase, 2005; Creswell 2012; Marshall & Rossman 2014). For the purpose of this study, I collected household data using a questionnaire. Later I facilitated four focus group discussions after household survey.

Data analysis

Data analyses were guided by the research questions and associated research hypotheses set out. Qualitative data analysis methods (Rubin & Rubin 1995; Marshall & Rossman 2014) were used for the focus groups and a combined analysis method (qualitative and quantitative) was used for the household surveys (Kvale 1996, Kvale & Brinkman 2009; Maxwell 2012; Creswell 2012). Household data (quantitative) were analyzed by use SPSS version 14 for windows.

I used categorical coding to classify the focus group data (Creswell, 1998; 2012; 2013; Marshall & Rossman 2014). About six main themes were identified and they include: natural physical changes, natural biological changes, human/social changes/ physical/biological indicators and traditional vs formal. On quantitative data from survey, Statistical Package for Social Science software (SPSS) was used for data analysis.

RESULTS AND DISCUSSION

Sources of IK/TK of weather and climate among the Ilchamus

Based on the focus groups discussion responses on the nature of knowledge on weather and climate, their local knowledge is obtained from the local "*experts*" (*Loomanyit (intestines reader), Loolakir (stars reader), loiboni (fore/fortune-teller, also a dreamer)* and personal experiences. This knowledge is experiential and cumulative over time.

Table 1: Common local/indigenous knowledge sources on weather and climate used by households (n=331)

Source of knowledge	**% of respondents using this source**
Own experience	74
Community ceremony	51.4
Social group	46.2
Foreseer/dreamer (*Loiboni*)	41.7
Community elders	36.4
Intestines reader (*Loomayit*)	32.6
Stars reader (*Loolakir*)	31.7

Source: Household survey, Marigat, 2011.

Table 1 above shows that many of the household heads use own experiences as a basis of knowledge on climate and weather, compared to consulting the traditional experts and local elders. It was noted that 86% of the respondents in this study claim to have heard issues of climate change discussed or talked about.

Local indicators (biophysical) of traditional knowledge on weather and climate forecasting

The following is a list of environmental physical and biological indicators observed:

1. Stargazing (called "*reading of stars*")
2. "*Intestines reading*"

3. Movement and direction of winds associated with rains
4. Temperatures
5. Clouds
6. Movement of large mammals
7. Birds' behavior, songs, and movements
8. Movement and direction of swarms of bees
9. Phenological changes in vegetation

2 Environmental changes over time and their trend

Changes observed over time include change in the amounts and timing of the rains, hence changes in seasons. Previously, the onset of the long rainy season was around March/April, but in recent years, rains delay to around May/June and may prolong all the way to August. Other changes include temperature rise, vegetational changes, crop yields, water scarcity, loss of wildlife on the land (migrated away), and loss of traditional medicinal trees and shrubs. Many of the changes are said to be heading in the negative trend, see examples in Table 2.

Table 2: Environmental indicators respondents (n=331) claim to have changed over the last 30 years

weather/climate indicator that has changed	**% of respondents who reported this change**
Rainfall timing and amounts	96.7
Vegetation on land- replaced by weeds	89.4
Temperature changes (rise)	87.3
Crop yields (low yields)	79.5
Water availability (scarcity)	79.2

Winds predictive likeliness	71.9

Source: Household survey, Marigat, 2011.

Table 2 is a list of significant observed factors thought to have changed in the last couple of years by the community members of the Ilchamus. The changes are to the negative directions and leading to loss of livelihoods. The changes are attributed to climate change indicators/factors as shown in the table 3 below.

Table 3: Direction of change in the indicators that respondents (n=331) reported and what they attribute these changes to

Climatic indicator	**What is the direction of change?**			
	Good/improving (%)	Bad/ getting worse (%)	No change (%)	Change attributed to climate (%)
Temperature	3.3	84.3- more hot than before	12.4	88.8
Rainfall	5.4	91.2- less, unreliable	3.3	95.5
Stars	16.3	39.6- unpredictable weather	44.1	-
Winds	28.4	43.5- unpredictable	28.1	45.9
Vegetation	6.9	79.2- weedy	13.9	71.9
Crop yields	16.4	63.3- low harvest	20.3	76.7
Water availability	16.7	63.9- less water	19.4	75.2

Source: Household survey, Marigat, 2011.

Meaning and implications of the observed changes on livelihoods and production systems

Table 4 below is the reported examples of the implications of the climatic/weather changes to their livelihoods and production systems.

Table 4: Reported implications of changes to their production and livelihood systems as claimed by the respondents (n=331)

Climate indicator	**% of households who observed change in this indicator**	**Meaning and implication of the change to production systems and livelihoods**
Temperature	85.5	• Temperatures have been noted to be rising • Changes in temperatures has led to low yields from crops and poor livestock productivity
Winds	72.8	• There has been a noted reduction in intensity of the rain predictive winds • The change is an indication of environmental changes, meaning people cannot accurately plan for seasonal grazing and planting
Atmospheric (clouds) changes	72.2	• Clouds are observed regularly to forecast the likely weather/climate events in the coming days/weeks/months • It has been observed that clouds occurrence time has changed than previously known
Stars	58.3	• Stars are observed very closely to assist forecast the seasons rains, no longer useful • This because seasons have changed but no

		longer in tandem with the stars • 4 key kinds of stars (*lipong (**female star**), laingoni (**male star**), nkowa and nkorikineji (**constellations**)*) • Planning for livelihoods systems is affected

Source: Focus group discussions, Marigat, 2011.

Table 4 shows those indicators observed to predict the seasonal rains, but since the seasons have changed/shifted due to climate change, the indicators cannot anymore be useful in prediction. The changes have affected the ability of the pastoral groups' decision making process. This means their indigenous coping and adaptation strategies are hard to implement.

Local "experts" as sources and custodians of knowledge on weather and climate and means of passing knowledge

The knowledge systems used in forecasting weather among other cultural activities are the purview of a few "*experts."* Experts come to be designated due to interests they developed to learn this knowledge early in life. This knowledge is mostly learned and acquired through kinship relations. There are three key natural knowledge systems L*akir (stars), Manyit (intestines)* and *Loiboni (Fortune-teller medicine-man)* and a fourth minor source, *Namuka (shoes*). These knowledge systems have no specific or regular means of teaching or passing other than regular meetings/elders deliberations which are passed to the other members of the community through their social networks or though community ceremonies and *loiboni* functions. Knowledge on weather is no different from other knowledge sharing processes. This is

shared informally by the herdsmen in grazing and water points and in community free-for-all meetings or during ceremonies and ritual events.

Folklore (*nkatini oo sinkoliotin*) was found to be an essential component of general knowledge and information transmission and sharing among members of the Ilchamus community, especially in early ages of a child's growth and development. Meanwhile, in general there exist and recognized social networks/organization that people commonly use while sharing information through which local knowledge can be transmitted. These networks are formed for different purposes and users. Their usefulness and participants' trust in them as a source of accurate knowledge varies. While some are permanent, others are temporary. Some have strict rules of engagement, while others are loosely formed; some are formal and others are informal. Examples include council of elders, council of age-set group, women council, peers and youth among others.

Local coping practices

Given that many families practice livestock keeping, household respondents claim that crop farming is one of the coping strategies they opt for and has become one of their primary income sources. About 86% of the households practice this along with livestock keeping. To them, crop farming is both a coping strategy and an adaptation practice. They claimed that when they settled in this area, they had livestock, but raiders took them all. Then a bird brought to them a seed of millet and dropped it in one of the clan's homesteads, called "*Ilkap*is." Since then, millet has been part of their cultural crops, used in ceremonies to bless and cleanse the land, in addition to being food.

Keeping of different kinds of livestock is practiced as a coping strategy. This ensures a supply of milk and other family needs in case one type of livestock are unproductive, sick, or affected by drought.

Other coping options include migration in search of pastures and water. This is a recent practice in this community. As human population increased, land seemed to shrink; migration became an option to seek better pastures. Later, migration was practiced just by a few families who had strong ties with members of other tribes. Such ties enabled those families to loan out part of the livestock to "*stock friends*" in distant lands to ensure security until the rains come back. Currently migration is restricted to neighboring villages or hills.

Herd-splitting is a practice where herders divide their herds into small groups for ease of grazing and management. A number of factors were given by respondents as contributing to less herd-splitting. Among the factors are lack of dispersal areas to graze different herds, shortage of labor, schooling, competing livelihoods such as urban wage employment, and security (cattle rustling). The majority of families, instead, join together (communal pooling) when drought is severe. Pooling resources allows for close families to share the responsibilities of herding, while freeing young boys and girls to attend school, and also allow some parents to seek wage labor in urban centers to supplement livestock income.

Traditional rain-making ceremonies and rituals are frequently performed to cleanse land so that it can rain again. Therefore, they believe that some rituals have to be performed to please some super-natural spirits that control rains.

Table 5: Local coping practices used by the local community (n=331)

Coping strategy	**% using**
Diversify sources of income/livelihoods	74.6

Sell excess animals	70.1
Migration	68.9
Split the herds and pooling	45.0
Loan out livestock to stock-friends	34.1
Community ritual for rain-making	34.1

Source: Household survey, Marigat 2011.

Adaptation practices (internal/local and external interventions)

The common adaptation strategies were crop farming (rain-fed and irrigation), casual labor in urban centers and farms, charcoal burning, shop/petty trade, and fishing. Participants strongly argued in support of schooling/educating children as an adaptation strategy due to imminent loss of the current livestock keeping because of climate change, insecurity, and interference of their culture, all of which will lead to loss of their current livelihoods. This community has several adaptation strategies, if supported with scientific strategies, they are more likely to sustain their livelihoods.

What are the responses to perceived and observed weather and climatic changes?

About 81% of the respondents indicated that they undertake some kind of response if they anticipate changes in weather, but only about 50% of them undertake a proactive response, the rest act in response to outcomes of the rains. These responses are undertaken through various coping and adaptations plans. The failures and delay in taking action are attributed to lack resources, national policies, lack of alternative livelihoods and poverty, so they take great risk by holding onto what they have hoping environmental conditions improve before they lose their

properties. The most important lesson here is that people clearly know the possible consequences of climate change, and that coping and adaptation practices are widely known, even though not many of them have the capacity to use them.

CONCLUSIONS

Knowledge and perceptions of weather and climate change can influence individual and community strategies to reduce their vulnerability to climate change impacts. Examining and documenting community and household knowledge and perceptions is important to understanding their strategies, approaches, and actions to either cope or adapt to changes in order to sustain production systems and livelihoods.

Reviewing the results from analysis on the sources of knowledge, we conclude that Ilchamus pastoralists have access to a variety of indigenous and non-indigenous, physical and biological sources of knowledge on weather and climate that go beyond local traditional sources. The Ilchamus use a wide range of different indicators to detect and interpret environmental changes. These indicators are interpreted by local experts to give meaning. We therefore conclude that the Ilchamus observe many weather and climatic indicators and make use of local experts to make decisions about weather response.

The Ilchamus indigenous knowledge system, however, is faced with challenges. Young people, especially those formally educated, are not paying much attention to indigenous knowledge. This study findings are important to our understanding of how local knowledge is acquired and transmitted among its users. It provides a baseline of information on indigenous

climate knowledge transfer. IK is only meaningful when others can benefit from it. Users of traditional knowledge can pass on coping and adaptation practices to future generations and the knowledge can be tested over time as conditions change.

They are also aware and practice coping and adaptation mechanisms in response to climate change even though less than 50% of them do take actual pro-active measures to secure their livelihoods early enough. The other half's inaction could possibly be interpreted to mean delayed responses due to limited fallback activities and alternative livelihoods systems. A good number of the respondents actually said that they take response actions non-proactively, that is when conditions are either already biting and are getting bad day-by-day, or after counting the losses. They explained that they usually hope conditions will improve soon before it gets worse, only for them to find they are in situations where they cannot rescue themselves anymore. Other reasons are lack alternative livelihoods to opt into or lack of capacity to venture into other production systems or sources of income.

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