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Research Report

Rainmaking rituals: Song and dance for climate change in the making of livelihoods in Africa

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Abstract - The imperative to climate change in the African continent is a matter of livelihood and survival. To secure and maintain livelihoods, historical evidence indicates that, native African communities had rich indigenous knowledge and science of responding to instances of climate change. This study interrogates extant data on the ethnoscience of rainmaking rituals, as a prototype of African indigenous knowledge on climate change, to show not only its prevalence across the African anthropological space, but also indicate its effectual outcomes in responding to manifestations of climate change. To fully tap into the potentials and strengths of this knowledge and science, the study tenders for its marriage with modern climatological science, for both to partner in providing solutions to the ever-recurring problem of climate change in contemporary Africa.

Keywords: Climate Change, African Indigenous Knowledge, Rainmaking Rituals, Livelihoods.

Climate Change and Africa's Livelihoods

Climate change is one of the biggest challenges facing the community of human societies. In Africa, climate change presents both the greatest challenges humanity has ever faced and a tremendous opportunity to move towards resource efficient and sustainably developed society. This is because climate change and development, in the African continent, are deeply intertwined and directly linked. Climate change and its direct and indirect consequences increasingly compromise the very survival of people and communities in Africa. It profoundly influences, affects and determines Africa's livelihoods in terms of agricultural production and food security, energy and water resources, forests and ecosystems, hinterland and coastal zones, animal and human health, and migration patterns and onset of disaster events (Calzadilla et al., 2009; Kalungu, Filho & Harris, 2013; ACPC, 2013a, 2013b).

Deficiencies linked to climate change diminish Africa's ability to produce enough food for the ever-expanding population and consequently, undermine the continent's development agenda and capacity to achieve the world acclaimed Sustainable Development Goals [SDGs]. Indeed, the Intergovernmental panel on Climate Change (IPCC, 2007) projects that by 2020, between 75 and 250 million people in Africa will face water stress due to climate change. In the same period, some countries will have their yields from rain-fed agriculture reduced by up to 50%. This will further adversely affect food security and exacerbate malnutrition. Towards the end of the 21st century, projected sea level rise will affect low-lying coastal areas with large populations. Similarly, by 2080, the proportion of arid and semi-arid lands in the continent is projected to increase by 5-8% thereby destroying part of the existing ecosystems. The cost of adaptation could amount to at least 5-10% gross domestic product (GDP).

Perhaps the most devastating effects are felt in agriculture, which is the mainstay economy of African countries, contributing an average of 30% gross domestic product (GDP) and about 50% of the total export value. In addition, over 60% of Africa's population directly derives their livelihoods from agriculture related activities. Smallholder farmers, with an average access to 2 hectares or less of land, are the majority and form the backbone of agricultural production in Africa. Due to their dominance, they make a huge and critical contribution to Africa's development, domestic food production, while at the same time producing excess for export that earns

foreign exchange for African economies. Unfortunately, Africa overwhelmingly depends on rain-fed agriculture, which is largely affected by climate variability characterised by extremes of temperatures and rainfall that ultimately bring about frequent droughts often alternating with floods. It therefore follows that climatic instability negatively affects Africa's agricultural productivity (AGRA, 2014; Kalungu et al., 2013; Thornton et al., 2011; Phiiri et al., 2016).

The devastating consequences of climate change threaten to consign millions of people in Africa into extreme poverty, as priority crops identified as key to drive agriculture led development growth, eliminate hunger and reduce poverty, are projected to experience a sharp decline (UNECA, 2013; Thornton et al., 2011; Phiiri et al., 2016). Examining the interactions between climate change, agriculture and food security across Africa, the African Climate Policy Centre (ACPC) (2013a, 2013b) observes that based on current trends, the detrimental effects of climate change will take a steep toll on the quality and quantity of yields on most of Africa's staple crops. Crops that have traditionally performed very well in specific agro-ecological zones are projected to dramatically decline under the impacts of climate change. Accordingly, by 2050, average production of food crops in African countries is projected to decrease with maize deceasing by 22%, sorghum by 17%, millet by 17%, groundnuts by 18%, and cassava by 8%, with more severe losses recorded in some regions. As such, the threats of climate change to Africa's already fragile livelihood systems, compounded by the continent's low adaptive capacity, will deepen existing problems of erratic food shortages and volatile prices.

Livestock are a critical and significant resource for African communities, accounting for far beyond wealth, power, social relations, insurance, survival and livelihoods to what cannot easily be monetarised. However, the sector is worst hit by the cascading negative impacts of climate change due to its climate-sensitive nature. Prolonged periods of water scarcity not only affect livestock drinking water sources, but also the quantity, quality, composition and productivity of forage and pastures. Equally, climate change may heavily modify land suitability leading to significant changes in biodiversity (plant and animal species) composition, patterns and biome distribution. Habitat change would lead to species range shifts and changes in plant and animal diversity. These changes most often lead to shift in land use systems making the breeding of certain genetically adapted animal varieties unviable in certain ecosystems. This phenomenon often leads to extinction of local and rare breeds and therefore

affecting genetic diversity. Similarly, climate change leads to increased abundance, distribution, transmission, spread and outbreak of existing and new disease vectors, parasites, pathogens and epidemiologies, increasing infection risk and exposure of livestock and humans. In some areas, climate change could generate new transmission models while at the same time diminishing the genetic resistance of livestock to diseases to which they are commonly exposed. Without a doubt, all these factors combine to influence the production, growth, reproduction, maintenance, and mortality of animal species (IFAD, 2009; FAO, 2007; Thornton et al., 2009; Thornton et al., 2011; Thornton et al., 2015; Musemwa, 2012; Rojas-Downing et al., 2017; Rust & Rust, 2013).

Fisheries play a crucial role in supporting the livelihoods and food security of millions of people in Africa. Fisheries also provide a safety net offering protection against the effects of the unpredictability of agricultural production. Nonetheless, the negative impacts of climate change represent a big risk to the sustainability of fisheries and aquaculture development in Africa. Salinisation of fresh waters, coral reef bleaching, changes in water flows and temperature cause disruption to the reproductive patterns of fish and the corresponding depletion of fish species and stocks. In addition, temperature changes increase disease vector transmission and have an influence on marine pathogens (IFAD, 2009; FAO, 2007).

Further, Africa's vulnerability is precariously, compounded as climate change is adversely correlated to health. Climate-health intersections, both direct and indirect, continue to rise in both number and intensity in the continent. The World Health Organization (WHO, 2008) warns that a more variable climate threatens to lead to higher levels of some air pollutants, increased transmission of diseases through unclean water and through contaminated food, and increased hazards of extreme weather. Indeed, poor sanitation, scarcity of safe water, ecosystems degradation and other climate change-induced disasters exacerbate the spread of water-borne and infectious communicable diseases such as cholera and diarrhoea that are prevalent in Africa. Diarrhoea is recorded as the second leading cause of death for African children. Equally, millions of people are exposed to malaria, the leading cause of death in the African continent, due to increase in temperature and rains, which affect areas that were hitherto malaria-free (Sewankambo, 2009).

Similarly, the effects of climate change such as food and water shortages, growth in poverty and an increase in natural disasters undermine the continent's response capacity to diseases, calamities, epidemics and disaster outbreaks including the HIV/AIDS pandemic (Stern, 2008). The leading international institution on climate change, the United Nations' Framework Convention on Climate Change (UNFCCC, 1992) declares that, as the core connecting principle, climate change causes "significant deleterious effects" for (public) health and appeals for signatories to "minimize adverse effects" on health (Articles 1 & 4).

The impact of climate change stand to be more severe as a result of Africa's overreliance on rain-fed production, poor governance, gender inequality, environmental and economic challenges, complex disasters and conflicts, high levels of poverty, low levels of human and physical capital, and inadequate infrastructure and technology. It is true for example, that smallholder farmers in the continent plan their agricultural calendar of activities based on rainfall patterns, anticipating both good and bad. Any change in climate, therefore, which disturbs the pattern, adequacy and even distribution of rainfall disrupts that procedure and jeopardises their system of agricultural production (AGRA, 2014).

In such a context, the imperative to climate change is a matter of livelihood and survival for the African continent and its people. The stark reality of current climate change impacts and the prospect of future impacts and the havoc they represent underscore the importance of strengthening the continent's livelihood resiliencies, and proactive adaptation and response intervention capacities. However, tackling climate change is an inherently complex problem. The complexity and uncertainty that are features of the climate and development nexus in Africa require a holistic and robust paradigm that targets safe climate and climate friendly development. This encompasses a diversity of local actions and inter-related policies at the international, regional, national and local levels in order to deliver positive development and climate compatible outcomes.

African Indigenous Knowledge on Climate Change

Fortunately, Africa and its people have a wealth of knowledge, science and innovations that African communities have long used to sustain themselves in the face of climatic change. Many African communities have for decades, used indigenous

knowledge as a critical strategic base and survival tool during extreme climate events and other natural hazards.

African indigenous knowledge as used herein is adapted from Berkes (2012) and Steiner (2008) to denote an African community's totality of knowledge including skills, information, attitudes, conceptions, beliefs, values, capabilities, ideas, practises and ways of solving problems. This is the body of knowledge, which an African community has built-up, accumulated and handed down through generations whether by social interactions, participation or existing norms. It encompasses every aspect of that community's existence, including its holistic understandings of local ecology, education, art, know-how and technology, medicine, norms, rites and rituals, social organisation and institutions, spirituality and worldview. Orlove et al. (2010) contend that such knowledge is place-based and rooted in local cultures, and is generally associated with a community's strong interactions to their natural environments. Such knowledge tends to be the result of cumulative experience and observation, tested in the context of everyday life.

An abundance of common terminologies used to refer this body of knowledge include but not limited to indigenous knowledge, traditional knowledge, cultural knowledge, traditional ecological knowledge, local knowledge, folk knowledge, indigenous traditional knowledge, ethnoscience, indigenous technical knowledge and indigenous science. Although each term may have somewhat different connotations and reference groups, they all share sufficient meaning to be utilized interchangeably throughout this study.

Challenges on African Indigenous Knowledge

Undoubtedly, African indigenous knowledge faces many challenges, which inhibit the complete utilisation of its apparent potentials, strengths and values. On the one note, while most African communities have rich developed indigenous knowledge and practises for responding to climate change and variability, such as instances of drought, such knowledge cannot precisely be accounted for. This is partially because African indigenous knowledge, wisdom and practises have, over the years, been accumulated, preserved and transmitted inter-generationally by oral means without verifiable and authentic written records and accounts.

On another note, previously, aspects of African beliefs, civilization and practises, on which African indigenous knowledge is founded, were systematically framed and subjected to Western epistemological codes. The foreign forms of knowledge coded and categorized Africa and its people from Western perspectives, dismissing aspects of African indigenous knowledge as not science but savage, primitive and suspicious black magic and sorcery. The Western forms of knowledge and the (mis)representations acted as a "form of epistemic violence to the extent that it involved immeasurable disruption and erasure of local cultural systems" (Linehan & Sarmento, 2011: 307).

For those reasons, and many others, African history, culture and civilization were falsified and the distortion has consistently been used to legitimate the destruction of African practises and thereby construct a distinctively Eurocentric understanding of Africa, its people and way of life. This kind of perspective and reasoning perpetuating European myths, tends to ignore the history and culture of the African people, and concentrates almost entirely on the Eurocentric hypothesis. It also strongly diverges from the values of the people living and working the African culture and civilization. The Eurocentric and colonial biases and misrepresentations accord local African cultures only limited space, if any. This is a clear pervasion of history, knowledge and civilization.

That then begs the question, how do we discount this distortion, suspicion and (re)claim the science of African indigenous knowledge? Secondly, can this indigenous science be integrated with modern scientific knowledge to respond to instances of climate change in contemporary Africa? Thirdly, how do we actually integrate two seemingly diverse forms of knowledge? That also pleads another question, if authentic and verifiable data on African indigenous knowledge are scanty and/or unavailable, what can, then, be applied to integrate these two forms of knowledge?

All these obstacles and concerns are related and point to a scarcity of empirically verifiable and authentic data on African indigenous knowledge, and the logical basis underlying and informing the foundation of this knowledge. Integration and mainstreaming can only happen on what is empirically available, and this is possible after considering the principal tenets grounding and informing African indigenous knowledge. Mainstreaming and incorporation of indigenous knowledge with modern

climatological science can only be possible after these concerns and glaring gaps in knowledge and literature have been bridged. This can partially be possible after empirically locating and recording verifiable data on African indigenous knowledge in general and African indigenous knowledge on climate change in particular.

Motivation

Accordingly, as a first step of disentangling these dilemmas, this study interrogates extant data on the African people's perceptions and interpretations of climate change vis-à-vis the predicament it presents on their livelihoods, and their corresponding social responses. Specifically, the study analyses the African science of 'rainmaking' as a prototype of indigenous knowledge on climate change response, adaptation and weather control which has characterised African communities over the centuries, and whose history dates back to the time before the introduction of Christianity and other foreign cultural elements. The study provides distinct descriptive details on the science of rainmaking and in the process indicates its efficacy across diverse anthropological and climate settings in the African continent. In so doing, the study proffers not only the recuperation of this indigenous science but also its marriage with modern science for both to partner in providing the magic potion to the ever-recurring instances of climate change in contemporary Africa.

The Science of Rainmaking Rituals in Africa

Wikipedia (02.04.2017), the free online encyclopaedia, defines rainmaking as a weather modification ritual that attempts to invoke rain. The most common form of weather modification is cloud seeding to increase rain or snow, usually for the purpose of increasing the local water supply. However, for purposes of this study the term 'rainmaking' is restricted to "the rites which accompany prayers for rain" (Mbiti, 1975: 111). For in the African anthropological thought and mindset "only God can make or produce rain" (Mbiti, 1969:180). Hence, 'making' rain is entirely God's mandate nonetheless it is the responsibility of men and women to summon God's rain. As such, the term 'rainmaking' is herein used to refer to those traditional practises, rites and rituals thought capable of controlling the weather, and 'rainmakers' are the people bestowed with the power to lead those practises.

In one of the earliest indigenous anthropological accounts, Kenyatta (1938), the first president of post-colonial Kenya, recounts in vivid details how the Kikuyu community approached their ancestors (*Mwene-Nyaga*) in prayer, ritual and sacrifice beseeching them to intercede with God (*Ngai*) during times of prolonged drought and failure of rains in due season. During such periods, a team "considered pure in heart, mind, and body, and are free from worldly sins" (1938:134) was assembled to offer the sacrifice. Kenyatta acknowledges that rain followed every rain ceremony, however should it fail, inquiries were made on the details of the clearly defined procedure and the whole ritual repeated with special care until eventually rain came. Thus, God heard, accepted and answered their prayer and brought them rain of prosperity. When the so anxiously awaited rain has fallen, the community immediately arranges for a planting ceremony where the seeds for planting were ritually, blessed to ensure good harvests.

Researching rainmaking dance among the Akamba community of Kenya, Korster (2011) concurs with Akong'a (1987) that the Akamba rainmaking rituals, known in their language as *Kilumi* dance, was a public event led by rainmakers or prophets who were believed to have the power to redirect or predict rainfall. Koster indicates "drought in particular forced community members" to pull out the *Kilumi* dance to "invoke the blessings of water spirits and deities" (2011:173). The community believed that unseen rainmaking ancestral spirits attended the *Kilumi* dances. The participants therefore were obligated to make excellent performances to impress the spirits. Akong'a (1987) agrees with Korster (2011) and they both explain that *Kilumi* dances were also accompanied by the pouring of libations and offering of sacrifices to appease the spirits. This is because droughts were considered as curses for wrongdoing. Successful *Kilumi* dances ended with celebrations as the community expected favourable response of rain from the spirits. Both Akong'a (1987) and Korster (2011) aver that it never failed to rain after these festivity rituals.

In the Ugandan kingdom of Bunyoro, Byaruhanga (1982) gives a detailed account of the Nyoro traditions on those people who are believed, through power given them by the divinities, to control the weather with regard to having or not having rain (controllers of rain—*abaigi b'enjura*). The Nyoro rainmakers can be either men or women and mostly stem from one specific genealogical lineage or clan. They however,

have to undergo training before assuming rainmaking duties. Only women of character, social quality and grace are allowed to be rainmakers.

When there is a serious drought threatening the survival of both people and animals, the community approaches rainmakers who are also believed to stop rain, say, on a wedding day, or for some other function when people do not want rain. Upon receipt of the request, rainmakers prepare for the proper day of supplication by collecting and assembling all the required implements, and then demand payment for the services. On the day of supplication, rainmakers clear a section of the bush or forest, which is, used as the shrine for the sacrifice. Byaruhanga (1982:78) provides minutiae descriptions of what happens at the shrine of sacrifice as the rainmakers pray for rain. After the ceremony, the people go home to wait for the rain, and evidence submits that they "get rain before they reach their homes". At times, rain may take a day to three days before it falls, however, it is very rare that "rain does not come and rainmakers are forced to admit they have prayed in vain".

Phibion (2013) focuses on the spiritual *wosana* and *mayile* rain praying song types as practised by the Bakalanga people of Botswana and Zimbabwe. Both males and females perform the *wosana* type, while females only perform the *mayile* type. However, both are invoked when people find it hard to survive and their anxiety is high because rainfall has either failed to come at the expected time or when the rains are not sufficient. The songs are also sung to praise the Supreme Deity, *Mwali*, as thanksgiving or appreciation during years of good harvest. The rain-praying dances are performed annually at the beginning of the wet season to request adequate rains, for either too much rain or too little can spoil the crops and lead to famine. Even then, the early months of the rainy season, when field preparation and crop planting is done, is always an anxious period and the slightest abnormality in weather patterns inspires the people to hold the rites. In the songs, the Bakalanga plead, request and praise the Supreme Deity *Mwali* for rain and good life. The Bakalanga Supreme Deity *Mwali*, is thus communicated through song and dance.

Phibion (ibid.) provides the procedure, instruments and equipment used during the performances of these two types of rain invocation dances, noting that contemporary Bakalanga continue to observe them in one form or another. Traditionally, these rituals are performed beside ecologies considered sacred and objects of creation regarded as holy abodes of the spirits and the *Mwali* Supreme Deity, so as, to ensure effective response. These include the *Nzeze* (Peltophorum Africanum) sacred tree, and the *Njelele*

talking hill in Zimbabwe. Sometimes the dancers imitate some birds associated with rain such as the *njelele* (eagle), *nyenje* (white stork), *makololwani* (storkbirds) and *nyenganyenga* (swallows). These birds are normally seen around the rainy season. In summary, the rites demonstrate the close relationship that exists between song, dance, worship of the supernaturals and supernatural causations. Thus, the Supreme Deity, *Mwali*, when worshipped, responds by giving rain and rescues people from difficulties.

Haruna (1997) describes and explains the most important aspects, beliefs and practises that are observed during prayer for rain amongst the Guruntun and the Bubbure people of Nigeria. As farmers, the entire livelihood of the Guruntun and Bubbure people depend on rain. Rain is seen as the most significant demonstration of the goodness and providence of God and whenever it falls the people rejoice. Haruna draws similarities of these practises, beliefs and aspects of the Guruntun and the Bubbure people with those of neighbouring tribes and the Middle East during biblical times, and concludes that the similarities are so striking.

The prayers for rain are led by a spiritual leader (chief priest) who is respected by the community and has a great deal of knowledge about the climatic conditions of the area. They are held in special spaces and locations, and under special trees considered "sacred abodes of the spirits" (ibid: 230), so as, to ensure effective response. During the prayers, the priests and the people carry all sorts of assorted foods, wear sackcloth and rags, and cover themselves with ashes (a sign of penitence), beat drums, empty tins, calabashes and blow horns.

Lack of rain is usually associated with sin, and therefore the high priest urges the people to "purge themselves of any known sin(s) committed against one another, their ancestors, nature, the environment and God" (ibid: 230). The confessional and supplicatory prayers are effected by people considered pure. For instance, only married women, without exception participates in the ceremonies, and all unmarried women and prostitutes are left out. The exclusion of unmarried women and prostitutes corresponds to the act of purification.

After the prayers, the high priest and the people share all the food with one another, leaving some at the location for the ancestors. Animals are not sacrificed. God answers their prayer and "rain begins to fall immediately and when there is too much rain it is the high priest who stops it" (ibid: 232). The rainmaking prayers are therefore, seen as an act of purification in which drought is clearly endowed with a moral etiology.

This suggests a link between immorality and apostasy with drought, on the one hand, and divine pardon or religious fidelity and rain on the other.

Huffman (2012:137) considers archaeological evidence on pre-historic ritual spaces and behaviour in pre-colonial farming societies of southern Africa, including that of the Nguni, Sotho-Tswana, Shona and Tsonga, and notes that in times of severe drought, rainmakers climbed special hills to "pull the rain down". Rainmaking hills are distinctive in that they represent mountains that are sources of streams and cisterns that represent pools. These rainmaking sites stand outside home settlements, on hilltops associated with heavenly bodies. At the sacred sites, rituals incorporated the roles of every citizen including leaders, rainmakers, preadolescents, and the 'guilty', and were therefore an aspect concerned with daily behaviour of the community.

Matsuhira (2013) provides a detailed participant observation on the preparation, process, procedure, participants and tools of an annual rainmaking ceremony of the Shona people in contemporary Zimbabwe. A major observation of this rainmaking ritual is the centrality and power of gender and virginity in consummating the ritual by invoking both the ancestral spirits and the divinity, by way of bodily purity. Secondly, the ceremony is not only a preparation for the farming season, but also the opportunity to discuss clan politics. It is thus, an important and still surviving traditional system of social, political, religious and economic organisation of the Shona people of Nyandoro region of Zimbabwe.

On the other end, Makuvaza (2008) writes of *Njelele*, a premier mystical and highly revered rainmaking shrine on the southwestern fringes of Zimbabwe's Matobo National Park. The shrine is an important cultural heritage site with diverse and powerful values and spiritual statuses. Local indigenous communities, Zimbabwe's freedom fighters and post-colonial African leaders often consult the oracle, however conflicts of power, priesthood and control, and tension and opposition, have prevailed in proclaiming *Njelele* a national monument, a status that would make it develop.

Further, Makuvaza (ibid.) provides detailed descriptions of the shrine site, which has remnant assortment of objects, believed to be offerings to the presiding deity. *Mwari* or *Mlimo* as God is referred to in the local dialect, the creator of the world, was believed to live at *Njelele* and His personal presence was felt through His voice when invoked. *Mwari*/*Mlima* through the supernatural powers ensured agricultural prosperity by providing adequate rainfall. During rainmaking ceremonies, only preadolescents and post-menopausal women carry beer pots to *Njelele*, so as, to maintain the shrine's purity

and not permit defilement by married women who still experience menstrual periods. What is more, after incessant prayers, incantations, singing, praising, clapping, and requests, *Mwari*/*Mlima*'s voice granted their appeal for rain and advised the priest and messengers on procedures and requirements to be followed for the request to come through.

Makuvaza (ibid.) avers that only intermediaries drawn from particular families believed to have strong spiritual traditions connected with the shrine and understand the *Mwari* cult lead, guide, and regulate pilgrims in consulting the *Njelele* oracle. In contemporary Zimbabwe, people invoke and consult the shrine during times of crisis such as illness and death, domesticated animal diseases, during agricultural seasons of sowing and reaping, succession disputes, personal and ethnic conflicts, natural phenomena such as drought and rain failure, and even in times of politics and war.

However, Makuvaza (ibid.) reckons that the local people have always resisted government efforts to proclaim *Njelele* as a national monument because that would open it for tourism, which would ruin and defile the sacredness of the revered shrine. The local people resent control of their indigenous cultural properties by agents of the state. They feel strongly that they should be an integral part of the team that protects, preserves, repairs, maintains, manages and benefits from the utilization of their cultural properties. They resent deprivation of their economic, social, and cultural rights by the proclamation of *Njelele* as a national monument.

Babane and Chauke (2015) provide insights on unique ways of managing drought amongst the Vatsonga ethnic group within Limpopo Province of South Africa. This group of Xitsonga speakers is also found in Mozambique, Zimbabwe and Swaziland where they are interchangeably called Machangana, Shangani or Shangaans.

Babane and Chauke (ibid.) explain both the cultural and religious customs involved in rainmaking rituals (*nkelekele*), and indicate that the rituals have, always, been practised when there is an extended period of drought. The rituals can either be in the form of invoking the ancestors or God or both. However, the ceremonies differ when performed by specific people, at different places and times, and for different purposes. During drought seasons, ancestral worship by members of the royal family was performed by elderly women together with selected members. Alternatively, the *Bandu* rainmaking ritual was performed during seasons of slight drought. This involved certain groups of the community lineage and not all members. Another ritual form

involved community participation in which the whole community is cleansed. Babane and Chauke argue for the need to practise and preserve the rituals for future generations.

Prins (1990) reports on rock art including paintings, which reflect notions of shamanistic nature, associated with trance, among the Southern-Bushman San of Transkei region of South Africa. The San descendants, highly regarded as knowledgeable experts on the art and science of rainmaking particularly in the prevention of bad rain, such as lightening, lived in rock shelters and visited caves situated adjacent to rivers to conduct rainmaking rituals. They were believed to enter into a trance and make rain in the invincible realm. During droughts, the San were summoned to come and pray for rain. On such occasions, the rainmaker disappeared into isolation to the rock shelters in secret, and experienced a trance, sometimes described as a dream or vision, and on return, it would rain. In contemporary South Africa, the San are, still, believed to have the power to make rain. This ability is related to placing a San individual in a river, the individual sweating profusely while seated on a reed mat (reeds are water plants), and rain follows thereafter. The "association between rain, reeds, river and sweat" (ibid: 114) in the San rainmaking thought and universe, probably suggests, as Frazer (1942) contends, sympathetic magic which is based on the logic of association of ideas, particularly the concept that like produces like and that things that have once been in contact continue to affect one another.

Schapera (1930) provides variants of rainmaking ritual processes in Bechuanaland of the Bantu Sotho society in southern Africa as the people, the BaKxatla, struggled to respond to instances of drought in their territory. In the *pulanyana* or the 'little rain' ceremony, preadolescents, soon after cultivation, marked the tribal territory and purified the fields, and crossroads with doctored water as they sung traditional rain songs. The outstanding feature of these rites is that they were held annually at the beginning of the agricultural season, and were an essential part of the customary agricultural ritual. They were thus, not resorted to in case of drought only. The chief had a special rain enclosure (*segotlwana sa pula*) where several pots of rainmaking medicines were kept. Every year, before the cultivating season, immature girls ceremonially brought water to the pots and, they and immature boys, then, sprinkled some of the contents over the fields and crossroads in their territory. If the rain did not come, driftwood and other objects connected with water were burned in the enclosure, so that the smoke could summon the clouds. Sometimes, too, men were sent to capture alive a wild animal of a specified species and sex, which was then

slaughtered, portions of its flesh added to the mixture in the pots. Failing this, women would gather at the graves of the chief's ancestors, sprinkle them with water and beer, and sing special songs of prayer for rain.

Schapera (ibid.) notes that ultimately the chief himself would go to one of the ancestor graves, accompanied by the people, where an unblemished black bull was slaughtered, and portions of its meat, the skin, bones, etc., burned on the grave and as the smoke rose, he would pray to the ancestor 'to let the rain fall'. As a last resort, search would be made for objects out of place (e.g. a pot hidden in a tree), which were thought to have been deposited by sorcerers to keep off the rain. Such objects were doctored and thrown into a riverbed or pool, and the people then gathered at the tribal palace to be sprinkled with the contents of the rain pots and freed from contamination. Throughout the rainy season, too, all newly bereaved people were reported to the chief, on whose instructions they were smeared with the juice of irritant bulbs used as rainmaking medicines. This treatment was intended to 'cool' their bodies and prevent them from scorching the land wherever they went.

From the foregoing, it is clear that, the ritual science of rainmaking has dominated the African anthropological universe and is closely related to the everyday lives of the African people. The rites indicate the African peoples' pragmatic adjustment to nature and relation to the political, economic, legal, socio-cultural and cosmological environment and surroundings, through the application of empirical knowledge. They also systematically unpack the complex relationships between African humanity, cosmology, ritual and power.

Indigenous Knowledge Meets Modern Science in Kenya

Many local communities across the African continent look to indigenous knowledge, on weather forecasting, to steer the calendar of their agricultural activities. Nonetheless, Kenya is reported (Koigi, 2016; Kaya, 2016; Guthiga & Newsham, 2011; Moore, 2016; Mojon, 2010) to have achieved a hybrid weather intelligence system in which traditional rainmakers and modern scientists, meteorologists and weather forecasters collaborate and consequently bolster the accuracy of weather predictions. This is a result of a partnership between the country's meteorological department, research institutes, universities, and the much-respected *Nganyi* rainmakers of Bunyore sub-tribe of the Luhya community of western Kenya. The partnership has made the

traditional rainmakers gain trust and no longer be disregarded and ostracised as sorcerers from scientists and the government, as was the case in the past.

The *Nganyi* rainmakers are well-known for weather forecasting using indigenous knowledge that by observing subtle changes in nature and making interpretations on plant responses, animal behaviours, and on aches in their bodies, they are able to predict with high precision and accuracy the local weather, particularly the timing and intensity of rains and drought. The *Nganyi* rainmakers have perfected the science of rainmaking that they have long used in advising local communities about when and what to plant based on weather patterns.

In the collaboration, modern scientists and the *Nganyi* rainmakers blend indigenous and conventional weather prediction in a model that combines each other's knowledge. The scientists conduct consultations with the rainmakers at a shrine forest, which the rainmakers have relied on for weather prediction for decades. The shrine is a treasure trove of biodiversity, with different tree species, many birds, wild animals and insects, and is designated shrine due to its importance to the local communities. The shrine is pivotal in providing key climatic intelligence for local communities. Scientists have also set up a resource centre near the forest shrine where learners, trainees and researchers are exposed to indigenous meteorological science. This project spells the need of combining modern science and indigenous meteorology so that there is a more accurate model.

A typical consultation between the *Nganyi* rainmakers and the scientists involves each side presenting their weather predictions, and then comparing notes. Once the two sides agree on the forecast, it is then, released to local communities, in local languages, through radio, community-gathering points, and by word of mouth. That the two groups complement each other's knowledge to make weather predictions and the resulting interventions is significant in insulating vulnerable communities, the majority of whom are smallholder farmers, from the vagaries of climate change. Moreover, the weather forecasts may become even more essential as climate change impacts Kenya's already fragile food security situation. In other words, the partnership provides essentially reliable information for communities at the highest risk from climate change.

While traditional meteorological methods have their own limitations, they are however pivotal as early warning signs especially for local communities who depend on the rainmakers to guide their agricultural calendar. Whereas modern meteorological forecasting focuses on wider spatial coverage, and can predict phenomena such as El

Niño or cyclones, indigenous meteorology focuses on smaller localities, over shorter periods. Nonetheless, it is this local forecasting which is important because it helps in explaining the meaning of scientific predictions to local people who need it most but who would not understand it if explained in technical terms. Relaying the information through traditional rainmakers makes it more accessible to local communities who find scientific approaches cluttered with technical terminology. The *Nganyi* traditional rainmakers provide their forecasts in simple and specific terms that are very relevant to the local people. The collaboration and partnership is therefore necessary with a view of perfecting the indigenous science.

However, as climate change affects local animals, plants, insects and ecosystems, which the *Nganyi* rainmakers rely for weather predictions, it could also affect the accuracy of their indigenous knowledge. That makes a marriage between conventional science and indigenous weather forecasting, all the more important for the rainmakers, local communities, and conventional scientists alike. Even as majority of the indigenous weather forecasting systems continue being affected by changes in climate, certain aspects, like the ability of the rainmakers to tell the intensity and period of rain from the shape and colour of the clouds or movement and intensity of winds, are great take aways for modern meteorologists. Likewise, by incorporating indigenous knowledge of the *Nganyi* rainmakers with modern scientific weather technology, the Kenyan hybrid meteorological model confronts climate change without neglecting the heritage of the local people. Modern science cannot afford to ignore such knowledge and science if Africa is to sustainably adapt and respond to climate change.

Marrying Indigenous Knowledge with Modern Science

In the face of climate change and its myriad challenges and unknowns, the pertinent question, then is, given its potentials, can indigenous knowledge provide the magic potion to the recurring problem of climate change in contemporary Africa? Again, does culture and cultural institutions have a role to play in helping Africa address the problem of climate change?

It is the contention of this study, that policies and intervention response measures on climate change must be based on sound tested knowledge, data, research and science. Effective and equitable long-term solutions to the problem of climate change require robust scientific knowledge, drawing on anthropological experiences across time, space, climates and cultures. Modern scientific knowledge alone is

inadequate to solve the climate change crisis in Africa. Although nascent, indigenous knowledge has long guided African societies in their innumerable interactions with the environment. It is true that indigenous observations and interpretations of meteorological phenomena, for example, have guided seasonal and inter-annual activities of African communities for millennia. African indigenous knowledge therefore, has considerable demonstrated resourcefulness and response capacity in the face of climate change. Its resilience is known and well-tested, though mostly uncounted.

Granted, the strengths, value and potential of African indigenous knowledge on climate change are numerous. Notably, since indigenous knowledge focuses on elements of significance for local livelihoods, security and well-being, it can provide beneficially, customized climate change solutions. In addition, given that most African communities still apply indigenous knowledge to respond to the consequences of unstable environments in their localities, similar and related strategies can be enhanced and applied to respond to instances of climate change. Equally, indigenous science has the potential to offer valuable insights and complement broader-scale modern scientific knowledge on climate change with precision and nuance. That is, indigenous knowledge can contribute to modern scientific knowledge by offering observations and interpretations at a much finer spatial scale with considerable temporal depth by highlighting elements that may not be considered by modern climatological science (Nakashima et al., 2012; Guthiga & Newsham, 2011). Accordingly, with indigenous knowledge and science, African governments, communities and individuals may easily respond, adapt and improve their resilience in the face of adverse climate events.

In effect, African governments can viably address climate change and variability by invoking, integrating, incorporating and mainstreaming indigenous climate resilient science and technologies in their development pathways. In order for agriculture to continue providing solutions, securing livelihoods and guaranteeing food security and development in the African continent, time-tested indigenous knowledge for climate change must be embraced, enhanced, incorporated and mainstreamed with modern climatological science. This is particularly so if undertaken as a strategy of bridging the gap between modern scientific knowledge and African indigenous knowledge. Any integration and mainstreaming must ensure that indigenous knowledge is involved as a key partner in the development of climate change research, data, response and interventions. Collaboration will thus, generate new co-produced knowledge relevant

for effective climate change response and interventions on the ground. This will maximize the strengths of the two types of knowledge, and result in the mutual enrichment and reinforcement of both systems of knowledge, and by extension improve the uptake of climate change response and interventions.

Integration and mainstreaming can take many forms, however blending indigenous knowledge with conventional science, as the Kenyan case indicates is classical. This hybrid model can then be replicated across the African continent, and if need be, adjustments be made to suit different anthro-climatological contexts, where vulnerable communities are staring at climate catastrophes. Even so, the integration framework must comprise maintaining the integrity of and access to traditional knowledge systems, reinforcing local practises and diversity, and enhancing the transmission of indigenous values, attitudes and worldviews. By so doing, contemporary Africa will achieve sustainable development within more climate resilient communities.

Conclusion

Indigenous knowledge in the form of rainmaking rituals and weather control, which has dominated African communities over the years, has a great potential of facilitating effective response interventions to climate change. However, this requires its incorporation and integration into modern scientific knowledge. When integrated, it can, then, be used to validate scientific climatological approaches to climate change. People and communities practising rainmaking rituals, for example, can use the indigenous knowledge as a filter for modern climatological science. Integration will also facilitate participatory, bottom-up and concerted response to climate variability. In addition, integration will be an expression of confidence and acknowledgment on the ability and capacity of local knowledge to deal with climatic extremes over the years. Accordingly, integrating and mainstreaming indigenous knowledge can enhance Africa's response, boost the continent's preparedness, adaptation and intervention to climate change, and leverage benefits already recorded.

Nonetheless, a thorough validation of indigenous science through scientific research and data is required before integration into modern scientific knowledge. Integration can then be achieved through incorporation into modern climatological processes and national education and training curricula, commercialisation and patenting the materials and processes involved, documenting, preserving and popularising the practises.

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