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The Use of Traditional Knowledge in Weather Forecasting by Nganyi Community

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Abstract

Traditional weather and climate forecasting is used by many indigenous communities globally as a guide in making vital decisions that enable them to cope and adapt to the effects of the climate change-induced extremes in weather variation. This study focused on how traditional knowledge is being used to forecast weather in Vihiga County. It is the resolution of this study to show how Indigenous Knowledge Systems have been used by Nganyi

community to predict local weather and seasonal changes in their environment. The objective of this study was to highlight and document indigenous weather forecasting knowledge by the Nganyi Community in Western Kenya. The study was based on interactions with the Nganyi community members in identified Nganyi Shrines for this research in Vihiga County. From the study it can be noted that there is a rapid disappearance of fauna and flora due to climate variability and human induced activities. There are few elders aware of traditional methods of weather forecasting. Therefore, making traditional weather forecast less dependable. The study concludes that the traditional leaders need to be empowered to assist in the conservation of resources in their communities.

Keywords: Indigenous Knowledge, Nganyi, Rain Making Ceremonies, Rainmakers

1. Introduction

Weather forecasting, as understood today, relates to capability of assessing weather conditions in advance. This is done presently by analysing huge volumes of meteorological data collected from across the globe on real time basis and integrating the same with numerical weather prediction models using high end computing machines.

However, local communities across the globe are not well equipped with scientific instrumentation and analytical tools and techniques have developed the art of assessing weather conditions using their experience, observation and accumulated knowledge of generations. It's largely based on keen observation of various faunal, floral and other physical changes in their surroundings that precede or accompany meteorological phenomenon of larger interest (Rautela and Karki 2015).

The Local Indigenous Knowledge Systems (LIKS) comprises of a body of knowledge systems that have been developed within various peoples' independent of, and earlier to, the advent of the modern scientific knowledge system. These systems of cultures have evolved into broad and comprehensive knowledge systems, such as those from ancient Africa that addressed societal and traditional knowledge issues in various fields important to human survival and the quality of life, including atmospheric weather phenomenon, agriculture and water, amongst others. This knowledge has survived on for a very long period of time (Risiro et al. 2012).

For many generations, the Nganyi community has used indigenous knowledge and skills to predict correctly impending rainfall extremes including floods, droughts and associated famines that have ravaged the area in the past. This community has developed and accumulated skills and knowledge that help them to scan the environment for relevant indicators of rainfall. Nganyi Indigenous Knowledge (Nganyi IK) rainfall prediction is neither mythology nor witchcraft; rather, it is a body of ideas that can be studied, understood and protected as a valuable resource. Some of these events have shaped and reinforced the beliefs of the community in the rituals that are performed as integral component of the rainfall prediction process (Nganyi, Osore, and Osore 2010)

The Nganyi Community is renowned for their rare skills, ability and power to monitor, predict and early warning of the impending local climate risks. The Community rainfall experts can make or stop rain, can stop hail storms from destroying farm crops, and can send lightning to strike a location of choice, among other things. Although their ability is grounded on a number of bio-physical, social and astronomical indicators, their approaches also combine metaphysical and spiritual paradigms. The metaphysical angle implies that man can intercede with his creator, "God", knowing He has ways and powers to intervene in any cosmic events. This explains the influence that Nganyi rainfall forecasting experts has on the community members that rely on their skill (Guthiga and Newsham 2011).

The traditional weather forecasting knowledge of the community has the potential of being utilized for making modern weather-related predictions stronger and more actual but if not documented this rich knowledge of the community is likely to be lost forever. This study is therefore designed to highlight and document indigenous weather forecasting knowledge of the Nganyi community. The focus of the research is on recording the observations of the community members regarding changes in outer environment and on getting into collective experiences rather than on cross sectional comparative analysis of the impact of climate change (Guto 2021).

1.1. The History Nganyi community

Nganyi was an elder. The energy of rainmaking came to Nganyi through one woman who used to suffer. The window came from south Nyanza at place called Simbi Nyaima she was welcomed by Namonywa father to Nganyi. When she was about to die the woman told Namonywa to call Nganyi the son and said she wanted to bless him with rain making powers in remembrance of the good hospitality they had accorded her. The woman was a widow and

childless, she had walked several homesteads seeking for refuge but many did not welcome her. The woman thereafter decided to look for her sister who had been married to Bunyore, in her search for her sister, the widow met Nganyi, who welcomed her as a widow who had suffered. She was called Imbako married in Itumbu. Nganyi build a cottage for her and gave her a house girl to serve her. The widow stayed for a long time until it reached a point she was about to die, she called Nganyi and took a stroll with him through the forest. Nganyi carried a matchet with him and while in the forest, the widow instructed him to cut some flowers/leaves from different types of tree (Onyango 2019).

During colonial times, there was drought and the colonial masters arrested Nganyi and took him to Kisumu where he was forced to make rain. He made the rain during the drought season while in Kisumu and the whites killed him in 1919 in fear that he could be powerful than them. The widow smashed the flowers and then asked Nganyi to put water into a pot and add the smashed flowers. She told Nganyi to use a pipe to blow inside the pot containing water and smashed flowers. Bubbles came out up to the brim of the pot, the widow thereafter asked Nganyi to look up in the air, when he looked up, Nganyi saw drizzle which had formed as a result as the blowing in the pot. The widow told him this is the gift I give to you from generation to generation. From there on Nganyi went to Nabongo Mumia who by then was the ruler of Wanga community and started to perform the role of rain making all over the community (Ouma 2015).

During dry season, Nganyi could visit villages to make rain and as a result, people really harvested food crops of all types. That is how Nganyi rainmaker came to existence. This energy is effective during dry season and when there is no rain whereby, they perform their cultural rites and later on the rains falls. Abasiekwe, one of the Nganyi lineage, during the late Mzee Jomo Kenyatta days travelled to Nairobi to cause the rain during the dry season. Abasiekwe have one unity and work in togetherness. They believe that when they speak, God listens to them. The herbs that were shown to them is to bring rain, which facilitates provision of food. They relate their rain making techniques to Elijah's story in the bible.

The general and main point of Nganyi community rainmakers is to fight against all climate change issues. They educate the community members of how the climate will be during the season after their traditional prediction. They have Nganyi Kenya Community Media Network -RANET radio station called Anyole Fm, where they use to pass information to the community and to the nation at large. They do compare their indigenous knowledge to scientific knowledge before they come up with a conclusion about weather. They observe the

trees in the shrine, birds kept in the shrine and insects that serve as a key role in issuing of their forecasts. They also predict using changes in temperature and behaviour of animals such as dog's barks in a particular way and birds make particular sound. Also, observe the way the trees shed their leaves. The shrine acts as their observatory centre since they do also observe at night (Rundio 2016), (Guthiga and Newsham 2011)

1.2. Area of study

The Nganyi community is a sub-clan of the larger Abasiekwe clan of Bunyore. They are found largely in West Bunyore Location, Emuhaya sub-county of Vihiga County in western Kenya with several smaller sub-clans dispersed in other parts of Bunyore and beyond, spreading into the neighbouring Nyanza region. Wherever they have moved, the Nganyi sub-clans have not abandoned the rain monitoring and prediction practices (Onyango and Onyango 2019).

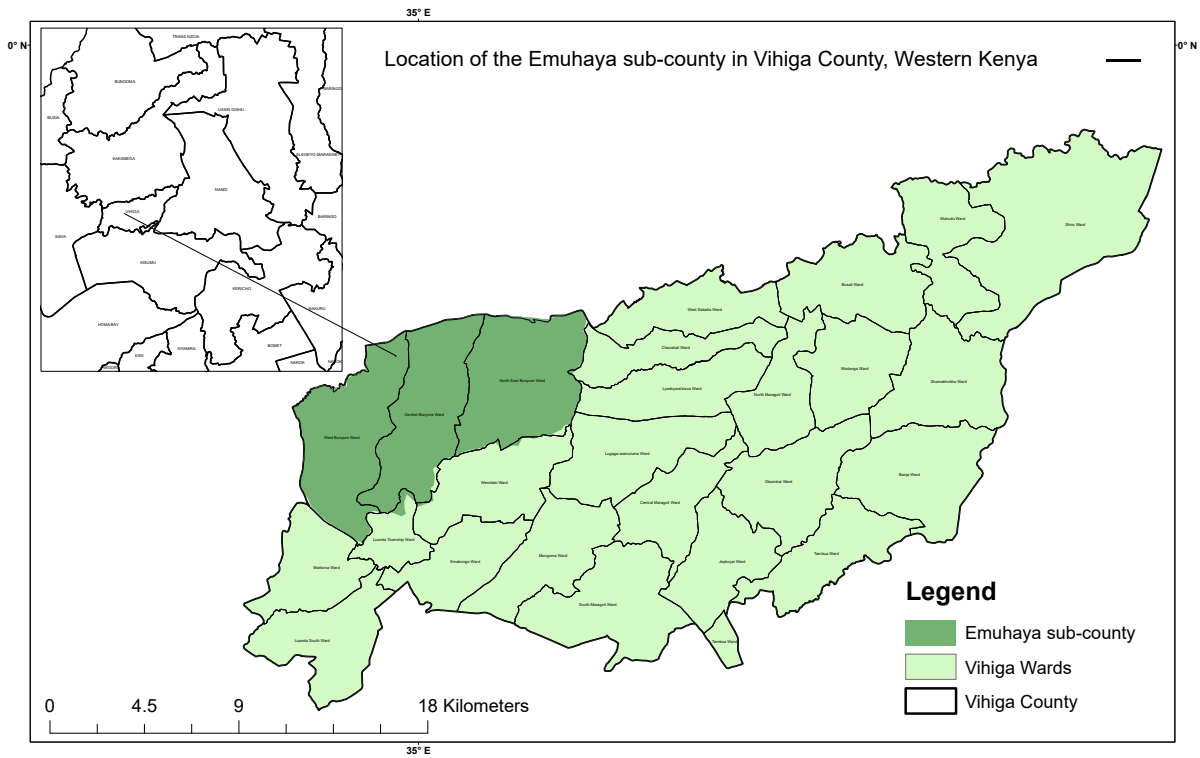

Figure 1: The study area. Inset is the map of some of the Western Counties showing the study location of Emuhaya sub-county in Vihiga County. Misiani Zachary produced this map on 29th Jan 2021.

The main Nganyi community inhabit a large area of the rocky Bunyore Hills. Living in harmony with the hilly environment has been part of their heritage. The community has developed a unique cultural belief system that allows them to manage existing natural resources in a sustainable manner and maintain a balanced ecosystem. The main Nganyi Community live in three distinct groupings namely: Ebusiekwe Esibila, Esitsimi Eluchiewo

and Ebusiekwe Esibembe. The other main Nganyi communities live in Ekasala Ekamanji, Imbitsa, Awasi in Kano, and Kaloka in seme (Nyanza). All the three groups have the knowledge and skills to predict rainfall, with each group having their own shrine where the prediction process takes place (Weather n.d.).

1.3. Methodology

This research work adopted the hybrid approach: Virtual and Physical. The information used in this research work was gathered from a 3-day fieldwork, which was conducted on 20th - 22nd December 2020 in Vihiga County and reviewing some of the relevant documents and articles on Indigenous knowledge. This study used interactive methods to explore how Nganyi Rainmakers conduct their weather forecasting.

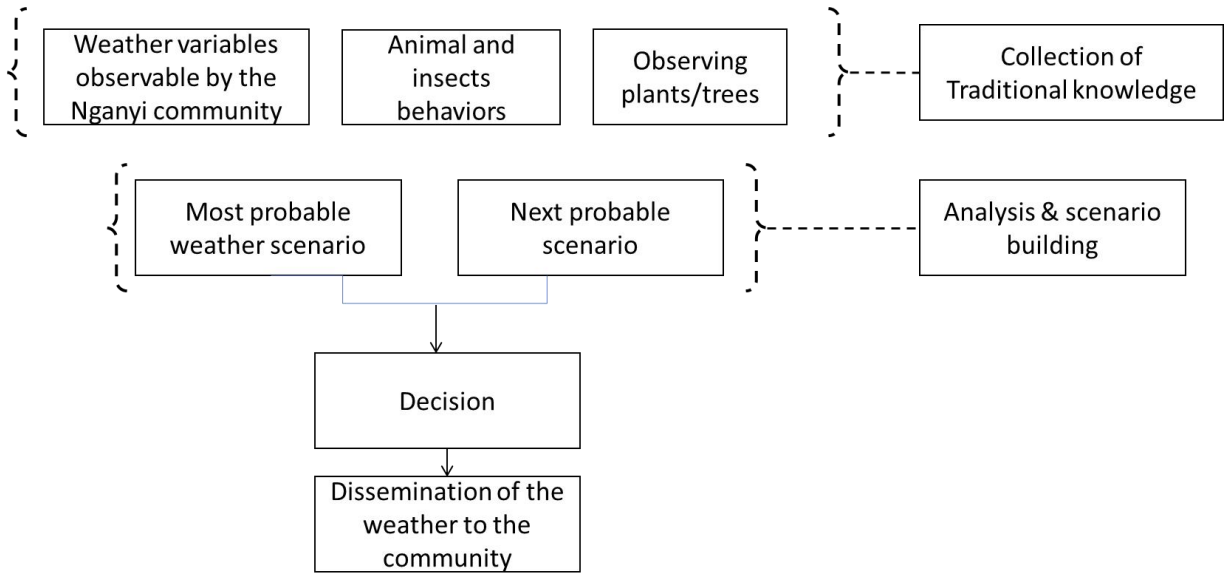

Figure 2: Collection, interpretation (analysis) and decision-making based on Nganyi tradition weather forecasting information.

Figure 3: The Virtual zoom meeting with Prof Lun Yin from China.

Figure 4: Zoom meeting with Xiaohan Zhang from France.

Figure 5: Group Photos. From Right: Mwai Zacharia, Bonfas Omena Omulako, Abisai Orendi, David Amayu, Owino Kutilo, Otima Nziwa, Ezekiah Mbilu, Bousted Mukolwe, Reuben Okonda, Misiani Zachary. Photo was taken by Hiram Njuguna.

Figure 6: Inside Oral conference

Oral conferences facilitated an in-depth exploration, which consisted of an integrated analysis of existing literature and lessons learned from previous study from other scholars. Rainmakers of Nganyi Community by Climate Action SDG Laboratory (CASLab). Part 1https://youtu.be/8PFPKBoJhaY.

2. Findings

2.1 Nganyi Community Indigenous Knowledge application in rainfall prediction process

There are two types of prediction approaches. One approach is applied for short rains and the other for long-rains. The methodology used is the same in both cases; however, the differences come in the duration of time set aside for invocation period. In each case the basic ingredients include a ram - omit a brown cock, prediction pot placed in a specific place and position in a shrine. Special rainfall prediction herbs collected by the elders and water collected from a stagnant source which satisfies special specifications. The water is collected by a virgin girl. The actual process entails pounding the herbs and mixing it with water and sprinkles of blood from the ram and the cock in a pot. The mixture is then blown into through the reed, which is like a pipe, as demonstrated in **Figure 7** This phase starts at about 4.30 p.m. of each of the invocation days preceded by intense prayers and invocation to the ancestral spirits. The blower faces east as he blows and reflections of the bubbles are seen in the pot. The colour, movement, sizes, resident period and other characteristics of the bubbles form crucial component of the rainfall prediction process.

Figure 7: Rainfall predictor using reed to blow and generate bubbles in the special pot. Photo was taken by Misiani Zachary.

From **Figure 7**, it should be noted that the various shrines are assigned specific elements to monitor on a day-to-day basis. The above process only marks the beginning of a consensus building. For short rains season the consensus building process takes two days but for long-rains, which usually comes after long period of dryness, they take one week. During this period, the elders invoke their ancestors and abstain from any sexual activities. Food is supplied to them by young boys. The shrines are strictly out of bounds for women. The explanation for this is that women are timid and would not withstand the experiences of interaction with ancestors during this phase of prediction. Offending the ancestral spirits would invoke untold damage to lives and even diminish happiness within the clan's nuclear and extended families.

The Nganyi community has retained its rainfall prediction skills for decades. This is because of the strong belief system on which Nganyi IK has thrived over the years and upon which the inner secrets of the community have remained protected.

2.2 Nganyi Indigenous Shrine

The Nganyi rainfall prediction relies on monitoring of the local natural environmental changes. The monitoring is done mainly in the indigenous observatories, also known as the shrines, which are sacred places endowed with flora and fauna that form the basis of rainfall observations and prediction. These shrines stand out as the most important institutions which harbour Nganyi traditional knowledge and practices and therefore they are considered as sacred natural sites.

Figure 8: A picture showing part of Nganyi Shrine. Photo was taken by Misiani Zachary.

Taboos and indigenous management codes commonly reserve these sites to particular activities and restrict access to members of the community. Many sacred sites have survived for hundreds of years and thus act as important biodiversity reservoirs. Sacred natural sites also contribute to forming an ethnic identity and play a key role in local communities' culture and lifestyles.

Nganyi IK rain prediction is a process and practice that takes place within these sacred places locally known as ebichimbilo. These are specific places set aside and dedicated for rituals that accompany rainfall prediction. It is here that elders consult their god for rain. Ebichimbilo (shrines) are landmark and historic places dedicated completely to rainfall prediction exercise or particular persons involved in this activity. They are places of worship and dwelling of the god of rain. Sacred objects of worship that represent the rainfall prediction process are stored in the innermost chambers of the shrines where they cannot be seen by anybody apart from those closely involved in the prediction process. Therefore, the shrines are treated with awe and respect. There are thirteen shrines across the eleven sub-clans of the Nganyi community.

Figure 9: Mzee Owino Kutilo. Photo was taken by Misiani Zachary.

Some of these are community shrines while others are family shrines. The former is more elaborate than the latter which are small compound shrines and which are very common

among the Nganyi sub-clans that migrated from the original settlement at Esibila and went to Eluchieo and Esibembe. The Nganyi's human concept is venerated at particular shrines along with a deity, the god of rain. Many members of the Nganyi community believe that the deity that they are worshiping actually enters and inhabits the ebichimbilo.

Nganyi shrine **Figure 8** in Esibila is the most famous among the Nganyi community shrines because it is where Nganyi the patriarch of rain-making was buried. It is approximately 10m by 10m and owing to its reverence, the shrine is dense with many mature indigenous trees that have been tended by the clan. However, despite the care that the shrine has received so far, it also faces the danger of being encroached. Signs are that trees are being felled and cultivation for food slowly creeping in.

At every shrine, there are special trees, three traditional stones on which rain-brewing pot rests, and a traditional stool among other smaller items. In the past, a sheep, goat and even chicken were core items that were imperative for rain prediction exercise. The animals were believed to have been part of the sacrifices made. According to Nganyi community elders, the shrines are an expression of the spirituality, which serve as bridges that connect them to mysteries greater than themselves.

2.3 Indigenous Knowledge Meteorological Related Indicators

The main wind observatories are at Bunyore, Malondole, Esibila hills and the equator. These hills have a dense vegetation cover and tall trees which are used in gauging the wind speed and direction. On these hills, the IK scientists observe the direction and speed of winds from Lake Victoria, and their interaction with the hills, to predict the weather. For example, the appearance of whirlwinds (*esitula*) or strong winds (*imbutsa*) and winds blowing predominantly from north to south indicate a pending dry spell. On the other hand, winds blowing from south-west to north-east indicate a wet spell. The observation of the behaviour of soot (*Omuyale*) and smoke from burning grass (*amasinde)* give the wind directions. The Nganyi being close to the equator observe the direction smoke is blown as part of the prediction exercise.

The whirlwinds observed by the IK scientists is most likely to develop on clear, dry and hot afternoons. These winds are called as dust devils due to the amount of dust and debris they collect in their formations. A series of these being observed would therefore indicate series of dry days and hence explaining the IK forecasts for dryness.

Winds blowing from south-west to north-east, are used to predict a wet spell by the IK forecasters, since they carry moisture from the nearby Lake Victoria and favour convergence over the local high ground and occurrences of afternoon rains. IK also link these winds to the large-scale winds from Indian and the Atlantic Oceans together with winds from Central Africa and Congo basin that transport moisture from these areas and enhance the rainfall process over the Nganyi Community area. The use of soot and smoke is analogous to the modern windsock, an instrument used by meteorologists to measure wind direction.

Other indigenous meteorological indicators for rainfall prediction include the building- up of dew (*elime*), temperature variations of water in storage pots, and lightning spikes in the atmosphere. These explanations confirm the efficacy of the indigenous science in rainfall prediction and its relevance when compared with modern-day meteorological practices.

2.4 Biological Weather Forecasting Indicators

2.4.1 Plants

Plants occupy a significant position in rainfall prediction among the IK scientists. The use of plants as IK tools for climate risk prediction and early warning is as old as the history of human kind. For Nganyi community, such plants include the fig tree (Ficussur), mahogany (Chlorophoraexcelsa), Terminaliabrownii, Ficusthonningii, Albiziacoriaria (mugavi), flame-tree (Ethryhrinaabyssinica) and Terminaliamollis, among others. These plants have unique behaviour depending on the quality of the impending rainfall season's onset or at the end of a season. The unique behaviour is what is usually observed by the IK practitioners and interpreted (Risiro et al. 2012).

The behaviour of the plants is based on their high affinity to water. The plants seem to be hygroscopic and are able to respond to significant increase / decrease in atmospheric moisture at the onset and end of the seasonal rains. Such plants normally flower and produce new leaves as an indication of enhanced increase in atmospheric moisture and subsequent near onset of rainfall season. Some of these plants are also able to sense significant increases in water towards the end of the rainfall season and respond by shedding their leaves to conserve the available water resources. The IK scientists use their long experience with these observations to predict and provide some early warning of the onset and cessation among other seasonal characteristics of the rainfall season (Zuma-netshiukhwi, Stigter, and Walker 2013).

2.4.2 Animals

The atmosphere has very organized large-scale atmospheric motions that are dominated by large-scale mean easterly winds from southern and northern hemispheres within the tropical latitudes. The migratory birds, locusts, pests, dusts and other pollutants are often driven by these migratory monsoonal wind systems over the tropics.

The migration of certain birds forms an integral part of indicators used by Nganyi community IK forecasters. Some of these birds migrate from very far areas, as far as southern and northern African regions. The late or early appearance of these birds are good IK indicators that can provide seasonal information on the rains within 3-5 weeks based on the appearance of these migratory birds. For example, early/ late arrival of the migratory birds often marks a good/ bad year based on this IK system. Appearance of large numbers of certain birds such as the vultures signifies severity of drought since they feast on carcases wild animals and livestock that died from the drought (Okonya and Kroschel 2013a).

Migratory birds include the white quails (*Tsisindu*), the eagle (*Esikhokhotole*) among many others. Ducks seems to shake and raise their heads up and down when the seasonal rains are about to start, and is a common IK indicator. IK scientists only use annual appearance of the migratory birds brought by monsoonal winds to determine early or late onset of the rainfall season. It is encouraging to demystify some of these particular processes that are used by both IK and modern scientists for seasonal rainfall prediction (Okonya and Kroschel 2013b).

2.4.3 Amphibians

The amphibians, mostly frogs (*Amashere*) and toads (*Olungála*), are good indicators of improved atmospheric humidity and seasonal rainfall onset. The Nganyi IK scientists observe frogs (*Amashele*) and use their croaking to assess the onset or disappearance of rainfall. The onset of wet season is marked by continuous frogs croaking while the beginning of a dry season is represented by cessation in the croaking noise and hibernation. The sudden appearance and absence of frogs and toads from their usual residing areas often signals onset of wet / dry season.

Movements of reptiles such as snakes and wild life are also used for monitoring and prediction of rainfall season onset. Because snakes and wildlife have capacity to sense high increase in atmospheric humidity after a long dry season, IK scientists frequently use their behaviour to monitor and predict the characteristics of rainfall onset. On the other hand, there are some rare species of snakes that appear only near the onset of the rainfall season. They seem to have similar hygroscopic stimuli like those noted under the discussion of plants indicators (Elia 2014).

2.4.4 Insects

The Nganyi community has very advanced knowledge of the study of insects which they in turn use to predict rainfall. For instance, the community understands that spiders (*olububi*) build their 'houses' (*cobwebs*) around the time when rain is about to fall. Thus, the presence of cobwebs in the house is a clear indicator that it would not be long before rains set in. Furthermore, when the spiders are observed spreading many webs across the direction of the wind current, the rains are expected to start soon and the season would result in a heavy harvest.

On their parts, black ants (*amamonyo*) engage in frantic efforts to store food in their underground dwellings to avoid being washed away and killed by the rains. The movement of some lake-based insects across the community land can indicate that sooner or later the major rains will start. Increased flow of winds from Lake Victoria to the neighbouring land (lake breeze) not only carry moisture for formation of convective rainfall, but also, like in the case of monsoonal winds transporting birds, provides free transport for the lake insects to the neighbouring land areas (Zuma-netshiukhwi, Stigter, and Walker 2013).

Other insects that are transported by large scale monsoonal wind systems include the locusts (*tsisiche*) and an influx of yellow and white butterflies associated with army worms (*lusese*). Locusts and army arms are very destructive to the environment as they devour plants and crops. The appearance of these insects signals bad season even if good rainfall is received late in the season. Wind and other climate related predictors are currently used by modern-day technology for locust and army worm spread, prediction and early warning (Rautela et al. 2016)

Conclusion

The study found that traditional methods of weather forecasting can be utilised for the purposes of short term and long-term seasonal weather predictions by local communities. It was noted that these methods ranged from biological, atmospheric, relief and astronomic features. Although a variety of methods were at peoples' disposal, it was noted with concern that a low percentage of people are at the moment using it or aware of the methods.

The main advantage of indigenous weather forecast is its easiness and timeliness; a person can make an independent observation without use of complicated instruments and make use of the information when needed without resorting to complex analysis of the collected information. There is no need for discussion with experts and in fact the indicators observed

by people in their immediate environment provide more accurate information than forecasts interpolated from data from the weather stations located at distant places. This holds good for remote and inaccessible terrains where most meteorological observatories are restricted to district headquarters and the data from the same is extrapolated for making a forecast.

The challenges for the integration of this traditional knowledge with mainstream science include the fact that observed environmental indicators lack sufficient scientific data for validation. The knowledge is based on cultural belief system of the people and often varies with different cultures and there is still no formal intergenerational transfer of knowledge amongst the communities. The environmental indicators are based on ecological interactions and response of the indicator species, which is being altered by effects of increasing climate variability and climate change thus making these predictions increasingly less reliable.

The study concludes that the traditional knowledge needs to be empowered and mainstream to assist in the conservation of biodiversity resources in their communities.

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