Community Risk Assessment of Rainfall Variability under Rain-fed Agriculture: The Potential Role of Local Knowledge in Ghana

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Abstract

One of the overarching goal of vulnerability assessments to climate change is to inform Climate Change Adaptation Planning (CCAP) for minimizing livelihood vulnerability at the local level. However, a nuanced understanding of the perspectives of climate related risks among local populations affected is often lacking and or seldom explored in vulnerability assessments due to the dominance of top-down approaches. This paper explores the potential of Community Risk Assessment (CRA) and local knowledge as a bottom-up approach to community-based risk assessment of rainfall variability in Ghana. A qualitative research design involving the application of Participatory Rural Appraisal (PRA) methods was employed for data collection and analysis. A case is made for the potential of CRA and local knowledge in vulnerability assessment at the local level. Combining CRA with local knowledge in risk assessment of rainfall variability yielded results comparable to what is known in the climate change scientific community. The key climate related risks included shortening rainfall season, decreased rainfall intensities and amounts and irregular and unpredictable rainfall patterns. However, CRA provided localized detail about the context, local knowledge and perspectives for a nuanced understanding of climate related risks. Therefore the paper advocates CRA and a role for local knowledge in climate change vulnerability assessments in Developing Countries and Ghana in particular.

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Introduction

In the wake of global climate change, vulnerability assessment has become important for understanding the nature of the risks to climate variability among local populations especially in the Developing World, and sub-Saharan Africa in particular. The quest for understanding climate related risks is underpinned by the need for climate change adaptation planning (CCAP). Climate change and climate variability has become a daunting global development issue and a major challenge to agriculture and food security, human health, poverty alleviation efforts, and the sustainability of the ecosystems that support various livelihood systems (Food and Agriculture Organization [FAO] 2008, 2009; Stern, 2006; Global Leadership for Climate Action (GLCA), 2009; World Health Organization (WHO), 2003). To deal with this challenge, vulnerability assessment to climatic variability is central for informing appropriate policy responses and measures for adaptation especially in Developing Countries. Although there is better understanding of the risk that climate change presents at the global and regional levels, there is limited understanding of how local populations are exposed to the risk of climatic variability. This situation arises from a lack of sufficient attention to participatory and community based approaches to vulnerability assessments to climate variability. This paper draws on local knowledge systems for community based assessment of the risk of climatic variability in remote communities of the Sissala East District, Northwestern Ghana.

Local level assessment of climatic variability is important because of geo-specific differentiation in the impacts of climate change – even if the differences are minor, they do lead to differential impacts on livelihoods. For instance, an assessment of climate change impacts in Ghana, Yaro (2010) observed that the direct and indirect impacts of climate change are specific to different socio-geographic zones and livelihood groups and sectors. In this context, a clearer understanding of the extent of risk exposure to climatic variability at the local level, specifically, drawing on the perspective of the local populations affected by climate change is relevant for two reasons. First, it contributes to filling the gap on participatory assessment of climate change. Secondly, it enables an analysis of the role of indigenous knowledge systems for understanding climate change assessments and also climate change adaptation. Eguavoen (2012) underscores that although local populations may have difficulties in the right interpretation of the concept 'climate change' in local languages, they do have the capacity and knowledge systems for observing and describing changes in weather elements, especially rainfall and temperature. Climate change is not new to the traditional people of African Sahel region since they have lived and coped with the changing climate (droughts) over the past century. Indeed, populations in the African Sahel region have over the past years coped or adapted to extreme climatic events, especially severe drought through their indigenous knowledge systems (Nyong et al., 2007).

This paper is structured in six parts. In the ensuing section, an overview of climate change and vulnerability to climate change in Sub-Saharan Africa is done. This is followed by a presentation of the conceptual framework, and description of the study area and methodology. The results are then presented and discussed. This is followed by the concluding part.

Vulnerability to Climate Change in Sub-Saharan Africa

According to the Intergovernmental Panel on Climate Change (IPCC), vulnerability is the degree to which a system is susceptible to, or unable to cope with adverse effects of climate change, including climate variability as a result of adaptive capacity (IPCC, 2001). Thus, vulnerability is determined by the degree of risk exposure, coping capacity and recovery potential (Blaikie et al., 1994). This brings to the fore the dual nature or structure of vulnerability, an external side and an internal side. The external side comprises the exposure to risks and shocks and the internal side, the capacity to anticipate, cope with, and recover from the damaging effect of the hazard (Bohle, 2001; Chambers, 2006; van Dillen, 2004). In this paper, the analysis is focused on the external side of vulnerability that is, analyzing community exposure to rainfall variability.

Climate change according to the IPCC (2007:21) refers to any change in climate over time, due to natural variability or as a result of human activity. Similarly, the United Nations Framework on Climate Change Convention (UNFCCC) (2007) defines climate change as a change in climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere, in addition to natural climate variability. The world's climate is changing with increases in average global temperatures due to global warming, changes in precipitation, melting of glaciers and ice caps and rise in sea levels (UNFCCC, 2007; IPCC, 2007; Chauhan, 2010). The climate in Africa has become highly variable and unpredictable. These variations in Africa's climate are said to occur seasonally, annually and over decades and may manifest in recurrent extreme events such as floods and drought, increased temperatures, incidence of pests and diseases, and bushfires (Department for International Development [DFID], 2004; IPCC, 2001; UNFCCC, 2007).

Climate variability in Africa is one of the major factor accounting for the continent's vulnerability to climate variability and change (DFID, 2004; IPCC, 2001; UNFCCC, 2007). Climate change has become a major developmental challenge in Sub-Saharan Africa, particularly, the northern savannah. It constitutes a major threat to environmental conservation, poverty reduction efforts and livelihood security in agriculture and other related sectors (Juana et al., 2013; IPCC, 2007; Mertz et al., 2008; UNFCCC, 2007). Climate change and variability are said to have devastating effects on the environment that provides household livelihoods in agriculture and other related sectors in developing countries and specifically Sub-Saharan Africa where poverty levels are high and adaptive capacities are limited (IPCC, 2007; UNFCCC, 2007; Boko et al., 2007). It is projected that climate change effects will be enormous with estimated future increases in climatic changes and that developing countries would carry a disproportionate burden of climate change impacts (Chauhan, 2010; Green & Raygorodetsky, 2010).

Climate change in Ghana reveals some regional variations. Forecast for temperature and precipitation trends over a 40 year (2010-2050) period indicates warming across the country with higher temperature projections in the three regions, north of the country (World Bank, 2011). The northern sector of the country suffers most from extreme variations in temperature and precipitation and the adverse consequences (Care International, 2010; Ghana, 2011; World Bank Group [WBG], 2010). Forecast on precipitation suggests a cyclical pattern for all ten regions in Ghana with decreasing and increasing precipitations in the northern and southern parts of the country, respectively. Increased fluctuations in rainfall are predicted to increase the risk of recurrent floods and drought in urban and rural Ghana, respectively and jeopardize the socio-economic being of the country (GSNC, 2011; Kuuzegh, 2007; WBG, 2011). Rainfall patterns in the Volta Basin of Ghana has revealed inter and intra-annual variations that negatively affect food crop farming (Derbile, 2010).

Community Risk Assessment and Local Knowledge for Community-Based Vulnerability Assessment of Climate Variability

Community risk assessment (CRA) was adapted as a conceptual approach to community based vulnerability assessment of climate variability, particularly, rainfall variability in rain-fed agriculture (Figure 1).

Community risk assessment (CRAs) involves the use of participatory approaches for the assessment of vulnerabilities, as in hazards and capacities for disaster risk reduction particularly at the community level (see Van Aalst et al., 2008:165). At the operational level, CRA particularly involves the use of participatory rapid appraisal (PRA) tools for diagnosing vulnerabilities, prioritizing community risks and working with people for enabling capacities for reducing the risk to the damaging effects of hazards. In general, CRAs have been used by NGOs and the international humanitarian community, particularly, the International Federation of Red Cross and Red Crescent Societies as a bottom-up approach to vulnerability assessment to climate change. Thus, CRAs has become an alternative to the top down approaches shaped by global environmental change modeling in the past (Van Aalst et al., 2008:165)

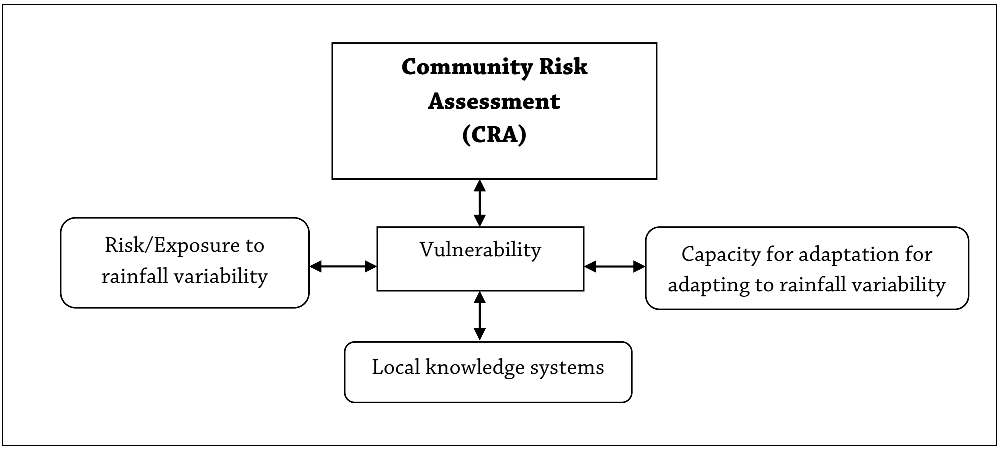

Figure 1: Conceptual framework: community risk assessment and local knowledge systems

Source: Adapted from Derbile (2010: 33)

The conceptual framework (Figure 1) presents vulnerability as a double-edged phenomenon, thus, exposure to risks/hazards on one end and relative capacity for adaptation on the other end (See Blaikie et al., 1994; Bhole, 2001; van Dillen, 2004; Chambers, 2006).This dual structure of vulnerability is combined with the potential role of local knowledge systems for analyzing vulnerability and or moderating the extent of vulnerability for community risk assessment. In the framework, the application of local knowledge systems presents a unique opportunity for drawing on community-based risk assessment, thus, tapping into the awareness, experiences, feelings, and knowledge of the risks associated with rainfall variability and capacities and limits of adaption among local populations. Therefore, the framework provided an opportunity for people to describe and analyze their vulnerability (risks and exposure) to rainfall variability in the practice of rain-fed agriculture, which is the main thrust of this paper. The framework also provides a window for assessing and analyzing local adaptive capacity to rainfall variability, but that should constitute the focus of another paper.

There are unique and distinctive benefits associated with drawing on local knowledge systems for and or adapting community risk assessment (CRA) (Figure 1). Local communities and indigenous people can effectively maximize their contribution to the assessment of community vulnerability (exposure to risk), because it provides a unique opportunity for communities to do the assessment from their worldview, knowledge systems, natural resource base and local production systems for which they are the experts and the primary carriers of such unique knowledge. Sillitoe underscores the importance of indigenous knowledge systems in research. He argues that indigenous knowledge is holistic and can facilitate interdisciplinary research towards accelerating development and addressing poverty in the Developing World (Sillitoe, 2004).

Local knowledge is an important asset to indigenous people and a strategic resource for development. It may also be referred to as 'traditional knowledge', 'Indigenous knowledge', 'indigenous knowledge systems', 'indigenous technical knowledge' or 'rural peoples' knowledge' (Arce & Fisher, 2003). Local knowledge in this paper refers to indigenous knowledge, the knowledge unique to a people through which they have survived on, accumulated through experiential learning within their environment and passed on from generation to generation (See Mapara, 2009; Shoko 2012; Van Fleet, 2003). Local knowledge is collective in nature and regarded communal property and often transmitted to selected few people within the community through specific cultural and traditional information exchange mechanisms. It encompasses mental inventories of local biological resources, animal breeds, local plant, crop and tree species and belief systems that enhance the livelihood of the people, health and protect the environment (Hansen &Van Fleet, 2003).

The Study Area and Methods of Data Collection

The study was conducted in the Sissala East District in Northwestern Ghana, specifically, in three randomly selected rural communities, namely, *Vamboi*, *Nabugubelle* and *Nmanduanu*. First, the district was selected because it has received little attention in climate change research. Secondly, it is one of the most important food producing areas in the region. The district has a total land size of 4,744 sq km with a population of 56, 528 as at the 2010 population census (GSS, 2012). The Sissala ethnic tribe is the majority with a few other ethnic minorities, the Kassena settled in one or two communities at the extreme eastern boundary of the district. The vegetation falls within the Guinea Savannah vegetation belt and the climate is part of the tropical continental climate with a single rainy season from June to September. Rain-fed farming is the primary occupation of the people and most are involved in cereal, leguminous and root crop production. These crops specifically include maize, millet, guinea corn, rice, beans, soya beans and yam.

A qualitative research design, involving the application of qualitative methods of data collection and analysis was adopted for collecting data for this paper. Thus, Participatory

Rural Appraisal (PRA) methods were applied for data collection and analysis in reference to a two generational analytical framework (Table 1).Triangulation was applied in the methods of data collection for ensuring robustness of data and analysis. The methods of data collection included Key Informant Interviews (KIIs), Focus Group Discussions (FGDs) and seasonal calendar analysis.

Key Informant Interviews (KIIs) were conducted among key informants with the aid of an interview guide. The interviews involved the chiefs, the earth priest (*Jantina*), chief farmers, traditional women leaders and some heads of households, both males and females. Thirty-three KIIs were conducted across the three study sites, eleven in each community. Data collected included the raining seasons, changing patterns of rainfall and related risks.

Fifteen FGDs were conducted across study communities and the number of discussants ranged from 8-12 per session. The different categories of discussants included the village chief and council of elders, elderly farmers (male and female), women's groups and the youth. The FGDs enabled development of the seasonal calendars rainfall seasons per the local knowledge of the people. This was followed by discussions on changes in rainfall patterns between the son and fathers generations. Findings from KIIs relating to change analysis and risk mapping were also validated during FGDs.

The framework comprised the present generation[9] of farmers (son's generation) and the generation of their parents[10] (father's generation).The purpose was to facilitate a historical analysis of perceptions of changes in rainfall patterns between the two generations, the sons and fathers generations[11] (Table 1).

9. Referred to as the son's generation in this paper and specifically means the present era of household heads.
10. Referred to as the grandfathers' generation. It specifically means the era of the grandparents of the present generation of household heads. The framework does not include the fathers' generation, that is, the era of the fathers of the present generation.
11. Choice of son and father for description of the generations was informed by the patriarchal culture of the people.

Table 1: Two generational analytical framework

Generation	Description	Estimated Period
Sons generation	Present generation of older age heads of households. Targeted ages ranged from 50 to 60 years old. They were born between 1955 and 1965.	The era in view is approximately the past three decades. This spans the early 1980s through to 2015. Those born in 1965 would have been in their twenties in the 1980s and could easily describe rainfall patterns then.
Fathers generation	This refers to the generation of the parents of the present generation described above. Thus, it refers to the era in which the present generations of household heads were children.	The era in view is approximately the 1950s, 1960s through to the 1970s. The period therefore, spans the colonial era through to the immediate independence era, and the early military regimes in Ghana.

Source: Authors (2016)

The two generational analytical frameworks was adopted as framework for guiding analyses over two time frames – the present generation lead by household heads and the previous generation, the generation of the parents of the present household heads (Table 1). In the framework, the present era of household heads is the present generation and referred to as the son's generation in this paper. The grandfathers' generation specifically means the era of the parents of the present generation of household heads. The choice of son and father for description of the generations was informed by the patriarchal culture of the people in the area.

Rainfall Variability: Perspectives from Local Knowledge Systems

The results showed that rainfall patterns associated with traditionally classified forms of rainfall had changed over the years in several ways when participants compared present day patterns (in present generation) with patterns in the past (in grandparents' generation). This section is structured in two parts to address this subject of rainfall variability as a risk in rain fed agriculture in the local context. We first present the forms of rainfall in the local parlance, followed by an analysis of the changes in rainfall patterns that present risk in agriculture.

Seasonal Classification of the Rainfall Season by the Sissala

As part of their worldview or local knowledge systems, local farmers identified six stages of the rainfall season in chronological order as follows:

- *Finfil duon (ash rains),* refers to the first stream of early rains of the year. These rains are associated with washing away of ashes from burnt vegetation. They also facilitate sprouting of new grasses and vegetation for grazing by livestock and wildlife, facilitate game by hunters and minimized dust associated with the *Harmattan* winds[12].
- *Bingolo duon*[13], the second stream of rains, particularly, flash rains is associated with washing away of faecal matter deposited through open defecation during the dry season. The season is also referred to as *limbaga* characterised by abundance of food and housing construction and maintenance activities; it also provides moisture for vegetative regeneration and moisture for fruiting of economic trees such as shea and dawadawa trees.
- *Duonpuso* or *Chankpaama duon*[14], rains marking the beginning of the farming season. These rains are intensive and continuous. Farmers begin clearing their farmlands in readiness for ploughing and planting. Some farmers do early planting of beans (*bonda)*.These rains also support fruit development of the *dawadawa*tree.
- *Kuduuriduon*[15] usually rains that signify onset of the planting season. They are intensive and occur between reasonable intervals. Farmers start to plant most crops.
- *Yibiin duon* or *Yu duon,* peak season rains. Rainfall is intensive, continuous and regular. They support maturation of crops, especially tussling, seed and or tuber development for grains and tubers respectively.
- *Wawajem or Gbanchan duon*. These rains mark the end of the raining season. The rains fall intensively for just few minutes, and immediate followed by sunshine. The name *Wawajem duon* describes the speed at which the rains falls. These rains are not useful to most crops. They simply mark the end of the rainy season.

Changes in Rainfall Patterns: Inter-generational Perspectives

The analysis on changes in rainfall patterns is structured in three parts – early rains, mid season rains and late rains. For the purpose of analysis, early rains are classified into three categories, namely, *Finfil duon, Bingolo duon and Duonpuso or Chankpaama duon*. In general, the onsets of these early rains were reported to be early, timely, heavier, had wide geographical coverage and predictable in the past generation (grandfather's

12. Northeasterly trade winds usually blowing over West Africa in the last quarter of the year
13. Literally meaning faeces rain.
14. Literally meaning dawadawa rain.
15. Literally meaning planting rains.

generation). In the present generation (son's generation), the experience shows that the onset of these rains are generally late (if any) and uncertain, with lower intensities and limited geographical coverage, and difficult to predict. Changes in *Duonpuso* are analyzed as a case (Table 2).

Table 2: *Duonpuso* and the changes in rainfall patterns

Past patterns	Present patterns
• Onset was early, certain and predictable, mid April to May • Heavy rainfall/Intensive rainfall • Rainfall characterized by hail stones *(duontabiaa)* • Wide geographic coverage and regular • Rains continuously for 2-3 weeks (hence the name *Duonpuso*) • Easily distinguishable from other stages of rainfall e.g.*Kuduuriduon*	• Uncertain and unpredictable onset • Late, untimely and shifted onset, late May to June (if any) • Light rainfall/Low rain intensity • Rainfall no more characterized by hail stones (*duontabiaa*) • Limited geographic coverage • Virtually disappeared or absent • Difficult to distinguish from other stages of rainfall, e.g. Kuduuriduon

Source: Authors (2016)

The results show that in the past generation, the onset of *Duonpuso* was early and could easily be predicted for planning farming activities because it showed a regular pattern year after year (Table 2). In fact, *Duonpuso*, regularly started in mid-April and ended at the end of May. In general, early rains could be expected between January and May. In the current generation, *Duonpuso* has virtually disappeared or is disappearing fast. For years that it occurred, the start has shifted forward, starting sometimes in late May through to the end of June. In fact, the start and end times are uncertain and unpredictable. The rainfall intensity, number of rainy days and amounts was high in the past and this provided the required moisture for farming and fruiting of economic trees. In the sons' generation, rainfall intensities and amounts are low. The rains are no longer accompanied with hailstones. Male farmers in *Vamboi provide a vivid narration of the changes*:

> *In the past, rains were heavy and came with hailstones (duontabiaa) which children rushed out to pick from the rains. Rain drops were big and painful if they fell on you. So many hailstones could drop and cover the ground like a spread of white chippings. In the sons'generation, the hailstones no longer fall. Children don't even know "duontabiaa" because they have not experienced it.*

In addition, the geographical coverage in rainfall was very wide. Large areas experienced the rainfall spanning many communities and the forest and bushes. In the sons' generation, the geographic coverage of this rainfall is very often limited. It is common for two neighboring communities to have two different experiences – rain in one community and no rain in the other. Even one section of a community can experience rain and the other section, no rain. The rains have become sporadic, intermittent and limited in geographic spread. In the past generation, it was easy distinguishing *Duonposu* from the other classifications of rainfall. The late onset of the rainfall and irregular patterns now make it more difficult to distinguish it from the next season, *kuduuriduon*.

Mid season rains are the second stream of rains in the rainy season. For the purpose of analysis, we classify *Kuduuriduon* and *Yibiin duon* or *Yu duon* as mid season rains. *Kuduuriduon* (Table 3) and *Yibiin duon* (Table 4) are associated with the main planting season and the peak of the rainy season, respectively.

Table 3: *Kuduuri duon* and the changes in rainfall patterns

Past patterns	Present patterns
• Early onset (May) and rained till end of June • Onset was timely and certain • Characterized by both heavy and light heavy rains • Covered large geographic area • Pattern was regular and easy to predict • Easy to distinguish from other stages	• Late onset as rains may start in June through to July or even later. • Onset is uncertain and untimely • Low intensity rains/inadequate moisture for supporting germination • Limited geographic coverage • Irregular patterns and unpredictable • Difficult to distinguish from other stages

Source: Authors (2016)

Table 4.*Yibiin duon/Yu duon* **and the changes in rainfall patterns**

Past patterns	Present patterns
• Start late July and rain till end of September • High intensive rainfall • Many rainy days per week (5-6 out of 7days) • Large geographic coverage • Rainfall characterized by hailstones (*duontabiaa*) • Continuous rainfall for some days(*duontor*) • Limited/Low sunshine and limited sunny days • Easy to distinguish from other stages • Certain and predictable	• Start anytime in August and rain till early September • Low intensity of rains and highly intermittent • Rains fewer days rain per week (2-3 out of 7 days) • Limited geographic coverage • High sunshine and increased number of sunny days per week • Absence of *duontor* • Difficult to distinguish from other stages • Uncertain and unpredictable

Source: Authors (2016)

Similar to *Duonpuso*, the onsets of these rains have shifted forward. The onset of *Kuuduriduon* has shifted from early May to June and *Yibinduon,* the peak of the rainy season has shifted from late July to anytime in August. In both, rainfall intensities and amounts, number of rainy days and geographic coverage of rains were much higher in the fathers' generation than the sons' generation. In fact, communities no longer experience hailstones that were associated with torrential rains during mid season. Sunshine which was rare or virtually limited during the peaks of the rainy season are now commonly associated with the peaks of the rainy seasons. Farmers now experience high sunshine and many sunny days during the mid season, even in the peak season. The shifting onsets of these rainy seasons, shrinking lengths of the rainy season and irregular patterns have made it difficult to distinguish between these two mid season rains in the sons' generation. In the past, they were easily distinguishable.

Late rains signify the end of the raining season. *Gbanchan duon* or *Wawajem* belongs to this classification (Table 5). Farmers report that *Gbanchan duon* has virtually disappeared or is disappearing fast in the seasonal calendar of rains in the sons' generation.

Table 5: *Gbanchan duon/Wawajem* and the changes in rainfall patterns

Past patterns	Present patterns
• Late September – late October	• Early September – Mid September (if any)
• Certain and predictable	• Uncertain and unpredictable
• Onset was certain (October)	• Undistinguishable
• Rainy days (Uninterrupted) were more per week	• Almost absent

Source: Authors (2016)

Even if it occurs, both the onsets and end times have shifted backwards (Table 5). The onset has shifted from late September to early September and the end times late October to mid September. Even then, there is high uncertainty about the onsets and duration of this rain. Farmers frequently experience abrupt ends to rainfall and this adversely affects agriculture production.

Local Knowledge and Community Risk Assessment of Climate Variability

In this section, the potential role of local knowledge for community-based assessment of climate change is discussed. The discussion underscores two important points: first, the relevance of CRA for assessing climate variability and secondly, an added value of localized detail that is reflective of the worldviews of communities in adapting local knowledge in the assessment.

The results from CRA largely corroborate the knowledge of climate change in the scientific community and thus, avails its relevance in vulnerability assessment to climate variability at local levels. For instance, the assessment reveals a shortening duration of the rainfall season and irregular and unpredictable rainfall patterns. These findings are not new; but the shrinking of the rainfall season is explained within the context of virtual disappearance of locally classified rainfall seasons, for example, *Duonpuso* and *Gbanchan duon*. A shrinking of the rainfall season has been reported in many parts of Ghana, for example, in the Abura-Aseibu-Kwamankese District (Penaranda et al., 2012) and Ejura-Sekyedumase District (Kankam-Yeboah et al., 2010). In the Limpopo basin (Souh Africa) farmers also observed shorter rainy seasons and changes in rainfall pattern (Gbetibouo, 2009). Studies on commercial farmers along the Little Brak River in South Africa prove that they observed changes in the climate over four decades from their farming experience (Wiid & Ziervogel, 2012).These observed changes which corroborated recorded weather data, included increasing temperatures, changing annual rainfall patterns and shifts in wind direction(Wiid & Ziervogel, 2012). Revelations of uncertainties in rainfall patterns and unpredictability of extreme events are similar to experiences among farmers in Northern Nigeria (Farauta et al., 2011), the Laikipiaa District of Kenya (Ogalleh, 2012) and Eastern Uganda (Egeru, 2012).

CRA and the adaptation of local knowledge in the process in particular, provide localized detail that is very often lacking in climate change research and knowledge. For instance, the assessments provides detailed description of rainfall variability on reduced rainfall intensities, disappearance of hailstones and experiences of high sunshine which was rare during the peak of the rainfall season. The assessment further revealed increasing incidence of sporadic and limited geographic coverage in rainfall. In the past, rainfall had extensive geographic coverage, spanning large areas. However, rainfall patterns have become more localized, sporadic and discriminatory over local spaces. Communities with close proximities can have two different experiences in relation to rainfall – one experiences rainfall and the other does not. For the same community, one section can experience rainfall while the adjoining sections do not experience same. Such observed local changes in rainfall patterns are seldom explored in climate change research largely due to the non appreciation of indigenous knowledge or local knowledge. As it is now known, local populations in Africa are able to rely on their indigenous knowledge systems to observe, interpret and respond to the effects of climate change in their livelihoods (Nyong et al., 2007; Salick & Byg, 2007; Green & Raygorodetsky, 2010; Gyampoh & Asante, 2011; Eguavoen, 2012; Egeru, 2012). In Sub-Saharan Africa, indigenous communities have a fair understanding about the changing climate and its adverse effects on their livelihoods. This enables them to adopt local strategies for coping with and or adapting to climate variability (Akponikpe, 2010; Gbetibuou, 2009; Faurata et al., 2011). In Ghana, particularly, in the northern savannah, indigenous knowledge systems play an important role in reducing livelihood vulnerability to climatic variability among rural communities (Derbile, 2012).

Conclusions and Policy Implication

This paper explored the potential of community risk assessment (CRA) and local knowledge for conducting vulnerability (risk) assessment to rainfall variability in selected communities in Northwestern Ghana.

The paper underscores the potential of CRA and local knowledge for community-based assessment of vulnerability to climate change. The combination of CRA with local knowledge has proven to be useful in vulnerability assessment for two main reasons. First, it yields credible results comparable to the knowledge in the climate change community. The vulnerabilities, in terms of risks exposure, included shortening rainfall season, decreased rainfall intensities and amounts and irregular and unpredictable rainfall patterns. Secondly, it has an added advantage of providing localized detail that is reflective of the context, local knowledge and perspectives for a nuanced understanding of vulnerability to climate change, rainfall variability in particular.

For the purpose of policy formulation, the paper recommends a composite approach to CRA that recognises the potential role of local knowledge in CCAP within the context of the National Climate Change Adaptation Policy Framework (NCCAPF) in Ghana.

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