Indigenous Knowledge of Weather Forecasting in Korehay Zone, Somali Regional State, Ethiopia.

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Abstract

The study focused on identifying Indigenous knowledge of weather forecasting mechanisms in Korehay Zone, Somali Regional State, Ethiopia. The study was conducted in Ethiopia Somali region, Korahay Zone in 2017.The purpose of this study to identify indigenous knowledge have been experienced among pastoralist communities to predict weather patterns in their area. The study was employed ethnographic descriptive survey methods using open ended questionnaires and interviews. Data was collected purposively from knowledgeable elders to assesses communities understanding of identifying indigenous indicators to determine weather patterns in their environment. It was founded that indigenous indicators that of biological, atmospheric conditions and astronomic are used topredict weather patterns as of short, medium and long periods of time. Birds sound and movement, insect's movement and sounds, temperature density, wind direction, animal behavior, trees, and moon/star relationship were regarded as indicators of weather patterns. *Both manmade and natural factors are deteriorating indigenous indicators of weather patterns in the study area. In the study area, indigenous indicators have potentials of predicting weather patterns with different duration though climate change vulnerability increasing has been questioned the relevance and reliability of indicators by communities. Thus, the stakeholders should have emphasized on documenting and preserving these indigenous weather forecasting mechanisms that enables to integrate into climate change adaption and modern weather forecasting mechanism.*

Keywords:*indigenous knowledge, indicators, weather forecasting, pastoral society.*

1. Introduction

Traditional knowledge is explained as the knowledge of a group or a community from a particular area, based on their environmental understanding, interacting with nature and experiences within their area(Shumba, O.1999; De Boef, W., etl., Eds.1993) IKS was pervasive in people's lives as tacit knowledge that was not easily modifiable but provided local basis for problem-solving strategies. But IKS was context specific which then allowed for the flourishing of the local situation and provision of enabling environment for activities designed to help the communities bring about development (World Bank Group, 2011). Traditional rainfall forecasting/prediction refers to indicators that are locally used to interpret weather/climate conditions to be expected. Traditional rainfall forecasts/ predictions differ across communities, cultural background, and environment around the (Hart,2007; Garay and Puri,2011).

Indigenous knowledge in weather and climate prediction is under threat of disappearance due to lack of systematic documentation of the knowledge; lack of coordinated research to investigate the accuracy and reliability of Indigenous knowledge forecasting and finally when old people who are the main custodians of the knowledge pass away, the knowledge which has been accumulated for many years is lost (Grace, 2008, Mhita, 2006 and Kijazi, et., 2012). Marginalization of pastorals indigenous knowledge, experiences and practices of weather forecasting weakened their adaptive capacity that resulted highly vulnerability risks than other community (WISP, 2007). Indigenous Knowledge of weather forecasting can be combined with the modern methods to produce more reliable and accurate forecasts. In Western Kenya Rainmakers indigenous knowledge are integrated into that of from the Kenyan Meteorological Department to produce more accurate weather report (Thomson Reuters Foundation, 2012). In many rural communities of Africa use Indigenous knowledge to cope up with hazards related to climatic variability, especially in Tanzania, Zimbabwe and South Africa (Changa and Ngana, 2010; Blench, 1999). Also, in Europe, Australia the government make use of indigenous knowledge in order to cater for the varied microclimates in the region (Australian Government Bureau of Meteorology, 2010). In West Africa study demonstrated how seasonal rainfall forecast information was used to reduce loss of lives, property, and illness due to floods(Tall and Braman,2008). Efficient early warning systems have been shown to greatly re- duce mortality and morbidity due to extreme weather events

in the health sector (Robinson and Herbert ,2001;Acharya,2011). Nyong, Adesina and Elash (2007) carried a study in the African Sahel on the value of indigenous knowledge in climate change mitigation and adaptation strategies show that indigenous knowledge has been applied in this region in climate change mitigation. In the area of adaptation, indigenous weather forecasts have been utilized in the assessment of vulnerability and implementation of adaptation strategies.

Moreover, Indigenous knowledge, skills and practices of pastoralists' community would obtain more attention as a productive asset and pastoral heritage that will be carefully identified and documented. Hence, in the case of Ethiopia Somali pastoralist are not out of these general aspects. Somali pastoralists community have developed indigenous weather forecasting mechanisms as their environments and livelihoods attached to it. These indigenous weather forecasting mechanisms yet not studied scientifically. It needs high attentions to study Somali pastoralists indigenous weather forecasting duet to any attention has not given to it nationally and regionally. This is because of misunderstanding and undermining pastoralists' indigenous knowledge, practices and skills in general and indigenous weather forecasting mechanism in particular. Indigenous weather forecasting mechanisms are largely practiced knowledge among pastoral and agro pastoral communities in world. They have used well known indicators that would enables them to identify either bad or good season/weather patterns. These knowledge, skills and experiences of reading, understanding and interpreting are not equally distributed among the communities. Thus implies that identifying, documenting and preserving indigenous weather forecasting mechanisms become significant among pastorals communities.

The specific objectives of this study is to Identify indigenous knowledge and experiences of weather forecasting among the pastoral communities of Korehay Zone, Ethiopia Somali regional state.

Importance of the Study

The pastoral communities have been experienced climate changes and have developed indigenous knowledge of determining the patterns of weather to minimize climate change vulnerabilities. Normally, pastoral communities have been living in scarce rainfall and their livelihood also affected by rain fall. Rain and rain related aspects are their life which means without rain no life and livelihood of pastoral communities. The study has identified and described the indigenous knowledge of weather forecasting of the study communities. It has

documented to preserve indigenous weather forecasting mechanisms for future generation. This study will pave the researchers to study and uses the finding as an inputs for their compressive scientific studies. The policy makers and other stakeholders will adopt the finding for their activities of climate change adaptations and decision making on the life and livelihoods of study area.

The Study Area

The Somali Region is geographically located in south-eastern part of Ethiopia, between 4° and 11° N latitude and 40 ° and 48° E longitude. The altitude of the region ranges between 400-1600 meters above sea level (m.a.s.l), with most areas lying below 900 m.a.s.l. It is the second largest region in Ethiopia next Oromia Regional State. It is bounded by Kenya and Somalia to the south, the Republic of Djibouti and the Somali region to the north, Somalia to the east and southeast and Oromiya region to the west. The region covers a total area of 350,000km2 (SoRPPACC, 2011:15). The climate of the Ethiopia Somali Region State can describe as arid and semi-arid climate, with an average rainfall ranging from 200-700 mm/year. The two rainy seasons are, Gu (April to June) and the Deyr (October to November) whereas the two dry seasons are Jilaal (December to March) and Haggaa (from July to September). Somali communities have their own ways of counting season that related with their environment and cultural values (ibid).

The minimum amount of annual rainfall in the area needed to support viable pasture in the Horn of Africa was about 300mm. According to Somali perception variability of climate in the year's seen within four seasons. Within these four seasons the pastorals societies identify and understand the vulnerability of the climate in the specified months and then stands for its vulnerability through indigenous socio cultural and economic adaptation, resilience and cope with climate vulnerability. The four seasons of   months in a year are Jilala, Gu, Haga and Deyra. Jilaal. Is the hot dry season (January to March), livestock are cheap because pasture and water are scarce, animals are susceptible to diseases, and pastoralists are in great need for purchased food, so they sell their animals at almost any price (Deveroux,2006 :56).

During Gu seasons, which is the first rainy period (April to June), and in Hagaa seasons which the dry seasons (July to September) whereas at seasons of the Deyr which is the rainy season (October to December), prices start to rise again (Ibid). The Somali society is highly structured and anchored in the system of clans and sub-clans that bind and divide Somalis. The systems form the basis of much of the core social institutions and norms of traditional

Somali society, including personal identity, rights of access to local resources, customary law (Xeer), blood payment groups (Diya), and support systems (Somali Region, Program of Plan to Adapt to Climate Change (2011).

1.1. Methods of the Study

The study was carried out in Korehay Zone, Somali regional state, Ethiopia. A descriptive survey was used. Purposive sampling was used in administering open ended interviews. The informants were selected purposefully from people based on their knowledgeable elders and social status as it matters. Twenty-five elders (25) in the community were purposively sampled for interviews. These were selected on the basis that they were assumed to be rich on knowledge and experiences regarding indigenous methods of weather forecasting. This research was carried out in Ethiopian Somali Regional state, Korahey Zone in 2017.

2. The Finding of the Study

The finding of the study is only limited to the study conducted in 2017 in Korehay Zone, Somali regional State, Ethiopia

Table 1: Somali indigenous seasons with its months

Indigenous Seasons	Indigenous Months	English name
Jilaal	Leekor	January
	Todob	February
	Habrari	March
Gu'	Amber	April
	Anokes	May
	Adar	June
Haga	Hayis	July
	Nayrus	August
	Karan	September
Dayr	Dalali	October
	Ururdha	November
	Daradhaf	December

The above table (1) indicates that Somali people have experienced great knowledge of universal understanding to identify and determine weather patterns in their area. Having their indigenous knowledge of season with month that indicates nature of all over the totality of one circle of a year.

Table 2: Indigenous names of Seasons with its respective stars

Indigenous Seasons Name (Somali Language)	Stars Name
Jilaal(Ciriro)	Faruur
	JidKabare
	JidDhirqle
	Rabhore
	Rabdanbe
	Miicaadhore
	Miicaaddanbe
Gu(Faraaii)	Godan
	Listan
	Urur
	Cadaad
	Agaali cad
	Agaalicas
	Affagaal/afarka
Dayr(Daalabi)	Gud ban
	Garbo
	Bayaxaw
	Gudban
	Libcas
	Mareegadheer
	Xoor
	Dameerofoog/madhan
Hagaa(Naato)	Naaf cad
	Naafmadoobe
	Afgoqoys
	Mijin
	Kooxdin
	Naasagaalo
	Dirrir

The above table (2) indicates that each season has its own stars appears seasonally also the key informants were strongly described stars reading is basic inputs for determine and knowing of season weather patterns. Stars basically significant to determine weather forecasting, but a few elders only know these knowledge and experiences.

Table 3: Indigenous Stars indicators and Its Description

Stars name	Description	Interpretation
Dirrir	Appear of 15th April, at sun set / early night. Star appear in line with the moon. It is during Hagaay season.	Good rainy seasons
	Appear of 14th (before April, at sun set / early night. Star appear in line with the moon	Scarce of rains/drought will occurs
Godan	Appear to the west and star appear in line with the moon. It is during Gu' season.	Coming of rain soon

The above table (3) shows that name of stars and its description of predicting weather patterns specifically. A few of knowledgeable Somali elders have knowledge calculating star/moon patterns for predicting of climate aspects. |Especially it is significant about determining the probability of drought occurrences. Accordingly, one of key informant described the calculation mechanisms of star/moon relationship in counting to know either good or bad climate aspects as follow;

"It believes that within six years, there is a probability of one month of drought period appearance. Also it believes that within one month there are five days of the occurrences of insufficient rainy period. Then, we have a calculation of 5(days) x6(years) that gives around 30 days (1month) of the occurrences of scarce rainy seasons in six years. This counting mechanism based on monthly movement of moon over 28days of star converges. To have equal 30 days of moon; star should have to cover two days /re-count".

Table 4: Camel Behavior

Camel behaviors	Descriptions	Interpretation
Sounds	Baaaaaa; For rainy season or others matters	Period of hope
Urine time	Give urine by crossing its front feet	Rains in near future/ continuing of rains
Milk production	Give less milk	Scarcity of rain
	Give much milk	Good period of rainy season
Birth	Less pregnancy/productivity Give birth out of period	Coming of drought / scarce of rains
Watering	Less drinking	Abundant rains
	Much drinking	Much rains
Irregular mobility	Moving into some direction forcefully, 15-20 days	Feels to where rains dropped or knows where to be rains near future

The above table (4) shows that the camel behavioral phenomenon reaction or action potentially determinant of weather patterns. In the study area, the communities' focuses on the changes of camel's behaviors to determine weather patterns of their area.

Table 5: **Bird's sounds**

Birds local names	Sounds	Descriptions/perceptions
Gugule	. KUU…KUU;;KU--	If it exist at morning/afternoon, it will indicate the coming of rain within short period(a days)
Fin	Morning (Degay)	It will indicate the coming of rain within seven consecutive days.
Kooragu	At night (Duu; duuu sound)	It will indicate the coming of rain within consecutive three days. They will stay and give the sound almost to five to seven hours; almost for three days.
Digren/ Lugubey	during high temperature	It will indicate the coming of rain within short period Folks of birds move together
Timbul	Duuu; duu-sound	Good rainy season
Irsankiyad,	Difficult to sound it/ its existences in the area	Good rainy season
Hedka	Difficult to sound it/its existences in the area	Good rainy season

Source: Field data, 2017

The above table (5) indicates that birds sound and movement has significant potential to determine weather patterns. Periods and nature of bird's sound will identify by knowledgeable elders towards weather patterns in the study area.

A. **Plants**

Existence of plants within/without learned season indicates either good or bad weather patterns. We assured that some of the key informants have experienced knowledge of understanding and identifying plants behavior that indicates the existences of either bad or good weather patterns in area. As one of my knowledgeable   key informant's, trees are more relevant indicators of predicting weather patterns in the area.

Table 6: Plants **behavior**

Name of Indigenous Plants	Descriptions	Interpretations/perceptions
Garas	Appears of flowers/leafs	Dry season
Meyag	Appears of flowers/ leafs	Dry season
Hegilo	Appears of flowers/ leafs	Dry season
Hode	Appears of flowers/ leafs	Good rainy season
Hager	Appears of flowers/ leafs	Good rainy season
Hankokib	Appears of flowers/ leafs	Good rainy season
Libeh	Appears of flowers/ leafs	Good rainy season
Yohob	Appears of flowers/ leafs	Good rainy season

The above table (6) shows that trees presence or absence will have potential of determine of weather patterns.

Table 7: Insects behavior

Indigenous Insects names	Descriptions	Interpretation /Perceptions
Abor	Collecting grass to its hole	Dry season/scarce rainy
	Putting grass out of its hole or making line like a bridge	Good rainy season
Bolol	Collecting grass to its hole	Dry season/scarce rainy
	Putting grass out of the hole/ making line based bridge	Good rainy season

The above table (7) reveals that insect's movement and its other behavior has a potential of determining of weather patterns.

Table 8: Temperature density

Temperature /density	Descriptions	Interpretation
Too hot	Hot temperature unusually	The coming of rains
Too hot and less air movement	Hot temperature unusually	The coming of rain

This table (8) temperature density of determines weather patterns as of the rainy season. Too hotness indicates the coming of rain within an hour in day.

Table 9: Wind Direction and Rain Patterns

Wind/Air direction	Description	Interpretation
East –West	Wind /air direction movement	Rainy season/ rains will come
West –East	Wind /air direction movement	Scarce rainy season
South-North	Wind /air direction movement	Rainy season/ rains will come
North-South	Wind /air direction movement	Scarce rainy season

The above table (9) describe that wind directions of the expected rainy season of the study area has determine the weather patterns. The communities will wait for either rainy period or dry weather patterns based on the wind direction. East-West and South –North waving of winds during expected rainy seasons would indicate the coming of rainy season for good of production. In contrary to these, the wind directions pointing to West-East and North-South would indicates the coming of scarce rainy season.

Table 10: Goat behavior

Goat's behavior	Description	Interpretation
Refused to be outside of compound	Coming of rains	Coming of rains/ Morning time
Watering	Drinking less	Good rainy season
Sound	Male, goats unregularly sound	Rains will come / Morning/evening time

This table (9) indicates that goat behavioral aspects determines the weather patterns of within the coming days or an hour. Based on the goat behavior, Somali communities, well known elders predict the coming of weather patterns accordingly.

3. **Discussion of the Study**

Somali people of the study area Korehay Zone have been developed knowledge and experiences of understanding indicators to determine weather patterns locally. These indigenous weather forecasting mechanisms indicators have been indicated either rainy season or dry season in general aspects. These indigenous indicators are sounds and behaviors of birds, insects, plants, moon, stars, temperatures, wind direction and animal's behaviors. Studies in Africa revealed that indigenous people have experienced using of indigenous indicators to determine weather patterns of their area accordingly (Muguti and Maposa, 2012); Netshiukhwi, Stigter and Walker,2013). These indigenous indicators are similar with this finding. Xidhiyeh,the knowledgeable Somali elders about star/moon readingunderstanding and describing the stars'/moons patterns to determine weather patterns. It is looking into patterns of moon and star position at different season, month and day. These would enable them to know the coming or continuing of either good or bad rainy season. The

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study in the South-Western Free State of South Africa revealed that farmers has knowledge and experiences of using moon as an indicators of determinant patterns of weather either rainy or dry seasons that enables to decides on their farming activities (Netshiukhwi, Stigter and Walker,2013:401).

People in the study area were socio-culturally attached with camel production and productivity. These study acknowledged that camel behaviors have indicated either bad or good rainy seasons. This study described that the mass death of livestock at occurrences of flood accident heralded, the end of long dry season and it would indicate a hope for next rainy season. Also, Birds' movement and bird's sounds have potential of indicating bad/good seasons among communities of the study areas similar with that Shona of Zimbabew and farmers in the South-Western Free State of South Africa respectively (Muguti, and Maposa,2012;Netshiukhwi, Stigter and Walker,2013). This study showed that plants behaviors indicates the happening of either a good or bad weather patterns like that revealed by scholars in different African countries (Muguti, and Maposa,2012; Netshiukhwi, Stigter and Walker, 2013).

In the study area insect's behavior has indicated either bad or good rainy seasons. These is similar with the study of Muguti, and Maposa,(2012) in Zimbabuwe, but different by its meaning of predicting weather patterns. For example, the study shows that among Shona people of Zimbabwe insect (like zviteza) begin to surface and continuously move around collecting grass for storage, it means the rain season is imminent (Muguti, and Maposa,2012:109) in contrary, this study shows that insects by the name Abor andBolol (indigenous name) an appearance and movement on the surface in mass of groups indicates the coming of the dry season. Also, this study showed that the higher temperature density at morning and mid-day indicates the coming of   imminent of rain fall that similar with the experiences of the Shona people of Zimbabwe (Muguti and Maposa,2012). Additionally, this study revealed that sky, with scattered clouds, indicates that there is rain coming in the afternoon that also described in the study of Netshiukhwi, Stigter and Walker (2013:400). In the study area wind/air direction also uses to identify bad or good weather patterns in the study area that has similar description of wind directions with some province of Zimbabwe (Majehwe, 2011:109). The study has limited to the Korahye Zone that was not uses to generalize the finding for the other geographical zones of the region. Thus, it needs further

study on others zones of Somali region to have comprehensive understanding about indigenous weather forecasting mechanisms.

Summary

Somali people have experienced knowledge of identifying and determining that indicates nature weather patterns in the area.Somali people have experienced great knowledge of universal understanding to identify and determine weather patterns in their area. Stars basically significant to determine weather forecasting, but a few elders only know these knowledge and experiences. Most of Somali elders have knowledge and experiences of calculating star/moon patterns for the probability of drought existence.   The communities' focuses on the changes of camel's behaviors to determine weather patterns of their area.Birds sound and movement has significant potential to determine weather patterns. Periods and nature of bird's sound will identify by knowledgeable elders towards weather patterns in their area.

Trees presence at timely rainy season or unusually absences of leaves/ flowers will have potential of determine of weather patterns. The specific well known by local people and elders about the insects uses to determine weather patterns of their area. Too hotness indicates the coming of rain within an hour in day. Wind direction of the rainy season of the study area has determine the weather patterns. The communities would have wait for either rainy period or dry weather patterns based on the wind direction. Goat behavioral aspects determines the weather patterns of within the coming days or an hour.

Recommendation

The communities should have to protect and preserve their indigenous knowledge to determine their day to day weather patterns that will be their future decision on their livelihood. Other stakeholders should have to consider into the indigenous weather forecasting of Somali people for their intervention on climate change adaptation and modern metrological forecasting easily and effectively.

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