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RESEARCH ARTICLE

Climate change, migration and farmer–herder conflict in Ghana

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Abstract

Climate change, migration, and conflict have been featured prominently in academic and policy literature. While Africa remains the major reference point, studies on key conflict hotspots fail to adequately examine empirical demonstrations of how climate change forces migration, and consequently major conflicts. Drawing on semi-structured interviews, focus group discussions, and employing the scarcity theory in a study of Agogo (Ghana), we illustrate how regional and local climate/environmental variability and scarcity trigger and sustain migration and farmer–herder conflicts. The findings offer insights into how other non-climatic and ecological conditions reinforce the so-called climate-induced conflicts, exposing the limitations of the scarcity-theory. Importantly, this study has provided an illustrative argument centered around the contextual dynamics of the nexus between climate change and farmer–herder conflict in Agogo to contribute to national, regional, and continental discussion on this critical topic.

1 | INTRODUCTION

Climate change is perceived as a major problem for human security in recent decades. It threatens peace and security through conflicts which are usually associated with disputes over the use of natural resources such as water and grazing fields (Cabot, 2017a; Cabot, 2017b; Swain, 2015; Swain & Jägerskög, 2016). Climate change is deemed "a truly global challenge" (UNESCO, 2009, p. 2), "the security risk of the twenty-first century" (Milder & Lauster, 2011, p. 1), and "a challenge which knows no frontiers, and so, requires a global response" (European Union, 2015, p. 3). Aside from the huge security risk, it also has a wide degree of impact on social, economic, and ecological systems, causing and/or aggravating existing challenges in society (Conley, 2011). Climate change, among other things, leads to loss of soil fertility and natural disasters, negatively affecting food and income security, destruction of habitats, and causing a migration crisis in many places (Olakunle & Adejoke, 2013). Victims of climate change, mostly migrate to other areas where its impacts are absent or less pronounced. This movement is well dominated in West Africa by the Fulani herdsmen who engage in constant movement or resettlement in search of green grass and water for their livestock (Abugu & Onuba, 2015).

The activities of Fulani herdsmen in the West African sub-region have often been associated with transhumance and nomadic activities, characterized by constant seasonal movements and temporary settlements (Olaniyan et al., 2015). However, in the case of Ghana and the Agogo area in particular, most of the Fulani herders who have been migrating from neighboring countries such as Mali, Burkina Faso, and Niger since the late 1990s, usually establish permanent settlements (Boateng, 2015). Although the vegetation cover of Ghana is gradually receding, it continues to offer a home for the Fulani herdsmen and their cattle, especially in the face of climate variability and change. The literature mainly categorizes the Fulani in Ghana into three groups. First, the mobile/nomadic ones who constantly move to and from the Sahelian region to the South. Second, the sedentary Fulani who have established permanent settlements in the South. Third, and in more recent times, the urban Fulani who settles farther South in big cities such as Accra and Kumasi and engage in different trades or businesses instead of herding (Baidoo, 2014; Olaniyan et al., 2015; Tonah, 2006).

While the major source of the conflict is believed to arise from the mobile Fulani due to destructions (to crops and water bodies) caused by stray cattle without designated grazing routes (Baidoo, 2014), the conflicting ethnic relationship between the Fulani and host communities in Ghana often leads to the fusion or generalization of nomadic and sedentary Fulani as all causing destruction to the local environment. Consequently, the conflict in Agogo usually features both groups of the Fulani on the one hand and the host communities on the other (see Bukari, 2017). Besides, as the nomadic herders are often not linked to specific locations, it is the sedentary ones who are usually available to serve as research participants, as also seen in this article.

The Agogo environs in the Asante-Akim North Municipality of Ghana have gained notoriety as one of the places where Fulani herdsmen and indigenous farmers have been clashing over land use and control (Boateng, 2015). Between 2001 and 2016, for instance, farmer–herder clashes in Agogo led to the deaths of about 70 people, destroyed several farms, and killed over half-a-thousand cattle coupled with more than 100 injuries (Bukari, 2017). The Regional Security Council (REGSEC) reported that farmer–herder disagreements resulted in over 20 conflicts between 2000 and 2010 in Agogo (REGSEC, 2012). Recently, the media reported that three soldiers were wounded in an attack by herdsmen at Agogo on 8th January 2018. This incident occurred after a joint Military and Police task force responded to a distress call from a farmer

whose food crops were being destroyed by cattle of the Fulani. Owing to the recurring nature of the clashes between farmers and herders, the conflict situation has been described as perhaps the most notorious case in Ghana (Paalo, 2020).

Farming in the Municipality takes place on unfenced lands. While farm sizes are usually too big to make fencing practical in most cases, the cost of fencing is a huge burden on farmers. As a result, grazing cattle have easy access to farm areas, destroying crops and other farm produce, which often generates disagreements and eventually violent clashes between farmers and herders. The swathes of fertile land in the region, especially along the Volta Basin in the Agogo Afram plains, offer the opportunity for crop and animal production, and hence the socio-economic lives of farmers and herders revolve around access to and control over land (Baidoo, 2014; Paalo, 2020). The struggles over the ownership and control of fertile land, therefore, cause tensions and violent conflicts among communities (Blench, 2010). To a farmer, the land is a valuable entity, a means of livelihood, and a source of wealth (El Hadary & Samat, 2012). Similarly, to a herdsman, cattle are the most treasured livestock, which is also kept on land (Okoli & Atelhe, 2014).

The nexus between a farmer's valuable assets (which is land) and the most treasured asset of a herdsman, cattle (which in most cases is dependent on a farmer's fertile land for survival) brings about competition over land use which consequently, together with other factors contributes to the onset and recurrence of conflict. What is interesting about these conflicts in West Africa, including Ghana, is that while it should be expected that herders herd their own cattle, some of them herd cattle belonging to the local people under contracts (Boateng, 2015) who may also have claims over land ownership. Also, several cattle under the protection of herders belong to some politicians and local elites who in turn defend herders during a reprisal attack over land use (Baidoo, 2014; Olaniyan et al., 2015). These issues are further complicated by the Economic Community of West African States (ECOWAS) agreements on the movement of citizens of member states, which makes the politics of conflict resolution and peacebuilding in the Agogo area and others cumbersome. This situation raises intellectual curiosity about the politics and dynamics of the conflict in Agogo (whether it should be treated as a local–local conflict, local–immigrant conflict, or international relations phenomenon) and the causes of the conflicts, in terms of the environmental and non-environmental dimensions (Paalo, 2020).

Generally, several studies (see Abugu & Onuba, 2015; Bukari, 2017; Paalo, 2020; Tonah, 2006) have been carried out broadly on conflicts over land use between farmers and herdsmen in Ghana. In addition, case studies (see Boateng, 2015; Dosu, 2011; Paalo, 2020) have explored natural resource scarcity conflicts, climate change and farmer–herder conflicts in Ghana. However, these accounts only suggest climatic factors in the conflict, but fail to offer deep insights into how specific dynamics of climatic and scarcity issues or their link to non-climatic conditions affect the conflict. This leaves a critical knowledge gap in literature. Therefore, the aim of this research is twofold. First, it seeks to offer empirical evidence on climate change-induced Fulani migration into Agogo. Second, it attempts to examine how climate change affects farmer–herder conflict in Agogo.

Guided by the data, we use the eco-scarcity theory to illustrate the major dynamics of climate change in these conflicts. The data further suggest that climate related issues intricately link with non-climatic factors, such as population increase, which complicates the conflict situation. Hence, this article does not claim that such conflicts are caused or sustained only by climate related causes, as will be seen later. Instead, this article only illustrates the contextual dynamics of the nexus between climate change and farmer–herder conflicts to contribute to national, regional, and continental conversation on the subject matter. The rest of the article is

organized as follows. Section 2 presents the literature review that focuses on the theoretical basis of the study, followed by an assessment of the climate change and farmer–herder conflict nexus. Section 3 presents the materials and methods used to conduct the research while the results and discussion follow in sections 4 and 5, respectively. The conclusion in section 6 affirms the relevance of the eco-scarcity theory in understanding the growing phenomenon of farmer–herder conflicts in sub-Sahara Africa and yet points to other angles that reinforced and are strengthened by natural resource scarcity. Consequently, some recommendations are presented to contribute specifically to understanding and/or addressing such related conflicts more comprehensively in Ghana, while it is also expected to contribute to peacebuilding broadly in the sub-region.

2 | LITERATURE REVIEW

2.1 | Understanding climate change and farmer–herder conflict through scarcity theory

The eco-scarcity theory is one of the prominent (and contending) theories in the debates on natural resource conflicts, which are increasingly being linked with climate change. Thomas Homer-Dixon's eco-scarcity theory explains the emergence and dynamics of conflict, involving farmers and herdsmen over scarce resources competition. The eco-scarcity debate began in the 1990s with the theorists suggesting complex causal links between environmental pressure, defined as scarcities of renewable resources, and the onset or the outbreak of violent conflict. The theory presents a wide collection of empirical work linking climate change induced factors such as environmental degradation, global warming, ozone depletion, cropland scarcity, freshwater depletion, the decline of fish stocks and biodiversity loss with violent outcomes and articulates a preliminary theoretical framework to explain these linkages (Homer-Dixon, 1999). The theory explains that "decreased in the quality and quantity of renewable resources, population growth, and resource access act singly or in various combinations to increase the scarcity, for certain population groups, of cropland, water, forests, and fish. This can reduce economic productivity, both for the local groups experiencing the scarcity and for the larger regional and national economies. The affected people may migrate or be expelled to new lands. Migrating groups often trigger ethnic conflicts when they move to new areas, while decreases in wealth can cause deprivation conflicts" (Homer-Dixon, 1999, p. 30).

The central proposition of the theory is that scarcity of renewable resources, occasioned by climate change can, in combination with other social factors like rising migration and energy consumption contribute to violent outcomes such as ethnic clashes and insurgencies. The theory adds that environmental scarcity is triggered by a combination of human population growth and excessive strain on some dwindling renewable resources, typically exacerbated by unequal access to that resource. This provokes livelihood dilemmas for many users of natural resources, leading to more scarcity, economic crisis, forced displacement of people and/or constant migration characterized by vulnerabilities, and situations of Darwin's "survival of the fitters" in many contexts (Homer-Dixon, 1999; Uhembe, 2015). Observing the bulging population of Africa, Kaplan (1994) uses *The Coming Anarchy* to describe how the situation is expected to cause intractable conflicts arising from natural resource scarcity, crime, diseases, and other difficulties that can significantly destroy the social fabric of populations. In congruence, Swain (2015) adds that future wars will be fought over water scarcity and other climatic situations, including migrating in search of water and grazing lands.

The result, according to the scarcity theorists, is social segregation and a weakening of state structures, both domestically and in neighboring, thus increasing the risk of violent clashes in two different ways. First, environmental scarcity-driven migration may provoke violent disputes between the migrant population displaced by environmental pressure, partly caused by changes in the climate and the host population. Second, the economic crisis in the affected areas, combined with a declining ability of the state to manage the crisis, can lead to an uprising among citizens, or citizens versus migrants. Homer-Dixon and collaborators, therefore, persuade us to seek a comprehensive understanding of farmer–herder conflicts using the scarcity theory as the basis of analysis, as scarcity significantly threatens livelihood and provokes intense competition within and between interest groups.

Yet, other bodies of literature assert that natural resource related conflicts should rather be traced to non-ecological factors embedded in local and global socio-political institutions. This reflects in key contending theories such as political ecology and political economy. The political ecology literature draws attention to the politicization of access and distribution of environmental/natural resources along identity lines, which usually generates conflicts (see Bukari et al., 2018; Olaniyan et al., 2015). Here, the scarcity discourse reflects in contentions along historical and cultural backgrounds engrained in societal fault lines, such as ethnicity and religion (Bassett, 1988; Penu & Paalo, 2021). Consequently, Kirwin (2010), for instance, places natural resource conflicts into categories such as herders versus farmers, autochthones versus immigrants, and herders versus herders. This is usually worsened if the social fault lines are manipulated by partisan politics, for instance, farmers and herders or sections of each group aligning to or being supported by a political party of the regime against the other (Moritz, 2006; Paalo, 2020).

The political economy scholarship links natural resource conflicts to the 'greed' thesis whereby actors start, join, or contribute to sustaining a conflict due to economic gains. These actors contribute to weakening political institutions, creating criminal networks from grassroots to international levels through which natural resources could be looted and possessed or traded locally or internationally. This profit-making nature of the conflicts then flows through the discourses of scarcity and emboldens the propensity of individuals and groups to perpetrate cycles of violence (Hoeffler, 2011; Wennmann, 2019). Consequently, the farmer–herder conflicts cannot be purely categorized as environmental, or climate change induced since they happen within inextricable social, economic, ecological, and political contexts (Dietz & Engels, 2010). Some of these limitations of the scarcity theory are reflected in the Agogo case, as some accounts cite ethnic/identity, institutional weakness, and economic interests as other key factors causing the conflict and hampering the potency of peacebuilding policies in the area (Baidoo, 2014; Paalo, 2020). Nonetheless, given the growing discourse on climate change, conflict and development at both national and international levels, and the lack of empirical data analysis on climate change and conflicts in Ghana, we find it compelling, in furtherance of scholarship and policy, to examine the specific key dynamics of climate change and farmer–herder conflicts from the locals' perspective, to bring into a substantial conversation the piecemeal, disjoint mention in the literature of the nexus between climate change and the Agogo conflict.

2.2 | Climate change and farmer–herder conflicts nexus

The impacts of climate change and the degree of its security implications are marked by controversies, because of the interdependence of several factors, ranging from social, political,

economic, to cultural that shape the exposure and social vulnerabilities of different settings (Adano et al., 2012; Akinyemi, 2016). Framing a clear link between climate change and conflict has, therefore, been one of the most controversial discussions in the climate change-human security debates. This is the result of the lack of adequate research in supporting or contesting climate change-conflict claims (Tol & Wagner, 2010). Many accounts, including Abbas (2012) and Okoli and Atelhe (2014) have attempted to establish the nexus between climate change and conflicts relating to the use of ecological resources. Some suggest a link between conflict and low precipitation (Fjelde & von Uexkull, 2012; Raleigh & Kniveton, 2012; Swain, 2015) or between scarcity of freshwater resources and violent conflicts (Gizelis & Wooden, 2010). Meanwhile, others observe no significant relationship (O'Loughlin et al., 2014; Wischnath & Buhaug, 2014), with some finding a negative correlation between the prevalence of low rainfall or water scarcity and existing violent conflicts (Salehyan & Hendrix, 2014). Growing evidence supports the prevailing scientific thinking and policy papers that climate change gives rise to certain natural resource changes and outcomes that seem to contribute to the start and/or perpetuate conflicts (Fjelde & von Uexkull, 2012; Kugbega & Aboagye, 2021).

Africa is one of the most vulnerable continents to climate change and variability, because of the aggravated interaction of "multiple stresses" happening at various degrees and intensities (IPCC, 2007, p. 13). Sub-Sahara Africa is especially likely to suffer the worst consequences of climate change impacts mainly because of the overreliance on climate-dependent sectors such as agriculture (Brown & Crawford, 2008). This suggests that climate change may already be playing a role in existing conflicts in Africa, for example, conflicts in Darfur, which in part had been driven by environmental degradation induced by the changing climate (UNEP, 2007). The tensions from this challenge have heightened the disappearance of pastures and water for cattle, forcing more herders to migrate to areas of less prevalence, resulting in more pressures and eventually clashes between their hosts, mainly farmers over land use. Perhaps the most challenging aspect of climate change and migration-induced conflicts in sub-Sahara Africa concerns the constant migration, and/or resettlement of Fulani herdsmen amidst the encroachment of the Sahel desert to areas of good pasture. There is a massive increasing hunger for land by both crop farming communities and herders in the face of increasing environmental challenges. What pushes the Fulani herders to migrate to the South of the Sahara include the damages that climate change has brought to their grazing fields in the form of rapid drought, desertification, pollution, sandstorm and landslides, diseases, and hunger, among others (Olakunle & Adejoke, 2013). Meanwhile, the pull factors range from the availability of pastures induced by moderate weather, market opportunity, to hope and aspirations (Olaniyan et al., 2015). This pattern of migration often results in competitive use of natural resources which, if not managed well could lead to conflicts.

Conflicts resulting from competition over the use of natural resources are common in West Africa, including a cross-border conflict between crop farmers and herders over grazing lands along the Ghana-Burkina Faso border (Cabot, 2017a; Cabot, 2017b). About 60% of Burkina Faso's central-southern herders live on the other side of Ghana's border (IRIN, 2010). In the Agogo area of Ghana, among other parts of the country, there have been several farmer–herder clashes over the years. Since 2016, about 23 cases of standoffs between herdsmen and farmers over access to natural resources in Agogo appeared in several Ghanaian newspapers. The impasses have resulted in the accusations of rape, murder, and destruction of farmlands against the Fulani herdsmen (Boateng, 2015). Environmental scarcity in terms of land, water, and foliage which emanates from unfavorable weather and climatic conditions, reduces the availability of these resources, and changes the grazing patterns of herders and social relations

with the host farmers. This change indirectly affects conflict risk through other factors such as altered livelihood conditions, where absolute or relative, resource scarcity seems to be crucial (SIDA, 2018).

The loss of per capita availability of water and pasture has been one of the contributing causes of major clashes involving Fulani herdsmen and farmers in Ghana. Climate change is limiting the available options in terms of pasture and water for herdsmen to cater for their cattle and livelihoods (Cabot, 2017a; Cabot, 2017b; Meyer, 2017). The limited available pasture and water in Ghana, typically some parts of the Accra-Keta Plains, the middle belt in the Brong Ahafo Region, Eastern Region, and parts of the Ashanti Region have made these places a hotspot of farmer–herder conflicts (Penu & Paalo, 2021).

3 | MATERIALS AND METHODS

This research was conducted in the Agogo Traditional Area of the Asante Akim North Municipality, Ashanti region of Ghana (Figure 1). The vegetation cover of the Asante-Akim North Municipal is made up of the tropical rainforest and savannah grassland with farming as the main occupation of the people. The area is undulating ranging between 305 and 610 m, and it is interrupted by a stretch of the Akwapim-Mampong Ridge, which serves as a watershed for many rivers and streams in the Municipality (Ghana Statistical Service, 2014). This feature facilitates both the cultivation of food crops and the rearing of cattle, and hence necessitated the migration of Fulani herdsmen to the area. The Agogo area has quite favorable climatic conditions that allow the cultivation of food crops and the rearing of farm animals. Over the past decade, the average temperature of the Agogo area has been 30°C with minimum and

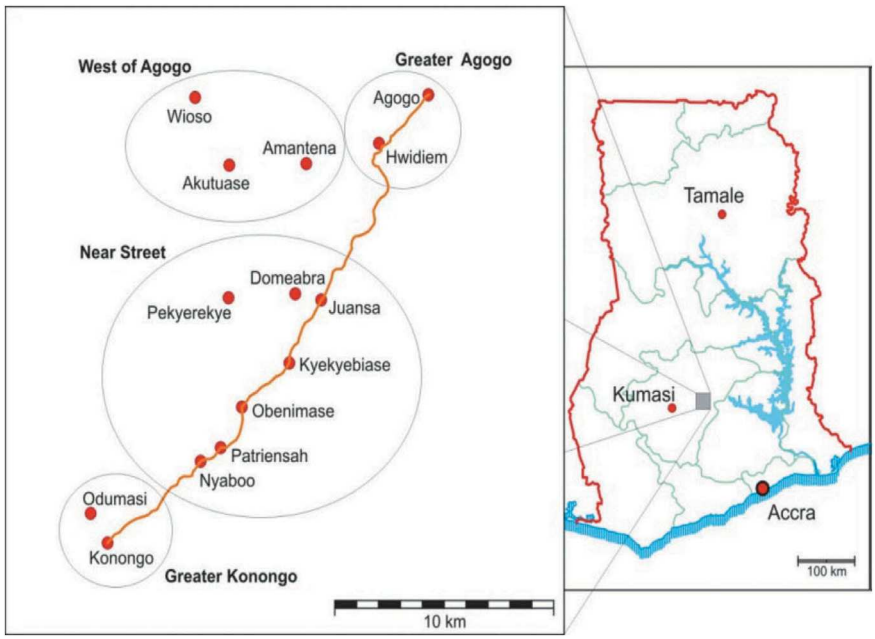

FIGURE 1 A map of Ghana showing the locations and towns within Asante Akim North Municipal District (Source: Ghana Districts, 2017).

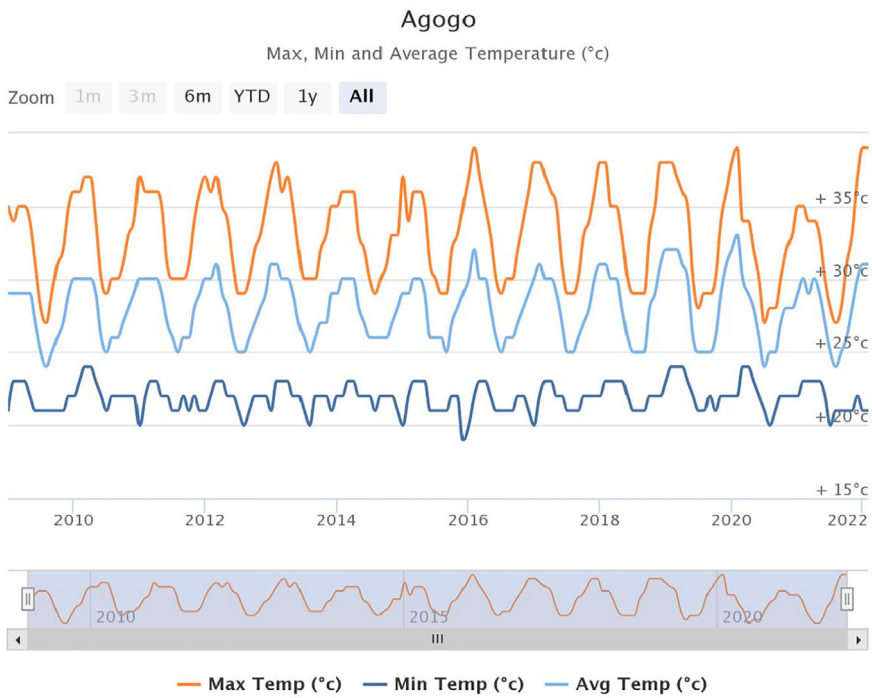

FIGURE 2 Temperature changes in Agogo between 2010 and 2022. Source: worldweatheronline.com (2022).

maximum temperatures ranging between 20°C and 35°C (Figure 2). Over the same period, the amount of rainfall also ranged between 100 mm and over 400 mm per year with the years 2016 and 2017 experiencing a considerably high amount of rainfall (Figure 3). Compared to the northern part of West Africa such as Mali, temperature and rainfall patterns show a different picture wherein these areas have historically been experiencing extreme weather events. In a study by Famine Early Warning Systems Network (FEWS NET, 2012), Mali experienced changes in both temperature and rainfall between the 1960s and 2009. Although rainfall increased in the mid-1980s, on average Mali and the surrounding countries experienced rainfall reductions and temperature increases as visualized by combining the observed 1960–2009 changes with predicted 2010–2039 changes (Figure 4). The implication of these changes is that countries in the northern part of West Africa continue to be dry with significant consequences on livelihood and food security, including cattle rearing. Meanwhile, the comparatively friendly climate and environment of Ghana and the Agogo area for that matter seems to attract herders.

The presence of the herdsmen has resulted in violent conflicts between sedentary farmers and herdsmen. A study by Olaniyan et al. (2015) reveals that conflict in the area started shortly after the arrival of the herdsmen in 2001 but waned in 2002 as the competition over scarce resources intensified. However, it erupted again between 2004 and 2005 and from 2009 to 2012 and resurfaced in 2017 through early 2018. The frequent recurrence of the Agogo farmer–herder clashes is a reason why the conflict situation has been labeled the most notorious case in Ghana (Paalo, 2020).

This research adopted a qualitative case study design. The design allowed for the identification of people that were directly involved in and were affected by the conflicts. Data for the

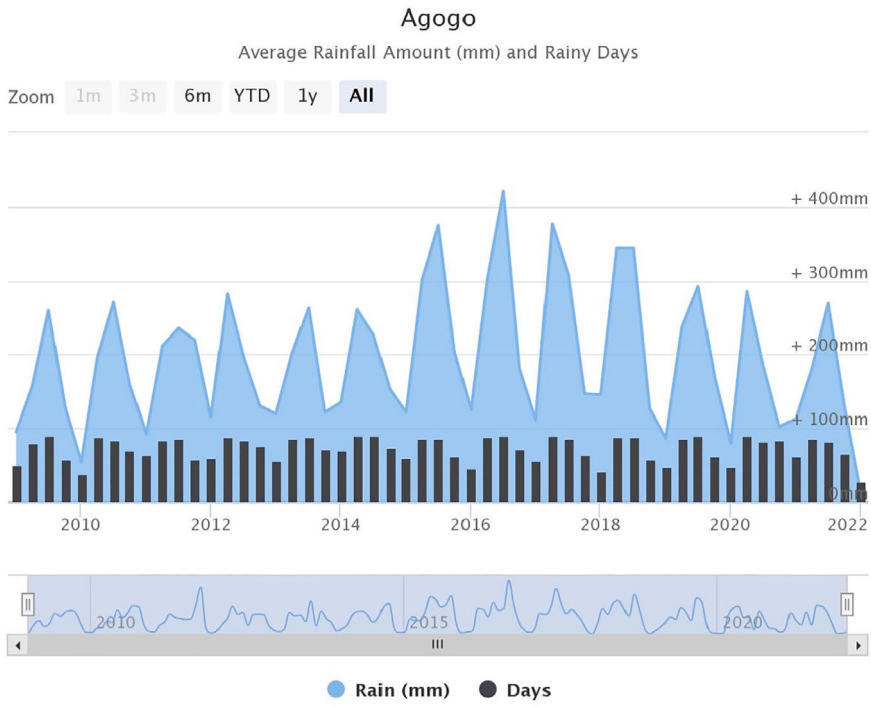

FIGURE 3 Rainfall changes in Agogo between 2010 and 2022. Source: worldweatheronline.com (2022).

research were collected from both primary and secondary sources. Primary data were collected between 20th October 2017 and 15th January 2018. Semi-structured key informant interviews and focus group discussions (FGDs) were employed to collect primary data. A purposive sampling technique was used to select the research respondents predetermined to have in-depth insights about the subject (Bryman, 2012). The research focused on participants who have been affected by the conflicts between 2004 and 2018, because between these years (especially 2004–2012) the conflict was intense and most frequent (Olaniyan et al., 2015). Using the snowball technique, 17 respondents were sampled for the research at the point of saturation. These comprised five Fulani herdsmen, three cattle owners, five crop farmers, two chiefs, one youth leader and one District Peace Council representative. The sample size was determined by no special rule. The in-depth engagement with the respondents yielded saturation at this point. Qualitative studies wherein in-depth interviews are conducted, and information-rich data are sought, use a small sample size determined by the purpose of the study (Creswell, 2009).

Key informant interview involving one-on-one interactions with respondents was used to collect data on their understanding of climate change and migration and the causes of farmer–herder conflicts. Key indicators such as "changes in rainfall frequency and intensity," "extended dry seasons," "drying up of rivers," "too much heat," "reduced amount of grass/pasture," "changes in planting time," and so on, were used to explain climate change to the research participants. Equally, "confrontations between a farmer and a herder," "arguments of disruption of farmer's food crops," "violent attacks on either a farmer or Fulani herdsmen," "destruction of food crops by cattle," "killing of cattle," were also used to define conflicts and their causes (violent or not) to the participants. More so, to understand from the perspective of the Fulani herdsmen what caused them to move to the Municipality, the concept of migration was explained.

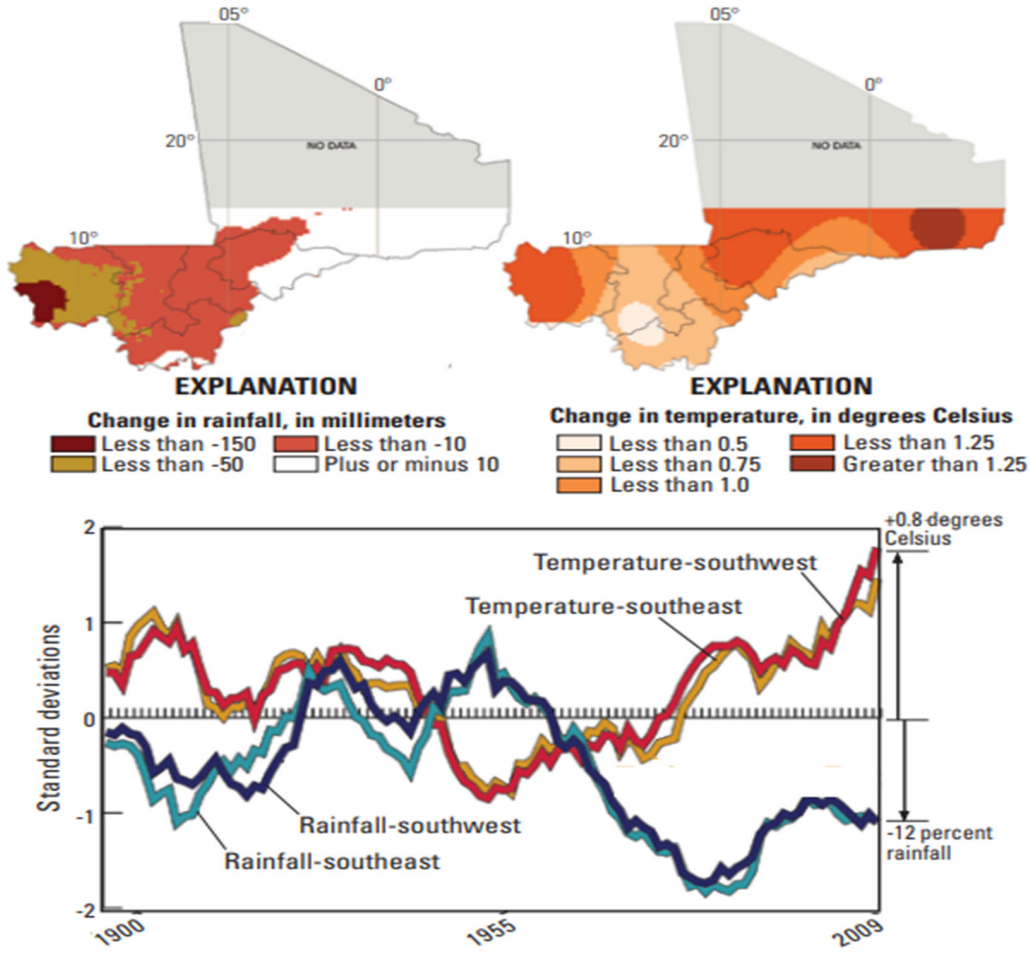

FIGURE 4 Observed and projected change in June–September rainfall and temperature for 1960–2039 (top), together with smoothed rainfall and air temperature time series for June–September for southwestern and southeastern Mali (bottom). Mean rainfall and temperature are based on the 1920–1969 time period. Source: Famine Early Warning Systems Network (2012).

"The movement from one's place of origin to settle either permanently or temporarily in search of a job or better opportunities in another place" was used to explain migration to the participants. Based on this explanation of migration, the purpose of the Fulani herdsmen movement into the Agogo area was solicited. One FGD consisting of 10 participants was later conducted with some selected respondents from the 17 to gather varied perspectives in one setting and for triangulation.

Secondary data on the other hand, were gathered from journal articles, published/unpublished theses, dailies, internet materials as well as reports on major themes such as: climate change and migration; climate change migration; climate change conflicts; climate change, migration, and conflicts in Ghana; conflicts in Asante Akim Agogo; natural resources conflicts; and causes and effects of farmer–herder conflicts in Ghana.

The primary data were mainly collected in three languages, the English language, the local language—*Twi* (for respondents who could not speak English), and the Hausa language (for the

Fulani herdsmen who were not articulate with either *Twi* or English). The responses were later translated into English by the researchers during transcription before the data analysis. Respondents' experiences from the semi-structured interviews and FGDs were grouped into stakeholders such as farmers, herders, and officials. These were aggregated using NVivo10- a computer-assisted qualitative data analysis software. The use of NVivo10 helped by developing coding frames to represent dominant themes and patterns. The contents of these themes were analyzed and interpreted. The aggregated responses were cross validated against field notes and reports from the FGDs, and narratives in the literature. A critical content analytical method was then adopted in the review of previous literature and other secondary materials. Findings from the primary data were compared with the previous narratives on climate change-migration-conflicts nexus from the literature. Certain important comments or quotes were maintained to reflect participants' perspectives (Harding, 1993).

4 | RESULTS

4.1 | Climate-induced migration

As revealed through an unwritten historical account of Fulani migration, the research found that the first Fulani migrant arrived in Agogo from Niger through the Northern and Volta regions to Atebubu in the Bono East region of Ghana in 1996. Due to low rainfall and frequent drought in the North, the intention of this migrant and his family was to settle and graze his cattle in the Agogo area where veterinary service and water and grazing fields were abundant. Upon realization of the potential nutritional impacts of his activity, he was welcomed by the community to settle with his family and cattle. However, the turn of the year 2000 saw a tremendous increase in the population of the Fulani herders since many others migrated with their cattle to join the initial settlers. Interviews with the Fulani respondents revealed three factors that induced their migration. These include climate/environmental variability, scarcity of environmental resources and personal reasons. For personal reasons, the Fulani herders explained that some of them moved to the area to be with their families or to look for opportunities to improve their living conditions.

Among these themes, climate/environmental variability, and resource scarcity were highlighted as the significant factors that first pushed them to migrate southward of the country. A herder who recently migrated to Agogo, in 2016, revealed that:

> Most of us came down here because of the declining quality of the environment. Since the rains do not come as it should, water became scarce, and the cattle did not get enough grass to feed on. I came looking for a better place and have no intention to go back because it is better here than where I come from (Interview, Fulani herder, January 2018).

Another herder basically referred to changes in climatic conditions as the cause of the movement. A 56-year-old herder, herding 102 cattle with his family stated he had been in the area for the past 11 years. He explained that he moved from Burkina Faso to the Agogo area because of resource scarcity (decreasing access to water and grass) for his family and the cattle. He indicated that:

> rainfall patterns changed, drought and heat become too much. There was no water for a long time to drink or cook not to even talk about feeding the cattle. Before I entered Ghana, I lost eight cattle to hunger. So, we continued moving and searching for a better place until we got here through a relative who was already residing here (Interview, Fulani herder, October 2017).

For another herder, he came to the area when he was young with his family, and he had been herding cattle for over 20 years. He revealed in an interview that:

> I was relatively young when I got here with my family. We came here because there was the need for pasture. Till now, the weather has kept on changing with limited access to water and pasture during the drying seasons (Interview, Fulani herder, October 2017).

The Fulani herdsmen see migration as an important adaptation strategy to the impacts of climate change. The research found that the herders have a great understanding of seasonal weather changes. They acknowledged that prolonged drought and increasing temperatures in their original countries are the effects of changes in the weather. The responding farmers during interviews alluded to the claims of the herders, but could not understand why they settled in Agogo and not in other areas. In an interview with a 47-year-old farmer, he revealed that:

> conversations with some of the Fulani guys tell me that they came here mainly because of their cattle, or sometimes they are hired by the indigenes to herd cattle. They indicate that the weather is not favoring their access to grazing fields and water for the cattle during the dry season. It is true since over the years, rainfall has been very unpredictable and temperatures is high, but what I do not understand is why they chose to come here (Interview, farmer, October 2017).

The findings show that climate change pushes herders to migrate into areas of assumed pasture and water availability.

4.2 | Climate change, migration, and farmer–herder conflicts

The research found that climate-induced migration comes with a cost to the activities of both the migrant herders and host farmers. The study revealed that as the population increases, farming activities intensify and grazing fields recede, the farmers and Fulanis both gradually move towards each other. This leads to the encroachment of cattle into farms and farmlands, since they find food crops as an alternative to the depleting grasslands, resulting in initial misunderstandings and subsequent clashes. Interviews with the farmers indicate that the herders are competing with them over scarce natural resources. A herder buttressed this by revealing that because of the drying up in grazing fields, especially during the dry seasons the cattle encroach the farmlands in search of water and green fields. This encroachment sets the ground for contention between farmers and herders over natural resource competition, which together with other factors contributes to the start of the conflict.

Results from the interviews showed that resource scarcity often leads to the destruction of farms and food crops by cattle of the Fulani herders through their activities—a situation that

results in conflicts. During an interview with a traditional leader, he posited that if cattle were kept away from farmlands and food crops, many of the conflicts would have been avoided. He indicated further that the common complaint they often receive is the damage caused to farmers' crops by the herders' cattle, especially during the dry seasons. During FGDs with farmers and herders, it was confirmed that the destruction occurs at night when the cattle are sent out to graze. It was uncovered through the interviews and FGDs that the herders usually roam at night with their cattle in search for food and water but end up destroying farmlands. As a 51-year-old dry season vegetable farmer indicated:

> last year, the destruction caused to my farm produce was devastating. I could not harvest much as I ought to because of the cattle. They started eating the crops even before they could be due for harvest. You know, I farm during the dry season using a river and it is the same river that the cattle also drink when grazing. Instead of the herders to guide the cattle they just allow them to move freely (Interview, vegetable farmer, January 2018).

The destructions usually occur during the dry seasons because water is scarce, and the grazing fields dry up. As the competition over the scarce water and grazing land intensify, confrontations and clashes occur. During wet/rainy seasons, the research found the least occurrence of confrontations when resources such as water and grazing fields are abundant. In these times, the herders move their cattle far away from crop fields. An informant from the District Peace Council revealed that indeed the farmer–herder conflict in the Municipality is arguably caused by resource scarcity such as grassland. An analysis of the report by the Regional Security Council suggests that crop destruction resulting from the lack of green grass is one of the key causes of the conflict between farmers and herders in the Agogo area. The herdsmen during interviews neither denied nor confirmed the allegations of crop destruction against them. They maintained that they do not deliberately drive their cattle into people's farms, but some of the cattle just go astray. The head of Fulani argued that:

> the accusations against us are not fair. We would not intentionally destroy livelihoods. Sometimes the cattle outnumber us, you could have over 150 cattle herded by two herders. Controlling the animals then becomes difficult. Sometimes we walk long hours without adequate pasture for the animals to graze so when they come across food crops, they pounce on them, but we always try to prevent them (Interview, Fulani community head, December 2017).

The Fulani community head further mentioned that the herders need more hands in herding the cattle, but since in most cases the cattle belong to other people, it is the responsibility of the owners to take care of that. Reacting to this, a 67-year-old cattle owner indicated that he (and other owners), are unaware of such situations but they would address that when the herders approach them.

Another aggravating factor in the escalation of farmer–herder conflict was the contamination of water bodies by the cattle. The farmers revealed that usually, the cattle contaminate the very water sources they use to nurse their crops. Some farmers also use the water for domestic purposes and for drinking when they are on the farm. Two important rivers that are consistently contaminated are the *Bontre* and *Asuofu*. Confrontations occur when fecal matter droppings of the cattle contaminate the water bodies. This, according to farmers poses considerable

health complications like Buruli ulcers. In their defense, the herdsmen conceded that destructions are caused by the scarcity of water sources, and that it happens because their cattle also need to survive. They conceived the water as a common good and/or resource available to all for use and as far as the benefits of their cattle are concerned, they cannot help it. From the foregoing, scarcity of resources threatens peace in the area.

However, the findings further reveal three important non-climatic factors that reinforce or exacerbate the impact of climate variability on the conflict. First, it was discovered from the interviews and discussions that a continuous increase in the population of farmers and settled herders as well as newcomers and transhumance herders, has stretched the per-capita resource space in the area. According to a respondent at the Ashanti Regional Peace Council, this demographic change increases the likelihood of conflicts. Second, the view of the Fulani ethnic group as "unruly" nomads (associated with rapes, stealing, armed robbery, murders, etc.), the herders indicated, strains relationship between the Fulani community and the farming communities, and thus conflicts. While the crop farmers claimed these attributes are true about the herder community, previous research in the area, affirms that such attributions amount to identity manipulation in the climate change-conflict narrative (Baidoo, 2014; Bukari, 2017). Third, issues such as the lack of political will, corruption, and ineffectiveness of state institutions to address the conflict, limit the potential of sustained conflict resolution or peacebuilding processes. While the herdsmen blamed the police and other state authorities for taking sides with indigenous crop farmers, both groups accused state actors of corrupt acts in handling the conflict situation, as well as the lack of logistics, especially by the police and the lack of resources for sustained peacebuilding processes.

The triad factors suggest that while population increase forms an integral part of the eco-scarcity claim, the last two non-climatic factors affirm some of the key inherent flaws identified with the scarcity theory. The impact of ethnic contentions on the conflict narrative falls under the political ecology theory while the character of state actors in addressing the conflict largely reflects the political economy related debates. While acknowledging the role of non-climatic dimensions of the conflicts, as indicated before, the authors have addressed the growing debates about climate vulnerabilities and farmer–herder conflicts in one of the hotspots in Ghana, using an empirical basis to further the discussions about climate change and security volatilities arising from the competitions for natural resources across parts of West Africa.

5 | DISCUSSION

Migration is one way of adapting to the impacts of climate change in some regions of the world. Since climate change issues heightened in the new millennia, the movement of Fulani herdsmen to southern areas in some parts of West Africa has become a major security tand developmental challenge. In Ghana, Fulani migration towards the south has been occurring for some decades, either from various West African countries or dispersal of the Fulani from Northern Ghana (Olaniyan et al., 2015). According to the 2010 housing and population census, migrants (people who had spent 12 months or intend to spend more than 12 months in the area) in the Asante Akim North Municipality were 15,004. While 39.2% of this constituted intra-regional migrants, 60.8% of migrants were from outside the District but within the country. As much as 3.3% migrated from outside the country, with the majority being Fulani who engaged mostly in cattle rearing. The movement of the early herders into the Asante Akim area was influenced by climate variability and environmental scarcity. Analysis of the findings suggests that the

impacts of climate change as evidenced in variations in rainfall patterns do not only influence migration, but also adds to the competitive use of scarce resources. The findings agree with previous studies that the migration of Fulani to Ghana is the result of factors such as the veterinary revolution (which resulted in the movement of cattle in areas with veterinary services) and precipitation plunge (Balling Jr., 2005). In Nigeria, Olakunle and Adejoke (2013, p. 106) noted that the movement of the Fulani people in the southwest of Nigeria has been "unprecedented" because of the "unusual weather, unprecedented heat, desert storm, drought, and diseases."

In fact, the seasonality of grass unavailability in the North of Ghana implies that herders have no option other than to migrate down south for better ecological resources. Explaining further the movement pattern of Fulani herders, Aderinoye-Abdulwahab and Adefalu (2012, p. 4) elucidate that "climate change impacts such as desert encroachment make grazing difficult. As most animal grazing is carried out in drylands, pastoralists and their families are usually affected by harsh weather conditions such as droughts, which have serious ecological and socio-economic effects on rangelands." While the cause of herders' migration pattern in the area may be attributed to climate change, some Fulani moved to the area not to primarily engage in herding, but to reunite with families or find opportunities to enhance their living conditions.

The findings suggest that environmental/climate changes do not only influence migration, but also add to the competitive use of scarce resources. The research shows a close link between environmental scarcity and the incidence of conflicts. Throughout history, herders and farmers have found rules and peaceful ways of living together. However, some of these rules no longer work in the modern world with national boundaries given that there is completion for natural resources. As a result, farmer–herder conflicts in many areas of West Africa have been caused by the competition for scarce natural resources. The capacity and ability to gain access to and control productive resources is vital to the livelihoods of both farmers and herders. Usually, the nexus between farmers and herders is dependent on ownership of resources such as land and water. As water and grazing fields deplete both farmers and herders tend to compete for the scarce resources, wherein the competition often ensues in confrontations. In Ghana, violent conflicts between farmers and Fulani herdsmen are caused by the competition over depleting grasslands in the Sahel region (Tonah, 2006). This phenomenon is also what the eco-scarcity theory seeks to explain.

The fault lines in farmer–herder conflicts identified include destruction of food crops, encroachment of farmlands by the cattle and competition for access to water sources. There are also non-climate-induced factors in the intractability of the conflict, mainly rooted in political ecology (usually identity politics). These mostly play out against the migrant herder community, including host communities' accusations of the herders on matters of sexual harassment, arms proliferation, and population increase. Typically, the front lines relate to tensions in two ways: the use of guns by both herdsmen for so-called cattle security and farmers for farmland protection. Thus, both farmers and herders identified specific underlying grievances. The farmers identified encroachment of their farms and destruction of food crops by the cattle, which calls for armed protection and allegations of rape against herders, which then ensue in counterattack organized along ethnic and identity lines with the use. The herders, on the other hand, indicated that the indiscriminate attack on their cattle and poisoning of their livestock through deliberate application of weedicides by farmers requires armed protection of their cattle. The findings agree with previous observations that crop destruction, sexual harassment of women, and related killings are the main cause of the conflict between farmers and herders in the Agogo area (Ghanaweb, 2018).

The growth in population in the area, including migrants, is an indirect contributing factor to the complexities of the conflict. In fact, population increase is noted to fuel climate change and conflicts through excessive exploitation and destruction of resources such as water bodies. An interesting account relates to the unsatisfactory efforts of security personnel by the local people regarding the police addressing the issues of abuse of women by some herders. Even if they act, according to Tonah (2006), the ending of most of the cases is unsatisfying due to corrupt practices. Most importantly, the study revealed that some herders possess guns they use to protect themselves without any training. This is an affront to peace and security in the area. Principally, this dynamic suggests that the providers of the guns are concerned about the economic gains that they will accrue from the security of their cattle. Their interests are not directly linked to the environment but profit. Together, the political ecology theory offers an appealing explanation for these outcomes that the profit-making nature of conflicts flows through the discourses of scarcity and emboldens the propensity of individuals and groups to perpetrate cycles of violence (Wennmann, 2019). These together with institutional weakness tame unscrupulous behaviors that threaten the search for peace in the area as stipulated in the political ecology thought.

6 | CONCLUSION

In Ghana, the bulk of studies on climate change, natural resource scarcity, and environmental issues has focused on conflicts over land use more broadly (e.g., Abugu & Onuba, 2015; Boateng, 2015; Bukari, 2017; Dosu, 2011; Paalo, 2020; Tonah, 2006). Although findings from these previous studies only imply climatic factors in these conflicts—contributing to the peacebuilding literature more broadly—they barely offered deep insights into how specific dynamics of climatic and scarcity matters or their connection to non-climatic circumstances affect the conflict situations. This study, therefore, attempted to address this critical knowledge gap. It does so by offering empirical evidence on climate change-induced Fulani migration into Agogo and further examining how the change in the climate affects farmer–herder conflict in Agogo. Importantly, this study navigated interviews, FGDs, and the scarcity theory to provide an illustrative argument around the contextual dynamics of the nexus between climate change and farmer–herder conflicts. Hence contributing to national, regional, and continental conversation on the subject matter.

The availability of ecological resources has proven to be a major pull factor that attracts migrants to an area considered to be welcoming for economic purposes. Meanwhile, when demand exceeds the availability of these ecological resources because of the realities of climate change, clashes often arise or aggravate. This research has suggested a close connection between climate change induced migration and farmer–herder conflict. It unpacks that to avoid the impacts of climate change on cattle and family, the Fulani herders migrated to the Agogo area in Ghana in search of the favoring climate conditions. However, on arrival, resource stress and scarcity realities often ensued in confrontations and violent conflicts. The frequent clashes and conflicts between the herders and farmers in Agogo are caused primarily by environmental scarcity and the competition for water and grassland use, especially during the dry seasons. Although this is supported by the eco-scarcity theory, other socio-political, and economic conditions like population growth, farmer and herder armed protection, sexual offense and weak institutions join with ecological factors to complicate the farmer–herder conflict.

As the findings of this research show, it is recommended that the Ghanaian government through the Municipal Assembly and local government departments should develop workable

policies that will ensure the creation of grazing fields and reserves for pastures and dams (water source for herders and their cattle to avert entering farms and farmlands to indiscriminately destroy crops). There should also be an intensive education by the National Commission for Civic Education to ensure regular meetings involving both the heads of farmers and Fulani herders and the Ministry of Food and Agriculture on the need for peaceful coexistence and community development. This, according to the research, would impact a significant relative peace in the Agogo area.

CONFLICT OF INTEREST

No potential conflict of interest was reported by the authors.

AUTHOR CONTRIBUTIONS

Abdul Karim Issifu conceived and designed the analysis, contributed data, wrote, and supervised the entire article. Francis Diawuo Darko collected the data and performed the main analysis. Sebastian Angzoorokuu Paalo: contributed to the data analysis, theoretical arguments, and Francis Diawuo Darko verified the analysis tools. Taken together, all three authors discussed the results and contributed to the final article.

DATA AVAILABILITY STATEMENT

Data available on request due to privacy/ethical restrictions

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