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INDIGENOUS TECHNICAL KNOWLEDGE SYSTEMS AND SOCIAL INTELLIGENCE; CRITICAL TOOLS FOR CLIMATE CHANGE ADAPTATION

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ABSTRACT

The study focused on the problem of persistent droughts in rural Zimbabwe, and on how subsistence farmers utilized indigenous technical knowledge systems (ITKs) and social intelligence in adapting to the phenomenon. The results indicated that farmers utilized various ITKs and social intelligence in preventing, mitigating impact, and in responding to the problem of drought that persistently affected them with varying severity. Such knowledge (ITKs) was derived and learnt from surrounding environment, livestock and animal behaviour, flowering of trees and bushes, behaviour of birds of the air, infestation of pests, availability of wild edible ants and fruits, certain signs and appearances in the sky and the stars to name but a few. The study further revealed that in rural agrarian communities of Zimbabwe where livestock and natural environment is at the centre of peoples' livelihoods, farmers have forged symbiotic relationship with both the animal and the vegetable world, in such a way that there is clear language and active communication that keeps the two worlds constantly engaged. 80% of study participants confirmed that extreme weather early warning messages and signs were learnt from nature or behaviour of livestock. While the world is advancing hi-tech technologies and internet communication technologies, the rural poor in developing countries have more and more depended on social intelligence, ITKs, nature and oral tradition in managing daily life affairs and in coping with climate and weather extremes such as drought.

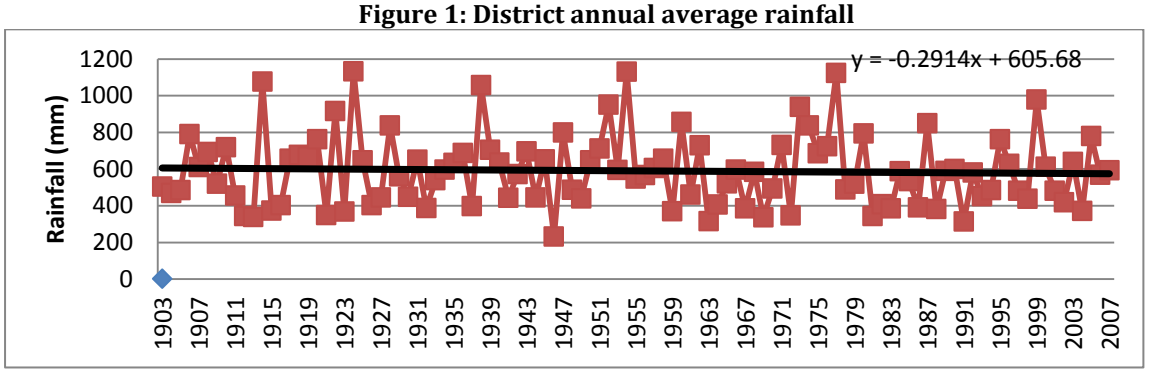
KEYWORDS : *Adaptation, Climate Change, Coping mechanisms, drought, Indigenous technical knowledge, social intelligence*

1. INTRODUCTION

Drought has emerged as a major global challenge of the 21st century because of its past, present and persistent livelihoods, environment, and socio-economic impacts. Globally, droughts have resulted in extreme water scarcity and the impact has been felt in mainly three areas, that is socio-economic and on the environment (United Nations Environment (UNEP, 2002). Yet poor farmers in rural Zimbabwe have over the years, continue to live with drought risk and live side by side with its impacts. According to CRED, (2012), Africa is more prone to drought compared to other regions, and Zimbabwe is no exception. The Southern part of Zimbabwe in particular has been and continues to be susceptible to droughts year on year, with increasing

intensity in the last 10 years (FAO, 1997). Most, if not all rural communities in Zimbabwe depend on subsistence rain-fed agriculture for their livelihoods and food security (United Nations Development Programme (UNDP), 2009). Yet, over the years, persistent drought conditions in arid and semi-arid areas of the country have continued to frustrate agricultural production efforts and climate sensitive livelihoods. On average the Southern part of Zimbabwe (Matabeleland South) receives 600mm of rainfall per annum (see Figure 1). Yet, subsistence farmers in the region have shown both high levels of resilience and resistance to the problem by incredibly adapting and learning to live with the risk.

Figure 1: District annual average rainfall



***Source**: Department of Meteorological Services, Zimbabwe (2012)*

This paper gives an overview of some of the tools and indigenous technical knowledge systems that subsistence farmers have adopted and utilized in living with the risk of drought in the Southern region district of Zimbabwe.

2. INDIGENOUS TECHNICAL KNOWLEDGE AND SOCIAL INTELLIGENCE IN LIVING WITH THE RISK OF DROUGHT AND OTHER WEATHER EXTREMES

Humans, livestock, wild life, nature and the environment connect in more than one way that largely benefit human kind and informs climate change adaptation. For starters, when cattle are observed 'smelling some rain' farmers start preparing for the new farming season; a non-verbalised language but active early warning communication. According to Mukundi, (2010), farmers and rural communities in Zimbabwe have relied on indigenous technical knowledge and social intelligence in learning to cope with weather extremes and in adapting to climate change (see Table 1 and 2). Farmers and communities are able to predict poor and good season, and this largely informs preparation and active planning in ensuring food security at household and community levels. A number of phenomena in the natural environment is observed in order to predict whether the season is good or bad, and this include wind direction, behaviour of birds of the air, flowering of trees and bushes and wind direction.

Table 1: Indigenous knowledge in weather forecasting

Feature	Observation	Prediction	Implications
Swallows	Large swarms	Wet conditions approaching	Land preparations
Swallow and water fowls	Lay eggs on raised patches in river valley	Floods	Avoid planting on wet lands and in river valleys
Swallows and water fowls	Breed on the ground under cover of grasses and reeds	Low rainfall to drought conditions	Early planting plant in wet lands and river valleys -plant drought tolerant crops eg sorghum, rapoko, millet etc
White and black stock bird	Large numbers	Normal to above normal rainfall season	No need to panic. usual cropping programme can be followed
Black and brown ants	Collecting food in people's houses in large numbers	Long wet spell	Leaching -flood dangers -stock up firewood

Source: Gwenzi, (2010)

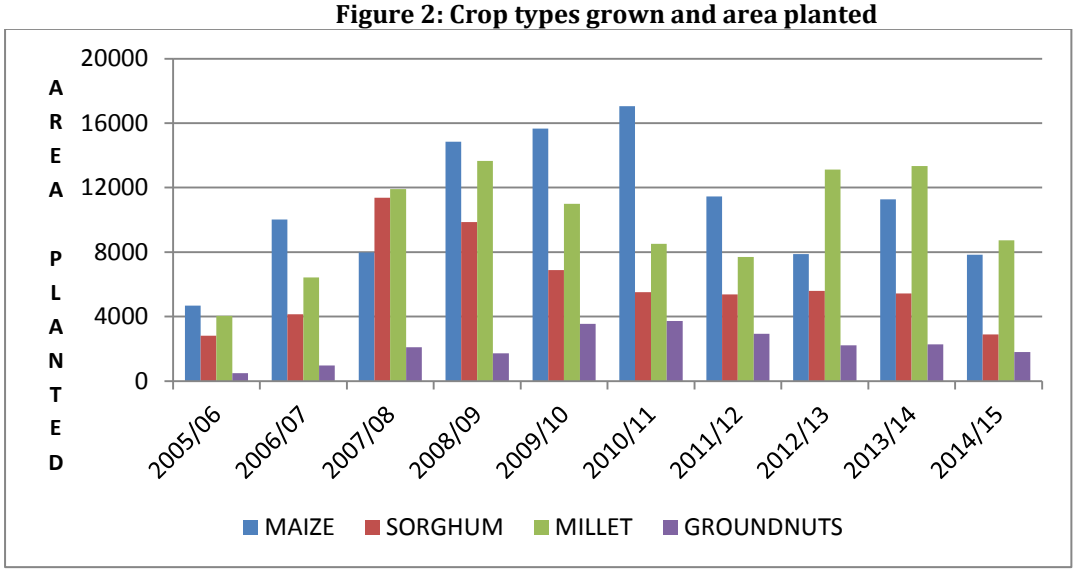
Table 2: Indigenous knowledge in seasons' prediction

Indicators predicting a good season	Indicators predicting a poor season
• Heavy production of tree leaves • Flower production on the top branches of a *mukonde* (candelabra) tree • a stork flying at very high altitude • presence of a lot of birds • wind blowing from West to East, and from North to South	• high fruit production** • heavy infestation of most tree species by caterpillars during springtime • late bearing and lack */muhute (Syzygium cordatum)* • figs in July–September • late maturing of acacia trees along • heavy populations of crickets on the ground • a strong wind blowing from East to West during the day and at night between July and early November

Source: Mukundi, (2010)

Being able to read the early warnings of the season, provides subsistence farmers with the opportunity to adopt early actions in order to mitigate the effects of drought on their lives and livelihoods. Mukundi (2010), states that, some of the response and coping strategies that farmers have adopted in Zimbabwe had included growing drought resistant small grains, early cropping and dry planting, growing early maturing varieties, sustainable storage and usage of granaries, purchasing cereals from the market or government's grain boards and storing for future use, performing rain making ceremonies (*mikwerera in Shona language of Zimbabwe).* It is through learning from nature that rural farmers in drought prone areas of Zimbabwe have, as a coping strategy adopted to planting small grains such as sorghum, pearl millet and groundnuts which are drought tolerant (see Figure 2). Small grains have over the years ensured food security in such arid regions of Zimbabwe, though maize crop still remain 'supreme' in the minds of farmers found in such specific regions. Over a period of 10 years, the study revealed that despite recurrent drought and arid conditions in the Southern region of Zimbabwe, farmers continued to plant maize (susceptible to drought), and this could be attributed to the Zimbabwe Government Grain policy that promotes maize to small grains, and also to lack of education and training for poor rural farmers. Yet, in the last half of the 10 years, it was evident that farmers slowly increased hectares of pearl millet and groundnuts.

Figure 2: Crop types grown and area planted

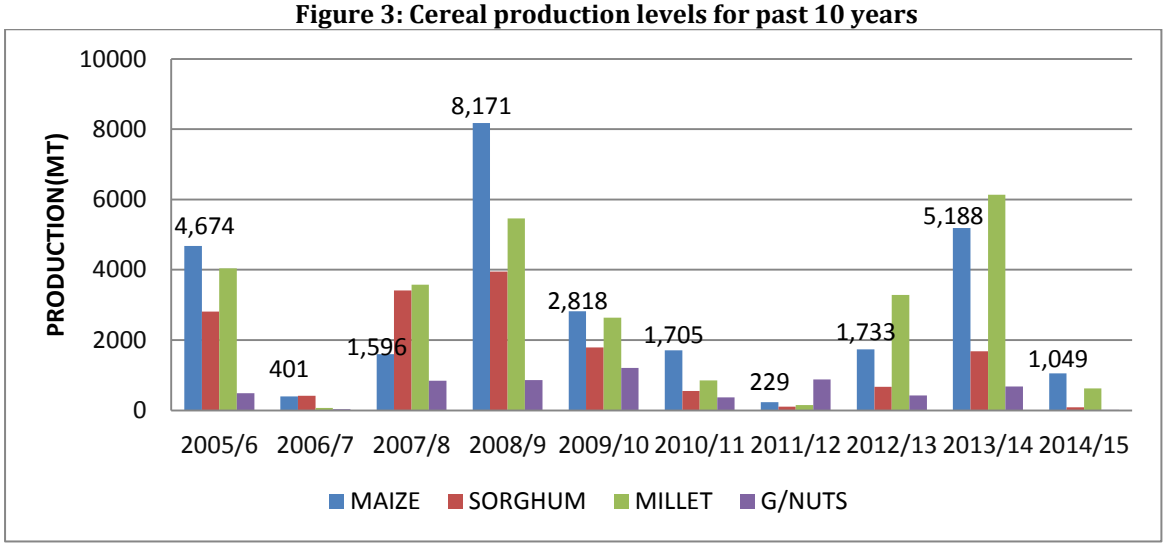


Source: District Agriculture Office (2015)

With the practice of planting maize per hectare, the cereal yield levels year in year out, have been below 0.5MT per year, yet the potential in the district is on average, 1MT per hectare, according to the District AGRITEX Officer (see Figure 3). Maize hectare from 2005/2006 has been more and to 2010/11 planting season; 2011/2012, it started decreasing up to the lowest in 2015/2016. This is

attributed to the climate variability and unavailability of crop inputs. For small grains, there has been a fluctuation on the area planted from 2005/06 to 2015/2016 season. This is attributed to sometimes unavailability of small grain seed. Overall, from 05/06 to 15/16 season, the production levels were very low so much that year in, year out, there was cereal deficit in the district, the magnitude which varied from season to season.

Figure 3: Cereal production levels for past 10 years



Source: District Agriculture Office (2015)

According to the District Agriculture Officer's report (2015), crop production trends have been diminishing over the years for all the main crop types. Maize yields had reduced and continued to reduce drastically from as high as 8 171 MT in 2008 to 1 049MT in 2014/2015, while sorghum and pearl millet had moderately low over the 10-year period. The reduction in yield over the years and counting, was better explained in terms of the amount of rainfall that fell in each of the planting season, the less rain there was, the less yield, especially maize yield. For example, the year 2008/2009 had moderate drought and maize yields were relatively good compared to other severe drought years. In other words, 2008/2009 season was labelled as a normal year for the subsistence farmers in the district.

The life of a Zimbabwe rural farmer is informed by an array of sophisticated knowledge systems and social wisdom that largely is articulated in the form of taboos that are upheld by all. The taboos could spell good life, bad life, or even death if violated (See Table 2). The taboos are upheld religiously by all since their violation might spell 'natural disaster' for the whole community or society.

Table 2: Role of Taboos in the conservation of flora

Type of tree	Taboo	Traditional belief
Mukamba (pod mahogany) Muwonde (fig tree) Mushakata (Parinari curatellifolia)	not allowed to be chopped for domestic use such as firewood	traditional ceremonies are done under any of these trees; they are associated with ancestral spirits
Mutarara (Lacaniodiscus fraxinifolinus)	not used for domestic purposes	it is placed on a grave after burial. Witches get confused in case they want to steal and exhume the body at night

Source: Adapted from Risiro et al, (2013)

3. DESIGN AND METHODOLOGY OF THE STUDY

This study adopted a qualitative case study method embedded in interpretivist paradigm. A case study has been used by a number of researchers in areas of social sciences, psychology, anthropology and ecology; especially used in trying to test theoretical models in real world situations. According to Stake, (1995), a case study method provides for in-depth exploration of an event, process or one or more individuals. When a case study method is used appropriately, it allows generation of a variety of detailed information over a sustained period of time; after which when analysed a phenomenon is understood by inquirer. According to Guba and Lincoln, (2000), case study method allows and facilitates exploration of phenomenon within its natural context using a variety of data sources; ensuring that the issue at hand is not explored through one lens, but rather a variety of lenses which allows for multiple facets of phenomenon to be revealed and understood.

The Case study method provides for in-depth study of a phenomenon and situation rather than a sweeping statistical survey (Neumann, 2000). It is a method suitable for narrowing down a very broad field of research into one researchable topic, yet suitable for isolating and studying a small group of people, community or countries.

This study adopted a case study method because it provides for rich, thick description of the cases with data drawn through triangulation techniques from various sources (Chisaka, 2007). The case study method has three important characteristics: the nature of experience as a phenomenon to be investigated, the knowledge to be achieved and the generalizability of studies from the method (Stake, 1995). The depth of the experience of the participants which is found in the method is precisely the most interesting aspect of its nature (Denzin and Lincoln, 2000).

Data was generated by utilizing researcher as main instrument, and through techniques of Focus Group discussions with key informants and household interviews with subsistence farmers' heads of households.

CONCLUSIONS

From the findings of the study, it is apparent that there is an African education curricular that is yet to be written or developed to inform and contribute practically, to many lives of farmers and communities. Such a curricular of African education system should explore sophisticated knowledge (social intelligence and wisdom) sharing between animals, humans and the natural environment. It needs to unpack the language and symbolism that is at play in indigenous technical knowledge systems and social intelligence. Working and living with drought risk in rural Zimbabwe; and learning from nature; language of animals and observing traditional laws have no doubt sharpened farmers' observational skills and prolonged learning. Some livestock are left in distant pastures, but come home alone at sunset, yet there has been very little acknowledgement by modern animal studies and science, in how livestock has contributed to enhanced relationship between humans and animals, enhanced trust between humans and their livestock.

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