

SHORT REPORT

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# The use of indigenous climate forecasting methods by the pastoralists of Northern Kenya

Anastasia Kagunyu<sup>1\*</sup>, Simiyu Wandibba<sup>2</sup> and Joseph G. Wanjohi<sup>3</sup>

## Abstract

This paper focused on the early warning signs of climate variation as indicated by the Borana community of Isiolo County, Kenya. The objective of the study was to determine the indigenous early warning signs used by the Borana to predict the onset of rainfall, floods and droughts and their efficacy. The study was guided by cultural ecological theory, and data was collected through secondary sources, semi-structured interviews, focus group discussions and direct observation. The findings revealed that the Borana had many indigenous early warning signs to predict different weather changes. These included the behaviour of animals and birds, presence of insects, clouds, the colour of the intestines of slaughtered domestic animals, interpreting dreams, flowering of plants and the pattern of stars. The study also indicated that the indigenous early warning signs have been reliable since time immemorial; however, the increasing severity and frequency of drought over the last decade has rendered indigenous forecasting less reliable than it has been in the past. Early warning of weather changes is very important as it helps the community to apply the most appropriate coping strategy when faced with certain natural calamities. This study recommends a combination of the existing indigenous early warning indicators with modern forecasting methods, to make them more appropriate.

**Keywords:** Early warning, Signs, Rains, Droughts, Changes, Indigenous knowledge

## Introduction

According to Steiner (2008), indigenous knowledge is a body of knowledge built up by a group of people living in close contact with nature. Langhill (1999) had a similar definition as he defined indigenous knowledge as the knowledge possessed by the original inhabitants of an area. Gufu Oba's work (2009) described indigenous knowledge as a product of time, society and environment. According to him, the useful parts of knowledge would persist through time, while the dysfunctional components are discarded. The dysfunctional parts are deleted because they fail to achieve repeated uses. Indigenousness is passed from one generation to the other through the process of socialisation.

Pastoral communities have used indigenous forecasting methods for a long time to predict seasonal climatic

events (Winnie et al. 2002: 22). Some pastoral communities observe clouds, wind and lightning that likely have their origins in traditional understandings of what contemporary researchers recognise as atmospheric science. Others watch the behaviour of livestock, wildlife and the local flora. Indigenous early warning signs of weather changes are not only limited to livestock-keeping communities. Njiro's (Njiro: Food, culture and environment: The case of the Atharaka of Eastern Kenya, Unpublished) work among the Atharaka crop producers in Kenya indicates that they have early warning signs which include the flowering of certain plants, the behaviour of birds and the croaking of frogs. Musembi's (2010) work in the Akamba crop-producing community in Kenya indicates that the Akamba also have early warning signs of rains and droughts.

The pastoral communities have relied on their indigenous early warning systems since time immemorial. This knowledge has enabled them to deal with multiple threats and variability and has helped them to survive

\* Correspondence: festcy2011@gmail.com

<sup>1</sup>Kenya Agricultural and Livestock Research Organisation, P.O. Box 147, 60500 Marsabit, Kenya

Full list of author information is available at the end of the article

and effectively use the harsh and highly variable environment. However, many traditional forecasting methods are perceived as becoming less reliable with increasing climate variability. Climate variability has led to recurrent, severe and prolonged droughts. In the past, a major drought was normally expected once every 10 years; in the past three decades, major droughts recurred after every three to four years and sometimes after two years (Kaitho et al. 2006). The timing of the rain by pastoral communities is an important issue as it indicates when to migrate with their livestock to different areas. The complications brought by climate change and variability have led to researchers becoming concerned about whether the Borana community uses any indigenous early warning signs to predict the weather variation and whether they are reliable. The study was guided by these objectives: to identify the early warning signs used by the Borana community to predict the onset of weather changes and to establish the efficacy of the early warning signs used by the Borana in the context of climate change.

**Study site**

This study took place in Isiolo County which is situated in Northern Kenya (Figure 1). The County borders Marsabit County to the north, Garrissa to the southeast, Wajir

County to the east and Meru County to the south (GoK 2005). The County covers an area of 25,605 km<sup>2</sup>. It is divided into six administrative divisions, namely, Central, Garbatulla, Sericho, Merti, Oldonyiro and Kinna (GOK 2004).

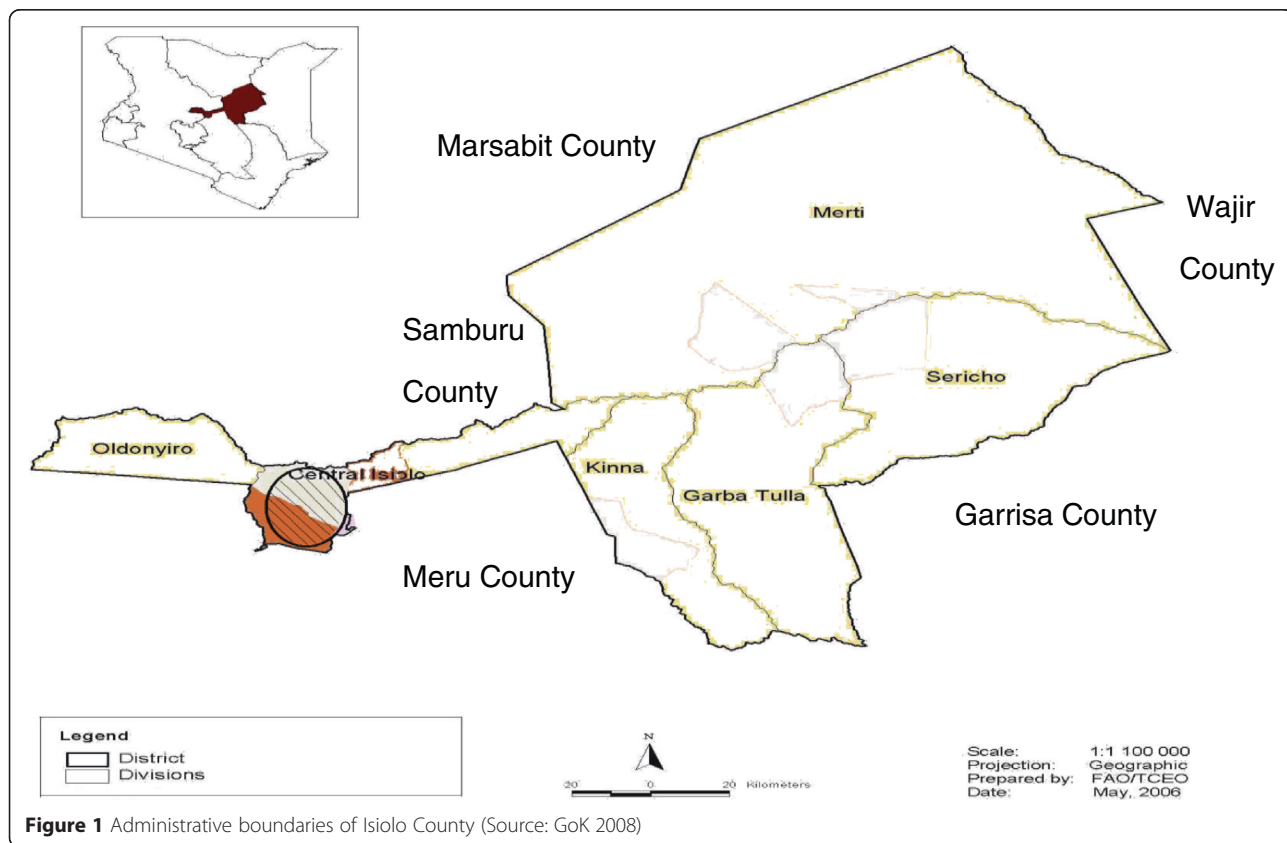
Most of the County is a flat, low-lying plain, which rises gradually from an altitude of about 200 m above sea level at Lorian Swamp in the northern part to about 300 m above sea level. The County is semi-arid since it is hot and dry most of the year. It has two rainfall seasons, the long and short rains, with the long rains coming mainly in March to May while the short rains come between October and November (GOK 2004). Rainfall is scarce and unreliable, which means it cannot support perennial agricultural crops. Livestock production is the major economic activity.

**Methods**

**Study population and and sampling procedure**

The study population consisted of Borana men and women household heads of Isiolo County. The unit of analysis was the individual man and woman household.

The sample consisted of 206 men and 194 women. The proportion of men was more because men were more readily available.



**Figure 1** Administrative boundaries of Isiolo County (Source: GoK 2008)

This study collected both qualitative and quantitative data. Systematic sampling was applied to select households for the interview. The sampling interval was determined by the equation given below:

$$\text{Sampling interval} = \frac{n}{N}$$

where

$n$  = required sample size

$N$  = population size

$n = 400$

$N = 4,000$

$$\text{Sampling interval} = \frac{400}{4,000} = \frac{1}{10} \text{ (i.e 1 in 10)}$$

Microsoft Excel FUNCTION = **RANDBETWEEN (1, 10)** was used to select a random starting number for the first household to be included in the sample, which happened to be number 8.

Purposive sampling was used to select focus group participants. Secondary data was collected from the literature, while primary data was gathered using questionnaires focus group discussions, and by direct observation.

#### Secondary sources

The literature reviewed included available literature on the Borana, climatic conditions (droughts and floods), coping strategies and adaptive strategies.

#### Interviews

Interviews were conducted with household heads, male or female, through the administration of a questionnaire on their perception of droughts and early warning signs of droughts, rains and floods. The household heads were also asked to describe the effects droughts had on their livelihoods and coping strategies. They also gave answers about the external agencies assisting the pastoralists to cope with various disasters and the type of assistance the communities received.

#### Focus group discussions

Two focus groups discussions were conducted. Each group had 10 participants who were selected purposively with men and women above 45 years of age. The issues discussed included the indicators of the community's early warning systems for normal rains, floods and droughts. The other issue discussed was the reliability of these early warning signs.

#### Direct observation

Direct observation was another method used to collect data on early signs. The researcher made observation of

vegetation, birds, insects, stars and the status of the sky as indicating whether there would be rains or droughts. The behaviour of animals and that of young children was also observed.

#### Data processing and analysis

Data obtained from focus group discussions and direct observation were sorted and interpreted in relation to the research objectives, to provide overall interpretations of the findings, showing how thematic areas and issues relate to one another. These themes included early warning signs of rains, floods, droughts and El Niño and reliability of these signs. On the other hand, quantitative data derived from the household interviews were edited, coded and analysed using the Statistical Package for Social Sciences (SPSS) software version 20 spreadsheets. Descriptive statistics were run to give frequencies and percentages.

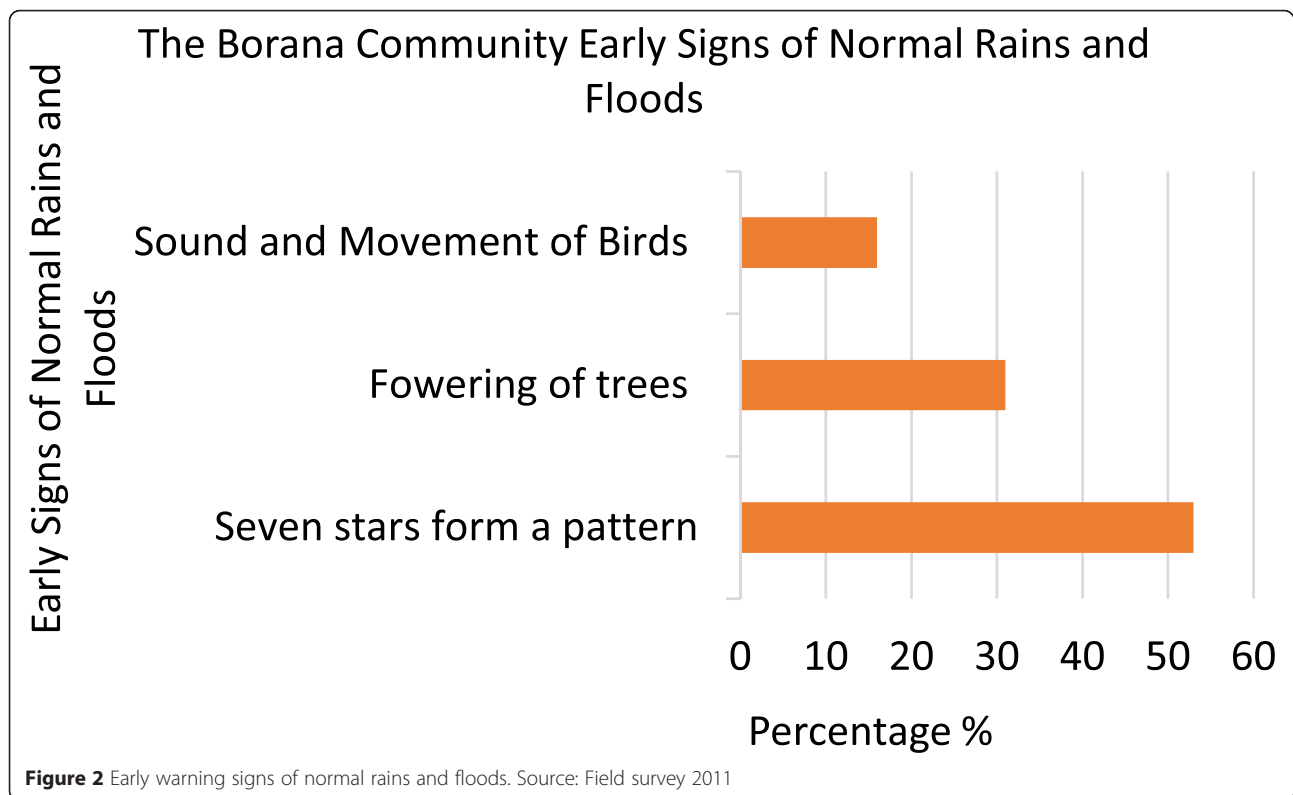
#### Findings and discussion

##### Climatic trends of Isiolo

Kenya has suffered a series of droughts and floods which have had devastating socio-economic and environmental consequences (Serigne and Verchot 2006). This has been attributed to climate change and variability. The arid and semi-arid lands (ASALs) are by far the most vulnerable. According to the GoK (2002), prolonged droughts affect the people living in Isiolo County and recur very often leading to losses of livestock and human beings. On the other hand, floods, although they are not very common, are very devastating whenever they occur since they led to deaths by drowning and landslides, loss of properties and displacement of people. Huho and Kosonei's (2014) report gives a chronology of the most recent droughts and floods in Kenya and Isiolo as follows: There were droughts in 2012, 2011, 2009, 2008, 2007, 2006, 2005, 2004, 2001, 2000, 1999, 1996, 1995, 1994, 1992, 1991, 1984 and 1980. There were trends of heavy rainfall and floods in 2011, 2006 and 2002, and in 1997/1998, there were heavy El Niño-induced rains.

##### Early warning signs of normal rains and floods

Various signs were used by the community to predict the onset of rains (Figure 2). For example, about half (53%) of the respondents stated that they observed the pattern of seven stars. According to them, these stars formed a particular pattern which showed whether it would rain or not. The location of the stars was also an indicator of the amount of rain and how soon it would rain. This was supported by focus group discussions. On the other hand, about a third (31%) of the respondents said that some trees produce flowers before it rains. They gave examples of *Acacia nilotica*, *Acacia tortillas* and *Balanites aegyptiaca*. Participants in one focus



group discussion gave similar information as evidenced by the following statement: *'A few days before the onset of the rains, Acacia trees start flowering. They also become very green'*. Another 16% of the respondents stated that through observation of some birds' movement and the sound made, there was an indication that the rains were about to start. The local names for these birds are *bararatu*, *buriya*, *urudhudhe* and *lakab*. Figure 2 summarises these responses.

During the focus group discussions, other signs were given as indicators of normal rains. The discussants stated that a few days before the onset of rains, domestic animals would refuse to enter their sheds and this behaviour was interpreted to mean that it had rained heavily and the shed was flooded.

Another sign was that a few days before it rained, livestock would refuse to get up unless forced to do so. Focus group discussions also revealed that elders could tell if it would rain by observing the intestines of slaughtered animals and if their colour was red, that was an indication that it would start to rain. Similarly, various signs were given by respondents as indicators of floods. Some of the signs were similar to those of normal rains such as the flowering of trees, the pattern of stars and the movement of certain birds and the noise they made. In addition, there were signs such as the increased presence of crickets, butterflies and other insects.

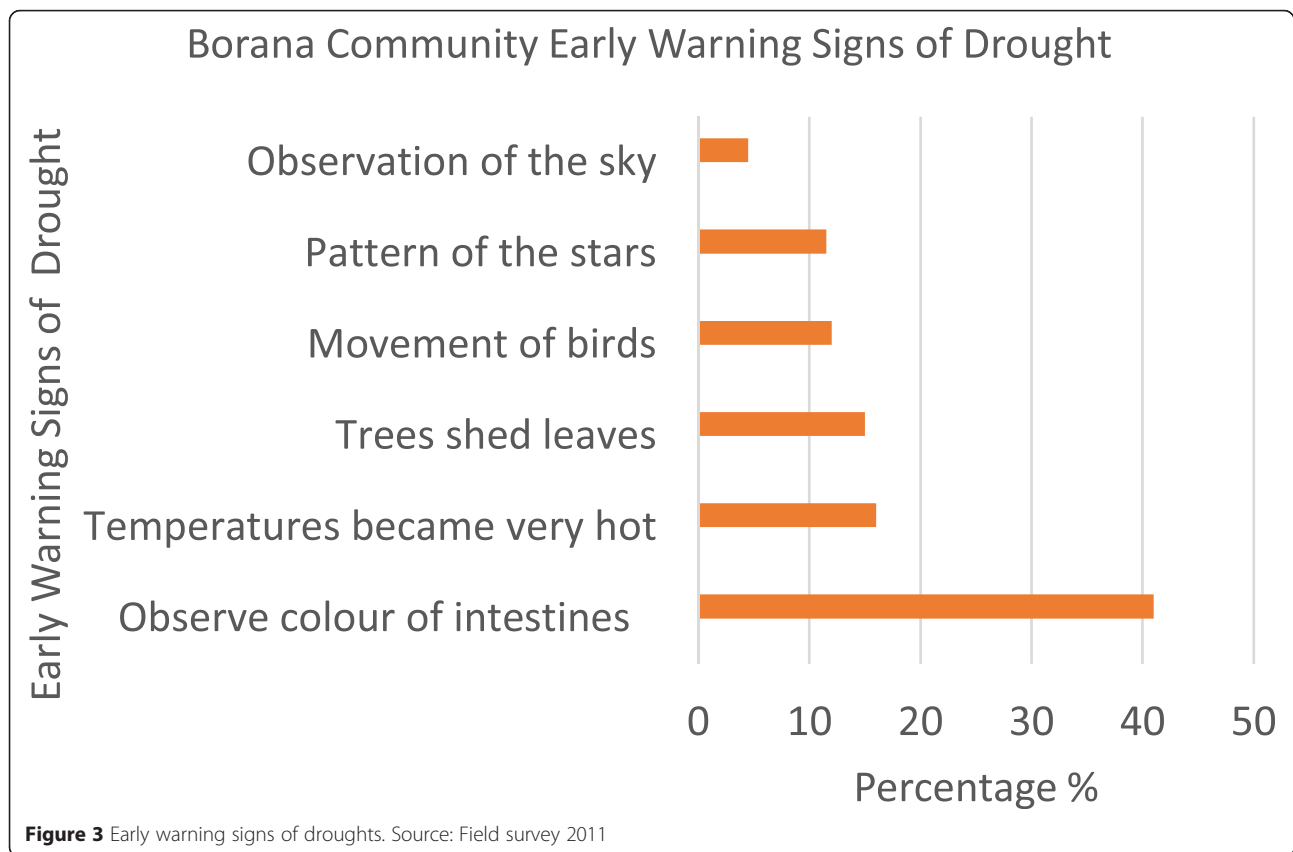
#### Early warning signs of droughts

Various signs were given as early warnings of droughts as shown in Figure 3. About two fifths (41%) of the respondents said that elders observed the intestines of slaughtered animals and if their colour was black, that was an indication that there would be a drought or war. Sixteen per cent of the respondents stated that before the onset of a drought, the weather would become extremely hot, 15% said that some trees shed their leaves, 12% talked of the sounds and movements made by some birds, while 11.5% mentioned the pattern of stars in the sky. Lastly, 4.5% of the respondents said that by observing the sky, their people would be able to predict whether there would be drought or not. For instance, if the sky was very clear without clouds, it was an indication that there would be drought. Figure 3 gives a summary of the responses.

There was consensus among the FGD participants on the behaviour of domestic animals before the coming of a drought. According to them: *'Before drought sets in animals are restless in the boma [enclosure], neither sleeping nor sitting. When they go for grazing and browsing they are usually unsettled and disappear in pairs to the bush and stay there until sunset.'* (FGD participants).

#### Reliability of the early warning signs

On whether the early warning signs were reliable or not, most of the respondents (74.8%) stated that they



were reliable, while 14.3% indicated that they used to be reliable only in the olden days. Focus group discussions suggested that the early warning signs used by the Borana were very reliable. They said that they had relied on their indigenous forecasting methods to predict impending seasonal events since time immemorial. According to the discussants, there were village elders (*wazee*) who were consulted and warned the community of any impending calamities such as droughts, floods and wars.

However, 11% of the respondents said that the early warning signs were not reliable at all. Some of these respondents added that their religion was opposed to observing the stars.

### Recommendations

This study reveals that the Borana community relied on their indigenous forecasting methods to predict impending seasonal events. This indigenous knowledge has enabled the Borana pastoral community to develop indigenous coping strategies which have assisted them to cope with natural disasters in the past. However, increasing climate variability, severity and frequency over the last decade render indigenous forecasting methods less reliable than they used to be in the past.

Therefore, this study recommends a combination of the existing indigenous early warning indicators with modern forecasting methods to make them more appropriate.

### Competing interests

The authors declare that they have no competing interests.

### Authors' contributions

AWK identified the research site, recruited the enumerators and collected and analysed the data. SW's contribution included supervision of the researcher during the data collection and editing the work, while JGW's contribution included the data analysis and editing the work. All authors read and approved the final manuscript.

### Authors' information

Anastasia Wanjiku Kagunyu is a PhD holder from the University of Nairobi. She is a Senior Research Officer at Kenya Agricultural Research Institute, working as a socio-economist. She has coordinated projects funded by the World Bank and European Union in the arid and semi-arid regions of Kenya. She has carried out policy-related work, research, community development, university lecturing and monitoring and evaluation, local and international organisations based in Kenya.

Simiyu Wandibba is a Professor in Anthropology. He works as a senior lecturer at the University of Nairobi at the Institute of Anthropology, Gender and African Studies. He has supervised many students at both Masters and PhD levels.

Joseph Gatura Wanjohi is a post-graduate student at the Catholic University of Eastern Africa. He works as an instructor at the school of the deaf Technical Institute Karen. He was a project coordinator of SOS based in Nairobi.

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### Author details

<sup>1</sup>Kenya Agricultural and Livestock Research Organisation, P.O. Box 147, 60500 Marsabit, Kenya. <sup>2</sup>Institute of Anthropology, Gender and African Studies, University of Nairobi, Nairobi, Kenya. <sup>3</sup>Catholic University of Eastern Africa, P.O. Box 62157, 00200 Nairobi, Kenya.

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