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## Assessing the Role of Local Institutions in Flood Resilience among Rural Communities in Northern Ghana

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*Adaptation Strategies, Adaptation, Floods, Institutional Mechanisms, Institutions*

### ABSTRACT

This study investigates the roles of local institutions in shaping flood adaptation strategies among rural communities in Saboba District, Northern Ghana. Using interviews and focus groups, the research identifies four key adaptation practices: Off-season farming, Burning Charcoal, processing of shea nuts, and Cattle rearing. Both formal institutions, such as the Ministry of Food and Agriculture, and informal ones, including chieftaincy and family units, were found to be integral in providing resources, governance, and conflict mediation related to these practices. The findings reveal that while institutions facilitate access to adaptation resources, they also introduce barriers. Factors such as favoritism, limited resource distribution, and exclusion of vulnerable groups, particularly women and widows, hinder equitable adaptation outcomes. Local institutions enable community-led responses to climate hazards by coordinating external support and guiding decision-making; however, they also perpetuate social hierarchies that can limit adaptive capacity. The study suggests that fostering collaboration between formal and informal institutions, improving resource allocation transparency, and ensuring gender inclusion in decision-making could enhance community resilience. This research contributes to understanding how institutional dynamics influence adaptation practices, highlighting the need for adaptable, inclusive frameworks that support effective flood resilience in vulnerable rural communities.

### INTRODUCTION

The negative effects of floods will hit low-income rural households around the world more than wealthier ones (Hallegatte *et al.*, 2020). How rural inhabitants in Sub-Saharan Africa dealt with environmental hazards like floods in the past was influenced for decades by local-level institutions and their arrangements (Nyamwanza & Kujinga, 2017). One way that future external interventions can help with adaptation to climate change (Amosah *et al.*, 2023) and its effects, such floods, is through the mechanisms already in place at the local level, such as institutions and their arrangements. Given the local nature of climate change adaptation, it is of the utmost importance to have a deeper understanding of how local institutions and their arrangements influence adaptation strategies and the ability of marginalized communities to adapt (Islam & Nursey-Bray, 2017). Formal and informal private, public, and civic institutions are the three kinds of local institutions that can play an important role in adaptation. In rural areas, they play an essential role in Sharing knowledge, gathering and distributing resources, developing and enhancing skills and capacity, leading, and engaging with stakeholders and institutions. As a result, they modify the effects of climate-related dangers, like floods, on livelihoods. According to Mubaya and Mafongoya (2017), no institution can withstand the effects of floods without other institutions. To what degree do rural households and communities face various environmental hazards, such floods? This is greatly influenced by institutional and social variables.

This shows how crucial it is to incorporate flexibility into all levels of institutions. According to Eriksen *et al.* (2021), there are three significant ways in which community-based social institutions influence the impact of climate hazards: In the context of adaptation, they facilitate the distribution of external support, impact household's response capacity for climate effects and pursue different adaptation techniques, and impact the ways in which households are affected by climate impacts. Local informal institutions play a crucial role in helping rural communities adapt to flood events, but they are underfunded and under supported by both the government and outside interventions (Mubaya & Mafongoya, 2017). Most forms of external funding go via already formal institutions. More often than not, formal local civic institutions are the ones with which external public institutions engage in adaptation activities. Consequently, fostering collaborations between informal processes and formal actions to support adaptation could enhance adaptable potential and mainstream adaptation (Amosah *et al.*, 2023). This study aims to explore the role of institutions in the adaptation strategies of rural communities in the Saboba District of Northern Ghana, considering the socio-cultural diversity typical of many African societies.

### MATERIALS AND METHODS

#### Study Area

The Saboba District is one of sixteen districts that make up Ghana's Northern Region; it is located in the north

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eastern corridor of the Oti River basin (Chegbeleh *et al.*, 2020). The district's administrative capital is Saboba town. The 1,751.2 km<sup>2</sup> district is situated between 27° and 13° East longitude and 24° and 25° North latitude. There are other districts that the Saboba District has borders with. It lies between Cheriponi and Tatale Sanguli to the north. The municipalities of Yendi and Gushiegu border the western half of the district. The Republic of Togo and Ghana are geographically separated to the east by the Oti River, which also forms their international boundary between the two countries. There are two main seasons that occur all year round in the district's Savannah climate. The dry season typically lasts from November to April

or May, whereas the uni-modal rainy season typically begins in April or May and continues until October or November.

During the dry season, the arid northeast trade winds, or Harmattan, are noticeable. An abundance of sunshine, particularly from March to May, characterizes the district (GSS, 2010). Kursah *et al.* (2017) reports that the district gets between 950 and 1050 millimeters of precipitation each year. Temperatures in the Saboba District ranges from 21 to 41 degrees Celsius year-round (Dogbe *et al.*, 2013). The unique ecosystem of the area is enriched by this climate feature. According to GSS (2021), 95,683 individuals reside in this district as their home.

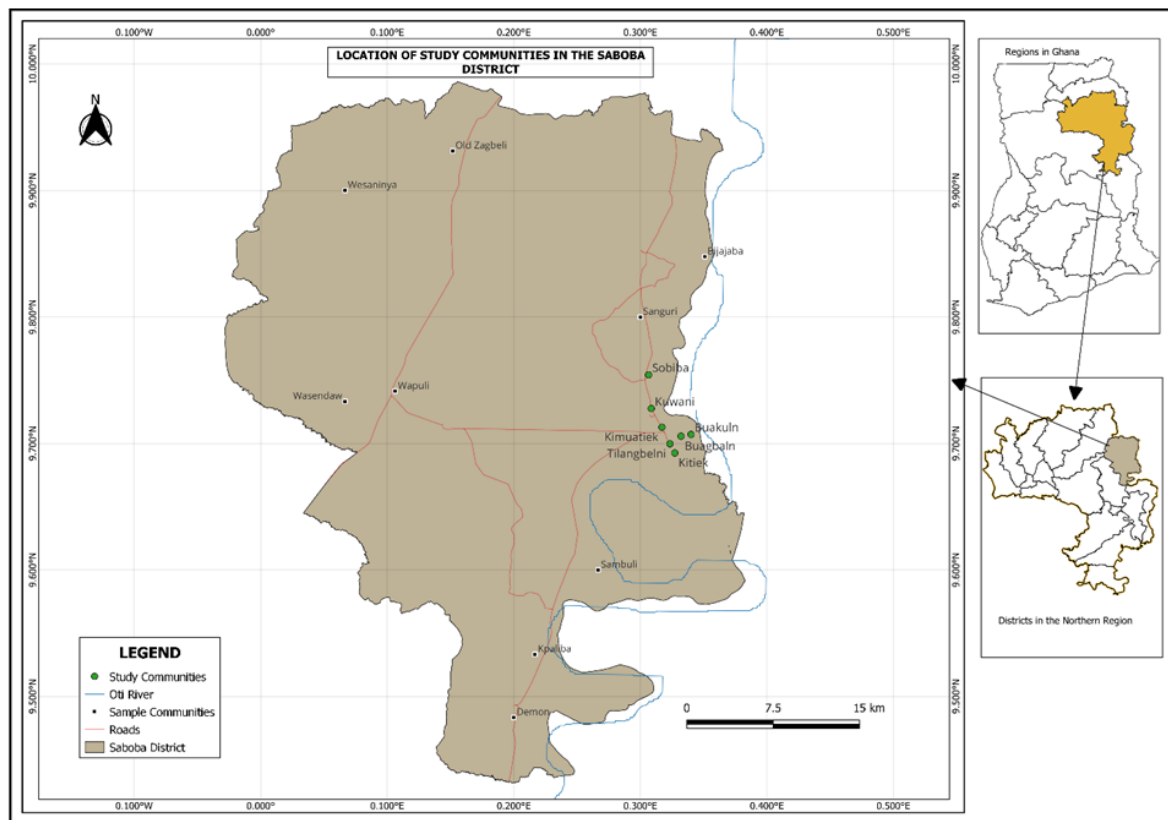


Figure 1: Map of the study area, Source: author's construct

### Data Collection

Interviews with key informants and focus groups (FGDs) were the main methods of data collection. Ten people from each of the communities made up each FGD. Seventy people in all participated in the focus group discussion. According to GSS (2021), the gender distribution in the district was used to choose 70 participants for the FGD. The district had 49.3% males and 50.7% females. Discussions took place on different days, and participants were divided into two groups based on their location within the research community. Both being a local smallholder farmer of the study community and being nineteen years old were the criteria for participant selection. It was believed by the researcher that participants who were resident farmers and had reached the age of nineteen would have a better grasp of the adaptation tactics used in the study region and

would be able to provide more insightful comments. In order to collect data from the focus group, the researcher used an audio recording device. The recording was duly communicated to the participants. The researcher also made note of the key informant interviews' replies using a notepad and pen. Fourteen in-depth interviews were carried out with community members aged 50 and up to glean additional information about the flood adaptation practices, their development and implementation in the communities, the connections between these strategies and responses to flood impacts, and the different institutional arrangements in place. Residents of the study community who are smallholder farmers and were fifty years of age or older were the selection criteria for the key informant interviews. People living in the study area who were fifty or older were presumed to have seen the different adaptation techniques develop over time

and to be familiar with the institutional frameworks that control these strategies.

**Data Analysis**

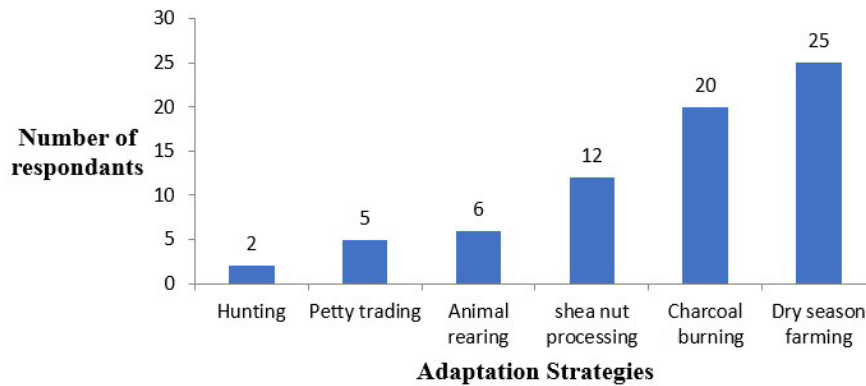
Qualitative content analysis was used to analyze the data. This method uses coding rules to systematically and reproducibly reduce large word counts to a smaller set of content categories. After each topic of questioning was covered, the transcripts were coded based on the answers. Subsequently, the data was examined and classified into significant subject areas. The data transfer

and comparison process revealed several new themes and subthemes.

**RESULTS AND DISCUSSION**

**Flood Adaptation Strategies**

Figure 2 shows the results of a series of focus groups conducted across the study area. Twenty-five participants out of seventy ranked off-season/dry season farming as the most practiced adaptation strategy, while twenty ranked charcoal burning, twelve (12) ranked shea nut processing, and six (6) ranked animal rearing.



**Figure 2:** Flood Adaptation Strategies in Saboba district  
*Source: Field Survey, 2023*

In the study area, people have begun using the aforementioned adaptive mechanisms as a means of livelihood. The present prevalence and extent of practice, however, are attributed to stresses in agriculture, according to key informant interviews. Complete crop failure and low agricultural output have been the norm for the farmers in recent years, brought on by insufficient rainfall and flooding. Therefore, they are currently looking at other ways to get money that don't depend on the weather to sustain their main occupation, which is farming. In July 2023, at Interview 4-Kitiek, a farmer responding to a question stated: 'That our farms have experienced very little crop production as a result of heavy flooding'. Other significant information sources across the study area corroborated this. According to the locals, the weather is the main cause of the drop in harvests. Soil fertility loss, reduced rainfall, extended floods, and high temperatures were all factors they cited as contributing to the reduction in crop yield. Because of the poor harvests, which were largely caused by the weather, they looked for other ways to increase their revenue from farming (Nacaya *et al.*, 2023). As a result, the aforementioned adaptation strategies have been intensified to ensure survival. In response to crop failure in the research area, key informants have reported that the practice of these adaptive measures has increased in frequency, scope, and severity over the years. Water, vegetation, and land were determined to be the principal critical resources needed to successfully apply these flood adaptation techniques. Therefore, people living in rural areas need access to the appropriate natural resources if they want to employ these adaptation strategies.

**Institutions Identified in the Study Area**

Several institutions were determined to play a vital part in regulating the execution of the flood adaptation strategies. These included the chieftaincy, the Utindan (landlord), farmer-based organisations, youth groups, women's groups, and the nuclear and extended family. In addition to the aforementioned social institutions, Food and Agriculture Ministry (MoFA), the Saboba Local Assembly, National Disaster Management Organization (NADMO), and NGOs like World Vision Ghana and the Evangelical Presbyterian Church of Ghana's agricultural unit were among the formal institutions that offered support.

**Institutions as Mechanisms for Governance**

The study revealed that the study area's application of flood adaptation measures was heavily influenced by a number of institutions. These included the chieftaincy, the Utindan (landlord), agricultural associations, youth organizations, women's associations, and the family (both nuclear and extended). These adaptation strategies include Off-season farming, Burning Charcoal, processing of shea nuts, and Cattle rearing (Takai *et al.*, 2023). These organisations play an essential role in ensuring that smallholder farmers obtain the resources they need to adapt to floods. According to the study, these social institutions were able to successfully regulate and implement adaptation strategies to floods because of the support they received from specific formal organisations (Takai *et al.*, 2023). These formal institutions included Food and Agriculture Ministry (MoFA), the Saboba Local Assembly, National Disaster Management Organization

(NADMO), and NGOs like World Vision Ghana and the Evangelical Presbyterian Church of Ghana's agricultural unit. These formal organisations mainly helped out by distributing better seeds and resources (such as wire nets for fencing) and by providing logistical and financial support. They also ran training programs and helped create capacity.

### **Institutional Frameworks for Managing Flood Adaptation**

After interviewing key informants and participating in focus groups in each of the seven selected villages, the researcher found that all of the communities had similar institutional frameworks for the various flood adaptation strategies. Agriculture during Off-season, Burning Charcoal, processing of shea nuts, and Cattle rearing were all governed by the various institutional frameworks discussed in this section. In reaction to actual or anticipated changes in the weather, humans and other natural systems undergo a process known as adaptation (Castro & Sen, 2022; Takal *et al.*, 2023). Several flood adaptation strategies, such as off-season farming, burning charcoal, processing shea nuts, and cattle rearing, were identified as efficient coping mechanisms by rural communities affected by floods, according to the study. All around the research region, people have been using these adaptation strategies to stay alive. Interviews with key informants revealed that agricultural stresses affected the frequency and scope of the present adaptation practices (Takal *et al.*, 2023). It appears from the data gathered from interviews with people in each of the seven study communities that these practices were historically seldom employed when smallholder farmers enjoyed bountiful harvests and could provide for their families all year round. Shorter rainy seasons, long droughts, and frequent flooding during the peak of the rainy season impair farming (Boansi *et al.*, 2019) in the study region, which is a crucial livelihood for the inhabitants. Since smallholder farmers are most affected by weather fluctuations, they have ramped up the use of these strategies. According to Jurjonas *et al.* (2020), marginalized communities feel the brunt of climate change's negative effects, such as floods. Furthermore, local social institutions play a vital role in deciding which socioeconomic groups have access to and make use of certain assets and resources. According to Jurjonas *et al.* (2020), specific institutional frameworks determine whether adaptation strategies work in any given area. Based on the findings from the key informant interviews and focus groups, the study found that different institutional configurations required different adaptation approaches to be implemented. Out of the seven areas studied, four were found to be the most effective in preparing for floods. Off-season farming, Burning Charcoal, processing of shea nuts, and Cattle rearing were all part of these pursuits. Different institutional structures were in place for each of these endeavours. Patnaik (2021) classifies the Utindan, women's collectives, farmer associations, chiefs and their elders, and the family

unit as civic informal institutions. These groups were primarily responsible for adopting adaptation techniques. Although the people involved may be the same, different institutional frameworks control different adaptation strategies (Matthews *et al.*, 2015). The reason behind this is that various adaptation tactics call for different kinds of regulations and depend on different kinds of natural resources to be put into play. At the individual and group levels, there were a variety of regulatory frameworks. In cases of farming during the dry season, the leaders of the individual families would punish anyone who disobeyed. During the dry season, the chief, his elders, and the utindan all work together to control who can and cannot farm the communal land. The community or individual households imposed regulations on the burning of charcoal. While the head of the family would typically allocate trees on family land for charcoal burning, the community leadership would authorize the allocation of trees on community lands. Also, it's important to remember that different adaptation strategies called for different kinds of resources. According to Jurjonas *et al.* (2020), institutions regulate access to adaptation resources by acting as conduits for their provision. This finding lends credence to their assertion. For farming during the dry season, land was the most important resource in the research area. The institutions in charge of allocating this resource were the Utindan, the chief and his elders, and the heads of families (Takal *et al.*, 2023). Charcoal was made from trees, and the people responsible for allocating it were the chiefs and their elders, utindan, and heads of families. The women's groups were responsible for purchasing the shea nuts, which were a vital ingredient in the shea nut processing. The ownership of a resource, which was strongly associated with the type of institution, determined whether or not it could be used in an adaptation strategy. Community or family ownership was the norm. It was easier to acquire natural resources with the help of these different institutional structures. Therefore, the chosen institutional structure should be based on the unique adaptation strategy and the necessary natural resources (Takal *et al.*, 2023).

### **Institutional Mechanisms for Off-Season Farming**

According to the findings, the institutional setup for farming during the dry season varied according to the dominant land ownership type in the studied area. It was determined that these parcels of land belonged to families or communities. Additionally, indigenous people and migrants had distinct institutional systems.

### **Institutional Mechanisms for Acquiring Family Land**

It came to light that the institutional arrangements around family land were as follows: whomever wished to utilize family land had to do two things: find the specific plot of land along the Oti River, and then get in touch with a relative as the primary contact. On the land seeker's behalf, the relative contacts the head of the extended family. The head of the extended family then convenes a

gathering of all the married males in the extended family to discuss if the land should be granted to the individual for use during the dry season. This is the institutional setup for migratory workers, as described above. For indigenous people, the process of obtaining land for off-season farming is as simple as contacting the leader of the household, who will then convene a gathering of all married men.

### **Institutional Mechanisms for Acquiring Community Lands**

Community members, family heads, chiefs, and Utindan (landlords) were the primary players in acquiring communal land for off-season farming, according to the study. The prospective farmer who plans to work the land during the dry season approaches any member of the community and lets them know what they want. An individual from the community went to the head of their family to report the matter. Additionally, the head of the household will approach the utindan (landlord) on the land seeker's behalf. The utindan then meets with the community chief for advice before calling a meeting in the chief's palace with the chief and his elders. The member of the community who was contacted relays the meeting's outcome to the potential farmer for the dry season. This is the institutional setup for migratory workers, as described above. If an indigenous person wants to farm during the dry season, he or she contacted the head of his household. Additionally, the head of the household will approach the utindan (landlord) on the land seeker's behalf. After consulting with the community chief, the utindan calls a meeting of all three of them, along with the chief's elders. As outsiders, migrants aren't familiar with the ins and outs of the communities where they're settling, so they had to find a community member to help them navigate the land-acquisition process.

### **Institutional Mechanisms for Burning Charcoal**

It was found that depending on who owned tree or trees, there were two primary approaches to acquire trees for this adaption technique. These trees were found on both private and public property. Hence, the location of the tree dictated the arrangement's institutional structure. This institutional framework differs based on the migrant or indigenous status of the prospective charcoal burner and the ownership of the property on which the tree was to be cut down.

### **Institutional Mechanisms for Trees on Family Lands for Burning Charcoal**

Members of the family, including the head of the household, the prospective charcoal burner, and the married men, were involved in the process of acquiring a tree on family land. As part of the established protocol, someone wishing to cut down a tree on private property had to locate the tree or trees in question before contacting a relative. On the charcoal burner's behalf, the

relative approached the head of the extended family. In order to determine whether the tree on the family land should be handed to the individual to produce charcoal, the leader of the extended family calls a meeting of all married men in the extended family. The locals disclosed that the choice of tree species dictated whether or not the trees were given out for charcoal making. For example, the head of the household never allocated a "dawadawa" tree for charcoal production (Takai *et al.*, 2023).

### **Trees on Community-Owned Land**

Members of the community, including the chief, family heads, and the utindan (landlord), would primarily deal with the acquisition of a tree (or trees) on communal land for the purpose of charcoal burning. The person planning to burn charcoal reached out to anyone in the community and informed them of their purpose. After making contact, the community member informed the head of their household about the problem. On the charcoal burner's behalf, the head of the household also approached the utindan (landlord) with the request. After consulting with the chief, the utindan calls a meeting of all three of them, along with the chief's elders. Afterwards, the member of the community who was contacted relays the meeting's outcome to the potential charcoal burner. Following the visit to the family head, the procedure continued as previously described for an indigenous person.

### **Institutional Mechanisms for Procession of Shea Nut**

The first step was a gathering convened by the group organizer, when the ladies determined the quantum of nuts to buy and how much money to put in. Two women were selected by the group leader from among those who had bought nuts from the Republic of Togo and additional inland areas of the district. After the nuts were bought, the group's leader convened a second meeting to schedule the turning of the nuts into butter. Following processing, the group leader delegated sales of the butter to two other ladies who reported back to her.

### **Institutional Mechanisms for Cattle Rearing**

Members of the family would add their own cattle to that of the head of the family as part of the institutionalization process. The head of the family also negotiates the terms of agreement with the Fulani. The cattle owners' financial capabilities and the Fulani herdsman's proposed terms determine the final agreement. It was common practice to agree to support the Fulani man and his family financially by covering their housing, food, and medical bills. In certain instances, the Fulani man was also granted lodging, some land to cultivate for his family's food, and a cow every five years. After the family head and the Fulani man reached an agreement, the Fulani man was hired to tend to the cattle. The head of the family took it upon himself to notify the community chief and his elders of the agreement reached.

### Description of the Flood Adaptation Strategies

Therefore, the main flood adaptation strategies that run throughout the seven communities and were extensively practiced included the following:

1. Off-season farming,
2. Burning charcoal,
3. Processing of shea nut
4. Cattle rearing

#### Off-Season Farming

Farmers in the study area had to deal with the unpredictable nature of the weather because of climate change. The rainy season might sometimes arrive late and depart early. There were instances when the rains arrived late and were quite intense, leading to floods and the complete ruin of the harvest. On a different occasion, a drought was brought on by extremely low rainfall. Because of these climate variations, farmers had a harder time predicting when to sow, when to prepare the land, and which crops to cultivate. Those living along the Oti River were the most affected, as the devastating floods that occurred there frequently washed away their farms. Also contributing to this was the fact that, during the dry season, most agricultural activities took place along rivers in an effort to circumvent water scarcity. In order to increase their revenues, farmers in the study area have resorted to dry-season farming due to the climate's volatility, particularly in regards to rainfall patterns. The Saboba people farmed the land along the Oti River during the lengthy dry season. During the study area's peak dry season, which began in October and concluded in May, farming activities began. The farmers clear the area of any vegetation and then surround it with a fence made of wood or wire. Vegetables, along with maize and beans, are the most common crops cultivated. The crops were watered by means of pumps or water cans that drew water from the Oti River. During the rainy season, farmers would often forego tending to their dry-season gardens in favour of their more conventional farmlands. Once the rains subsided, they would return to their dry-season fields.

#### Burning Charcoal

The study area's charcoal was traditionally made using the mound/pit method, which involved creating tiny holes as big as a cubic meters to contain little pieces of fairly dried wood. This method of burning charcoal involves starting a fire in a pit and then adding dry, small fuel to strengthen the fire. The pit was filled with additional wood, and the fire kept burning continuously. Before shoveling earth about twenty centimetres thick on top of the wood fuel, a layer of new leaves approximately twenty centimetres thick was laid. After letting the hole carbonize for two days, it could be opened. When the pit is unloaded, water could be necessary to avoid ignition. The quality of the charcoal varied, and an excessive amount of ash was produced when little pieces of wood and bark were utilized. The charcoal burning was done on a modest scale by individuals rather than in groups.

### Processing of Shea Nuts into Butter

The majority of shea nut processing in the research area was carried out by women's groups using traditional wet processing methods. This involved roasting the nuts using significant quantities of wood, which was a lengthy and difficult operation. World Vision Ghana was one of several non-governmental organisations (NGOs) that attempted to automate the procedure on behalf of local women's association. The majority of the women belonged to groups of twenty-five or more. Each nut was hand-pounded with the end of a pestle to remove its shell. Particles of kernel were collected and then roasted on a metal sheet in a fire. To make a smooth paste, the kernels were first crushed in a mortar to a coarse consistency and then grounded between two stones. The time required was proportional to the nut's quality. The mixture's hue lightened towards the conclusion of this period, prompting the addition of water. Afterwards, the frothy white shea butter rose to the surface of the mixture. The stirring operation was now performed with considerably less force. With a spoon, the oil was carefully spooned out of the dark brown residue, and it was washed with warm water until it was clean. By boiling it, the excess water evaporated. It was then left to cool and solidify so that any impurities may settle out. A fire was lit, and the butter was cooked until it turned transparent. After the oil has been let to sit overnight, it was stirred with small sticks the following day once it had solidified. After that, the shea butter that was produced could be put to good use.

#### Cattle Rearing

In the area under investigation, keeping the cattle was structured at the household level. In the name of the head of each extended family. According to key informant interviews conducted with the study's elderly participants, people in the study communities used to have their children tend to the animals, but after seeing the value in sending their children to school, they began hiring Fulani herdsman to do the same. On behalf of all members of the extended family who own cattle, the kraal was owned by the head of the family. Along with the Fulani herdsman, the family head negotiated the conditions of the arrangement. It was not uncommon for the Fulani man and his family to be promised food, lodging, and even medical care as part of the bargain. In certain instances, the Fulani man was also granted lodging, some land to cultivate for his family's food, and a cow every five years. If any animals went missing, the Fulani man held responsible. The expense of treating ill animals falls on the individual owner of those animals. It was also customary for a family member to notify the head of the extended family in advance of any cattle transaction.

### Effects of Institutional Frameworks on Flood Adaptation Decision-Making

One of the main obstacles to adaptation is institutions, which impact decision-making (Birchall and Bonnett,

2021; Takal *et al.*, 2023). People acted alone or in small groups to make these decisions. The women's groups in the research area who processed butter from shea nuts made decisions about flood adaptation as a whole. Decisions were made on the most efficient means of obtaining nuts in order to implement the adaptation strategy. The specific adaptation approach, however, was the basis for decision-making. For example, because the shea nuts weren't within the group's jurisdiction, the women's group that processed them into butter decided to send money to the Republic of Togo to buy them. Because the access to shea nut trees could not be guaranteed by the institutional mechanisms regulating this adaptation practice (Takal *et al.*, 2023), the women's association resolved to pool resources in order to sustain this flood adaptation strategy, which they all accepted was beneficial to them. The negative attitude towards work by the women's group members was designated as the second institutional effects. Decisions were also prompted by this effect. In most cases, the women would share the earnings from their endeavours according to how much they had contributed. They agreed to share up the butter sales proceeds according to everyone's contribution, timeliness, and seriousness to work in addition to their individual contributions; this was in response to the problem of people's negative attitudes towards labour. In order to move on with this specific flood adaptation technique, the women's group decided to buy nuts for the procession. Decisions were also spurred by the charcoal producers by the influence of favoritism by the Utindan and the chief on tree management on communal land. To acquire access to trees to ply their trade, they sort the aid of other royals who intervened. Collaborating with other royals to obtain access to trees requires financial investment. Having other royals become involved makes things take longer and could make future access to natural resources like trees and land for flood adaptation more complicated. In order to implement this flood adaptation method, this decision has also facilitated the acquisition of trees on community grounds by the rural people. In order to improve their adaptation techniques, farmers during the dry season also sort the involvement of other royals to gain access to community lands. Also, rural residents had no choice but to decide to charge the Fulani herdsman for each animal that went missing. The goal of this choice was to lower the rate of animal theft in the research study.

#### **Effects of Institutional Mechanism on Decision-Making Regarding Off-Season Farming**

Focus group discussions during the research showed that when the utindan (landlord) or chief shows favoritism, it took a royal or close family of either of them to help the people of the study area gain land. This happens when there is a delay in land acquisition caused by favoritism. The fact that there were respected community elders who were well-regarded by both the commoners and the royals was also brought to light. When issues of favoritism arose, the communities would look to these respected

elders for guidance. Since the chief and the landlord do not have direct control over family holdings, they turned to them when everything else failed, as brought up in the focus group discussion. While acquiring land from a family was considerably simpler than from the community, the caveat was that there was a cap on how much land one could purchase from a family due to the huge average family size. Land constraints forced rural residents to get creative, growing more crops in a smaller space.

#### **Effects of the Institutional Mechanism on Decision-Making Regarding Charcoal Production**

Regardless of the benefits, residents of the seven research communities felt that this institutional setup was hurting their charcoal production business. In that case, the residents gain trees on community lands through the assistance of other royal members or relatives of the chief or utindan, as shown during the focus group discussion surrounding the subject of favoritism by the utindan and the chief. The problem with acquiring trees on family land for charcoal production was that, due to huge family numbers, one could only obtain a few trees for the purpose, even though it was far easier to do so than on community land. The fact that certain community elders were held in high esteem by both the "commoners" and the royals was also disclosed; it was upon these revered elders that the prospective charcoal burners depended for intervention. Nobility and respect were common traits among the community's perceptions of the royal family, and as a result, they did not seek payment to intervene in such matters. Additionally, it was brought up during the focus group discussion that in the event that all of this failed, they would turn to trees on family lands, as neither the landlord nor the chief had any direct control over those trees.

#### **Effects of Institutional Mechanism on Decision-Making on Processing of Shea Nuts**

Although it brought them together, the regulatory structure for processing shea nuts was perceived as having a detrimental effect on the processing shea nut as an adaptation practice. Togolese officials and other communities in the district had chased the women and barred them from gathering shea nuts on multiple occasions because the trees were mostly in the Republic of Togo and in the district's inner communities (Takal *et al.*, 2023). They went ahead and bought the nuts from the Togolese. Despite the fact that adapting was costly because of the difficulty in getting shea nut trees, the women's organisations frequently got financial assistance from World Vision Ghana to buy the nuts for processing. They were able to keep up with this adaption approach because they bought the nuts. During the discussion, they came up with a solution to the problem of members' negative attitudes towards work. They decided to divide up the butter sales proceeds according to members' contributions, punctuality, and seriousness to work.

### **Effects of the Institutional Mechanism on Adaptation Decision-Making on Cattle Rearing**

The most difficult parts of animal rearing were dealing with the inevitable death of cattle and the incessant complaints from farmers whose fields had been ruined by the animals. They blamed the Fulani herders for the cattle's disappearance during the Focus Group Discussions (FGD). As a result, many of them entrusted their children, who were meant to work the land or attend school, with the responsibility of caring for the cattle. The animal also owners split the fines levied by the chief with their respective Fulani herdsmen in regards to the frequent summonses to the chief's palace caused by the cattle's devastation of crops.

### **Impacts of the Institutional Mechanisms on Flood Adaptation Practices**

#### **Impacts of the Institutional Mechanisms on Off-Season Farming**

The influence of the aforementioned institutional mechanisms were classified into two primary categories: positive and negative impacts

#### **Positive Impacts**

The benefits discussed during the focus group meetings included serving as a mediator, providing a means of resolving conflicts, and providing a sense of safety. The following were some of the unintended consequences of this institutional setup: land limitation, favouritism and cronyism in land allocation for off-season farming, and the susceptibility of rural residents to this mechanism.

### **Impacts of the Institutional Mechanism on Charcoal Production**

#### **Positive Impacts**

The charcoal burner felt safe as a result of this arrangement. As the focus group discussion progressed, it became clear that this institutional arrangement provided a safety net for the trees they had been allocated. That is, they had to go through the "legal" channels to get the trees for their charcoal business, so they were safe and sound. Furthermore, it functioned as a medium for resolving conflicts. The rural dwellers also disclosed that the institutional arrangement for charcoal burning prevented disputes among the different charcoal burners. In other words, this arrangement allowed them to swiftly settle any disputes that occurred between them.

#### **Negative Impact**

The main negative consequence of this institutional setup was the corrupt tendency of individuals in the allocation of trees to charcoal burners. It was found that certain persons appeared to benefit from the institutional system for charcoal burning, particularly regarding trees on community land. It was mentioned that the royals enjoyed preferential treatment due to their status, in contrast to non-royals. It was mentioned, for example, that a relative of the chief or the landlord would certainly breeze through these institutions.

### **Impacts of Institutional Mechanism on Processing of Shea Nut**

#### **Positive**

The women were able to approach the Saboba local assembly and Non-Governmental Organizations (NGOs) for logistical and financial assistance after they formed the group. Rather than individuals, these NGOs favoured supporting groups. For example, women's groups in the research area had consistently received funding and training from World Vision Ghana. The lack of shea trees and a negative attitude towards work were two examples of the negative repercussions.

### **Impacts of the Institutional Frameworks on Cattle Rearing**

#### **Positive Impacts**

Channel for Conflict Resolution between the Fulani Herdsmen and the Animal Owners, Source of Unity and Security for the Animal and Farm Owners.

#### **Negative Impacts**

Loss of Animals.

### **Impacts of Institutional Mechanisms on Effective Flood Adaptation**

#### **Positive Impacts**

According to the results of the focus groups, a positive effect of the institutional arrangements was that they helped to resolve conflicts and mediate disputes, which in turn made their activities more secure. For example, during the dry season, farmers would let their animals roam and graze freely, as this was also when the crops were at their peak. Animals like these might ruin the crops grown during the dry season, making it harder for people living in research area to practice their adaptation practices. Since the farmers had legally acquired the land on which their off-season farms were located, these arrangements allowed them to safeguard their farms. So, it was quite normal for the farmers to take legal action against any animal owner who let their animals ruin their garden. They could bring the owner before the utindan and the chief to demand restitution. Due to their involvement in the distribution of plots to farmers during the off-season, the utindan and chief typically took such summonses quite seriously. The farmers were made to wait at the chief's palace for their compensation after the animals were taken into custody to make sure they were paid for their losses. People living in the research area were able to resolve conflicts through these institutional arrangements. According to the study's findings, land grabs were a common source of tension among the farmers. There was certain to be conflict as a result of the interplay between the many individuals that made up the many institutional arrangements and their shared goal of adjusting to the effects of the flood. Three types of conflict were identified by the research as commonly occurring: When livestock or wildlife invaded farms in search of food, as happened when farms were situated along the Oti River during the dry season, there

was a conflict between farmers and pastoralists, or Fulani. Another conflict that arose was when livestock destroyed crops in an attempt to reach watering spots. Lastly, there was conflict as a result of land contestation, which happened when multiple farmers disputed over the actual boundaries of their plots. This is in line with what Renner (2020) found while studying the role of players and networks in resolving resource conflicts in rural Kenya in the context of climate change and its consequences. As a result of the interactions between the many actors involved in obtaining and utilizing natural resources, particularly water and land, they found farmer-livestock and farmer-pastoralist conflicts. These institutional frameworks served to end these disputes. Within the research area, the Chief and his council of elders, and Utindan were the primary institutions tasked with mediating such disputes (Takai *et al.*, 2023). The individuals participating in the institutional framework for resolving these disputes held differing opinions regarding the quasi-formal actors for conflict resolution. These actors included the local chief, elders, extension officer, and police officers, as identified in Renner's research on rural Kenya. The quasi-formal strategy for resolving the issue in rural Kenya included official state actors like the police to ensure that compensation was paid, in contrast to the study area's arrangement, which was made up solely of informal actors. Conflicts that develop as a result of engagements between institutional participants can be resolved by utilizing the built-in conflict resolution processes of institutions, according to this finding.

### Negative Impacts

Institutions exacerbate the problems that relative newcomers encounter when trying to acquire land and other natural resources (Batiran & Salim, 2020; Takai *et al.*, 2023). Institutional barriers to the acquisition of land and trees, two essential resources for the efficient implementation of flood adaptation measures, caused these repercussions in the research area. Because of institutional restrictions on access to natural resources, the research found that rural residents of the study area's flood adaptation tactics were also negatively affected by the institutional arrangements. Women, particularly widows, were found to be more vulnerable, and practices including favouritism and cronyism in tree and land acquisition were also identified as having detrimental repercussions. Different institutional structures benefitted some members of the communities at the expense of others. When it comes to community lands in particular, the study found that the institutional arrangements controlling all flood adaptation techniques in the study area appeared to benefit some persons. Because of their elevated social standing, the royal family enjoyed special treatment under the system that was put in place for them. For example, it was mentioned that these institutional arrangements would likely be more expedited for a relative of the chief, or the utindan. The aristocracy enjoyed special treatment in society due to their

social standing; nonetheless, the system of institutions continued to work in their advantage when it came to acquiring community land. For example, the cultivation of crops near sacred grooves was strictly forbidden to anyone other than the royals. Because of this, the non-royals were less equipped to deal with the effects of floods in the study area. When it came to access to community lands, for example, the institutions favoured some people over others, and this was often due to direct familial ties. This clarified the reason for the preferential treatment of royals in relation to community lands. Additionally, the research area's institutional arrangements favoured males over women, because important decisions involving land and other natural resources were made without women's input. Traditionally, women in the study area have been excluded from land-related decision-making. In the northwestern part of the Northern region of Ghana, women were treated less favourably than men due to the patrilineal system of inheritance, according to the findings of Nara *et al.* (2021) on land ownership and access. Some social groups were shown to be more susceptible to these institutional structures, according to the research. These institutional systems exacerbated the vulnerability of women, particularly widows. The fact that they could only obtain land indirectly through their spouses or, in a widow's case, any male relative or male offspring, made them particularly susceptible to abuse. After her husband dies, a woman who had inherited land from her husband can only pass it on to her male children or any male relative who lives after her in the patrilineal system of inheritance. For example, during the dry season, they could only farm on community land that was willingly given to them by their husbands, who had to approach or contact the chief or the Utindan. It was all because, in northern Ghana, women are not included in decision-making processes involving land and other natural resources. According to Nara *et al.* (2021), chiefs in northern Ghana are the primary landowners and custodians of their own territories. Each family has its own plot of land, which is overseen by the head of the household.

Because they couldn't get their hands on shea nut trees, the women's group that processed the nuts into butter was particularly susceptible. This was mostly due to the fact that the trees could only be found in both the interior settlements and the Republic of Togo, which is located across the Oti River. Because of this, access to the resource is limited because it is located outside of Ghana. Due to the low elevation and frequent flooding experienced by the Ghana side of the Oti River during the rainy season, shea nut trees are not found on this side of the river. Shea nut trees do best in places with less frequent flooding, but they do well in drier soils. Boffa (2015) found that shea trees occurred in wetter conditions, but not in flooded environments. This finding is consistent with the results regarding the lack of shea trees in flood-prone areas along the Oti River. The study area near the Oti River is prone to flooding, which implies that shea trees could

not do well there. Pickers in Togo and towns farther inland were the only places the women could purchase the nuts. Nut pickers from the Republic of Togo and other communities inland were crucial to their capacity to implement their adaptation strategy, which made them vulnerable due to their lack of control over shea nut trees and, consequently, shea nuts. This adaptation method is still extensively done among women's organisations, even though shea nut trees might be difficult to find. Word Vision Ghana helped the women's groups out by providing training, logistics, and money to buy the nuts.

### **Vulnerability of Social Groups to the Institutional Arrangements**

Certain demographic groups, including women, particularly widows, and unmarried men, faced vulnerability in terms of obtaining land within the institutional frameworks of the research area. During the focus group discussion, it was evident that women could only obtain land through their spouses. Consequently, women who were widowed faced significant challenges in acquiring communal lands for dry-season farming. A widow participating in the conversation noted that the reason for their lack of representation is due to the absence of someone advocating on their behalf, as her spouse had passed away. She clarified that while it was still possible to acquire communal land for dry-season agriculture through any remaining males in the extended family, the procedure was typically quite sluggish. One might have assumed that these institutional systems were supportive of the widows, given that they had no one to rely on. However, the opposite was true throughout the research area. Unmarried males were equally vulnerable because they were generally excluded from land-related meetings, which meant they could only obtain land for dry-season farming through their parents or any married family member.

### **Women's Involvement in Decision-Making Related to Natural Resources**

An all-encompassing and varied strategy was required to increase women's representation in study communities' decision-making processes about natural resources. It was critical to bring attention to the importance of women's participation in these processes, highlighting their unique contributions and the potential benefits it could bring to the community as a whole. It is significant to emphasize the critical need of launching training and education programs to empower women in the study area. People in the study area may be better able to contribute to conversations and decisions about the management of natural resources if they participate in these activities. Building welcoming communities where women can freely share their perspectives and experiences is crucial. Promoting women's active participation in local governance structures and community activities can help achieve this purpose. Important steps include pushing for laws and regulations that protect women's

rights and promote gender equality in the field of natural resource management, which is crucial. It is imperative that advocacy efforts centre on reshaping or establishing policies that ensure women in the study area have equal access to resources and decision-making mechanisms. Obtaining resources and financial assistance for initiatives that empower women in the study area can be made easier through establishing relationships with both local and international organisations. Community sensitization activities and campaigns in the study area can help achieve the goal of promoting shared responsibility in natural resource management and, by extension, increase women's participation in community activities by triggering a cultural shift that actively challenges traditional gender norms and stereotypes.

### **Key Roles of Local Level Institutional Arrangement on Flood Adaptation**

#### **Local Social Institutions Shape the Impact of Flood on Communities**

Vulnerability is heavily influenced by institutional as well as social elements. The impact of a flood on local livelihoods varies greatly depending on the quality of local institutional arrangements in a given location.

#### **Local Social Institutions Shape Communities' Response to Flood Incidence**

Institutions link individuals with and provide the mechanism within which households and communities choose adaptation measures.

#### **Local Social Institutions Serve as the Conduits for External Support to Adaptation**

Institutions play a crucial role in facilitating or hindering the effectiveness of adaptation strategies implemented by people affected by flood incidence. To maximize the effectiveness of any external intervention, local institutional arrangements are essential. When local institutional partners are willing to get involved, it makes external interventions far more effective.

### **Impacts of Climate Change on Individuals and Natural Systems**

In the research area, floods had a major effect on both people and the environment. All parts of society and the environment were touched by these far-reaching and significant repercussions. Significant repercussions were felt by the district's mostly agricultural populace. Reduced agricultural yields due to unpredictable rainfall, increasing temperatures, and other changing meteorological conditions might put people at risk of going hungry. Particularly at risk were those whose livelihoods depended on farming for subsistence. There may be a shortage of potable water and agricultural irrigation water due to changes in precipitation patterns. Climate change impacts will affect all natural systems in the research area and cause damage to habitats. Changes in rainfall patterns pose risks to ecosystems, which might cause biodiversity

to decline and ecological imbalances to worsen. In order to mitigate these effects, institutions, both formal and informal, play an essential role. In addition to promoting agricultural methods that are resilient to climate change, farmers can also devise and execute adaptation strategies. Conservation of ecosystems, mitigation of deforestation, and promotion of sustainable land use practices are all goals of natural resource management policies and regulations that involve institutions.

## CONCLUSION

Adapting to floods is an important strategy for rural areas that are at risk from climate change. Adaptation solutions for flood impacts might vary in shape and scale, nature and function of impacted communities, and the specifics of the danger. Within the mechanisms of established institutions, these strategies are put into action as instruments of governance. The primary adaptation strategies in the research area were identified as farming during the dry season, burning charcoal, rearing animals, and processing shea nuts into butter. Various long-standing institutional frameworks controlled each of these adaptation techniques. The interactions between the various institutional actors had an effect on the flood adaptation techniques, which in turn affected the institutional structures. The effects can be good or bad. Some of the beneficial effects of the institutional structures for flood adaptation measures in the research area include providing a sense of security, facilitating the settlement and mediation of conflicts, and bringing people together. Some of the negative effects of conventional institutional mechanisms on flood adaptation measures in the research area included land limitation, women's susceptibility (particularly widows), and cronyism and other corrupt tendencies in land and tree allotment.

In making adaptation decisions, the aforementioned institutional frameworks were influential on smallholder farmers. Decisions were made to: acquire trees on family lands instead of community lands; involve other royals and other respected elders in land and tree acquisition; share proceeds based on contributions, seriousness to work, and punctuality; buy shea nuts by women's groups involved in shea nut processing into butter; and involve the communities in tree and land acquisition. People made these choices either alone or in small groups. Additionally, these institutional structures had an influence on the decisions made since they made it harder to get the resources that were necessary to implement the adaptation measures to flood incidence.

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