Food and Agriculture Organization of the United Nations

COVID-19, climate change and other shocks on the Tamale city region food system: actor's bane or boon?

©Alexander Sasu-FAO

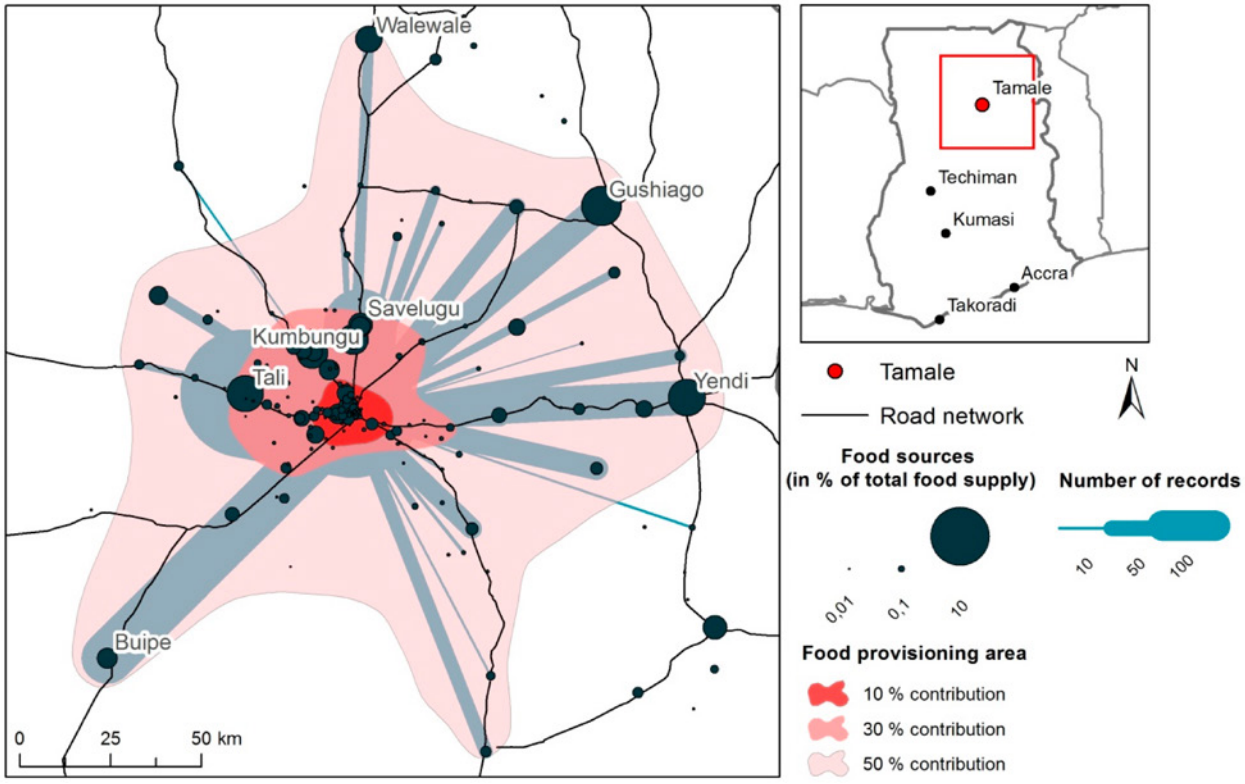
Over the past few years, external shocks (droughts, floods, crop pests or Covid-19) have impacted Tamale's food system with dire consequences. Why are people so vulnerable to these shocks? There are two main reasons. First, poverty is on the rise. Tamale and its 672 000 inhabitants (Ghana Statistical Service [GSS], 2021 census) is the capital city and the administrative, economic and financial capital of the northern region. It is the second poorest region in Ghana: poverty has increased from 50 to 61 percent from 2012 to 2016 (World Bank, 2020), about 60 percent of the populations live on less than USD 1.25 a day and up to 16 percent are food insecure. Second, agriculture and food are at the centre of the economy and society; 75 percent population work in agriculture, and have been directly or indirectly affected. These shocks and their impacts have become a source of concern for people living in the city region. Effective responses are needed to ensure future shocks have less of an impact. What should these responses be? Let's look at what has happened.[1]

The Tamale city region food system is vulnerable to various external shocks, why?

Tamale is located at the heart of a food production region where over 2.3 million hectares (ha) of land are under cultivation, around 15 percent of Ghana's agricultural land. Cereals, such as maize and rice, cover more than 60 percent of agricultural land during the rainy season from May/June to October; during the dry season, leafy vegetables, mostly traditional leafy vegetables, dominate. Poorly endowed with water bodies, in the dry season the region experiences severe hamattan winds – a dry and dusty northeasterly wind. Only the Volta basin, drained by the White and Black Volta, stands out for crop and livestock production. Root crops, such as yam, are mostly grown in the surrounding areas.

Tamale is also an important food trade hub, an assembly market for local rural producers, which supplies larger urban centres (Karg et al., 2022). Two central markets, one with wholesale functions, are the main sources for

Figure 1 Map showing the Tamale food region



Source: Karg et al., 2016

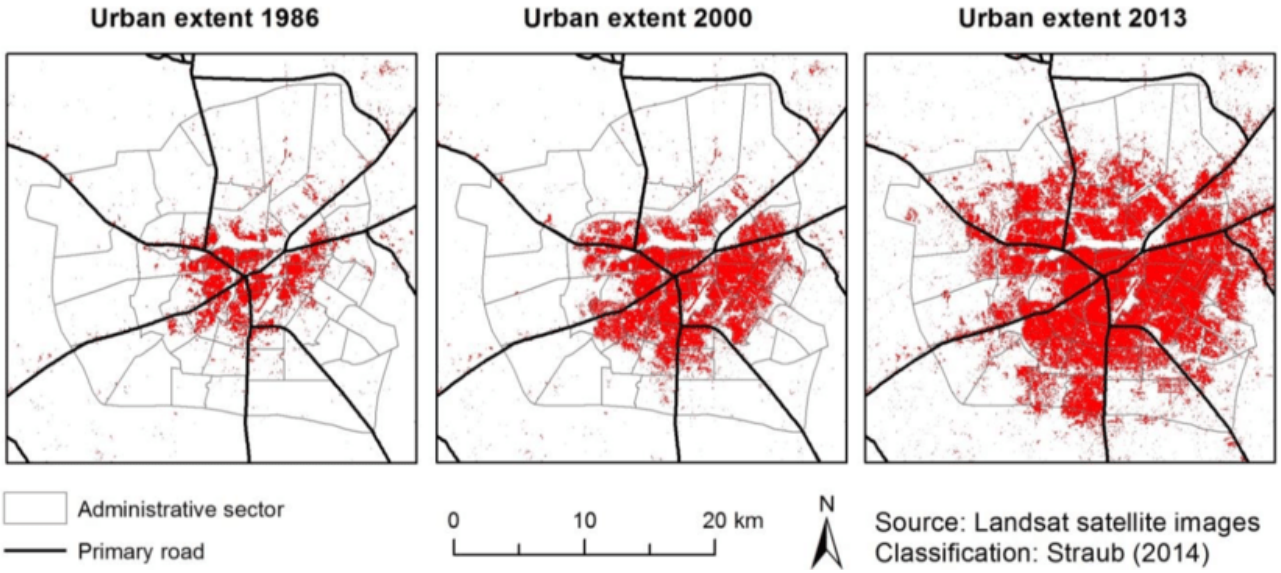
1 A total of 15 key stakeholder interviews and 2 focus group discussions were carried out between June and October 2022 to gather quantitative information reported in this brief.

marketed crops. Central Ghana is the main supplier of fruits such as oranges, papaya and banana; vegetables such as cabbage are supplied during the peak season. During the lean season, nearly all tomatoes come from Burkina Faso, making the supply potentially vulnerable to certain risks such as theft, which leads to loss of capital. Warehouses in the source communities ensure a stable supply of cereals throughout the seasons to the central and south regions and northern Ghana also exports animals to the central and south of the country.

Marketing plays a key role in the Tamale City Region Food System (TCRFS). Food flows from the rural, peri-urban and urban areas to the city (see Figure 1). The overall market system in this region is hierarchical, with producers (particularly smallholders) marketing their crops at the closest market, which then supplies the next higher-level market. This allows for significant volumes of food flows from producer to consumer. Village and small town markets link small-scale rural farmers through the regional market in Tamale to national and international markets. The few supermarkets mostly sell processed food, fresh produce is not usually offered.

Finally, rapid urban growth (see Figure 2) has created challenges: urban demand for food has increased dramatically, together with food prices. Even without shocks, the urban poor, who are highly vulnerable to price changes, suffer. These features of the TCRFS create a few vulnerabilities, causing the various segments to become more sensitive to shocks and stresses, especially to droughts, floods, pests and diseases, which impact maize and rice the dominant crops.

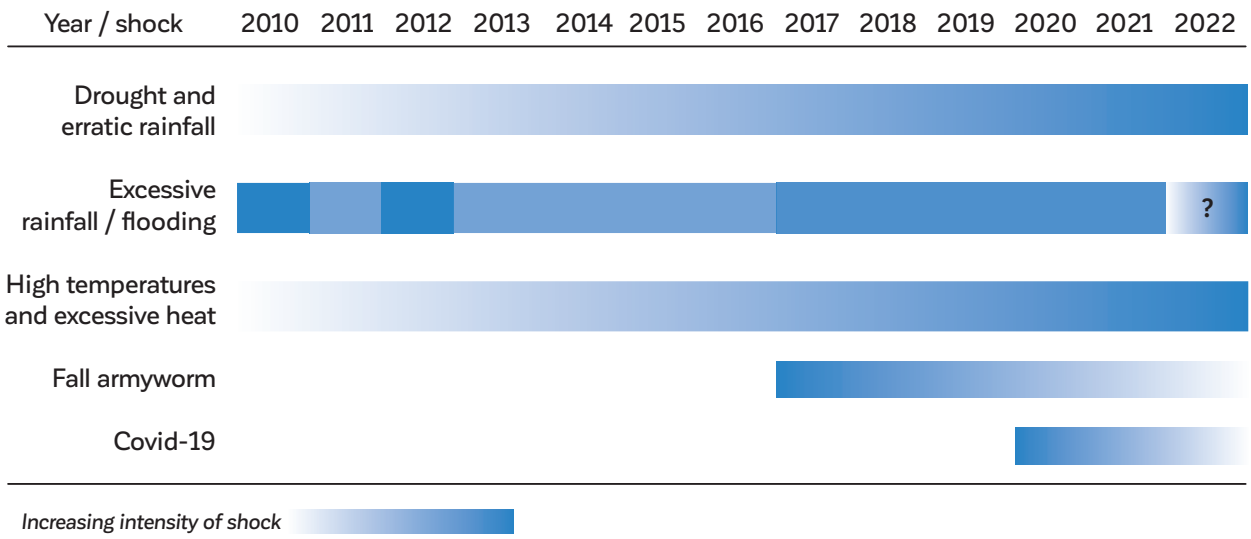
Figure 2 Expansion of urban built-up area in Tamale between 1984 and 2013.



Recent shocks and the Tamale city region food system

Over the past 5 to 10 years Ghana, northern region has experienced five different kinds of shocks, mostly related to climate change and variability. These are drought and erratic rainfall, excessive rainfall and flooding, high temperatures and excessive heat, fall armyworm and Covid-19 (Figure 3). As expected, climate related events have occurred for a few years, the main issue is the increased intensity of events (Figure 3). Recently, food system actors have reported higher temperatures and intense heat. This, coupled with erratic rainfall and increasing drought, which is the number of dry days within the shortened rainy season, and erratic rainfall patterns have impacted farmers in several ways. For example, with erratic rainfall, actors (including farmers) find it difficult to predict when the rains will come. Flooding has become an annual affair with the frequency and intensity increasing within the last four to five years. It is therefore not surprising that the Ghana Meteorological Agency warned of flood risk in 2022, saying "there is a high probability of floods in northern Ghana due to excessive rainfall and the likelihood of spillage of excess water from the Bagre dam in Burkina Faso, which occurs around September to November annually. It is very important that flooding and its impacts on the TCRFS are addressed as several actors can be affected.

Figure 3 Timechart for recent shocks on the TRCFS and their intensity as percieved by the CRFS actors



Fall Armyworm (FAW) was first record in 2017 and was not a problem, however, in subsequent years its devastating effect has forced farmers to switch to soybean, which is not attacked by FAW. With relatively fewer farmers producing maize, the quantity has been reduced leading to the increased price.

At the peak of an outbreak of FAW, which was being handled by the government and farmers, Covid-19 began to affect several food system nodes, if not the entire food system. According to most actors, Covid-19 produced an unprecedented challenge to the food system, even though for a relatively shorter period, and thousands of people were affected, particularly the most vulnerable, which included indigenous farmers, women and children.

There is no doubt that these shocks have had negative impacts (Table 1) on the TCRFS, with agriculture being the most vulnerable sector. The dependency of major farming communities in the northern region of Ghana on rainfall means that the effects of climate, e.g. drought and flooding are a critical threat to the food system. The shorter rainfall season and drier conditions, as perceived by most actors, are the most important shocks, as well as Covid-19, which has adversely affected both crop and animal production and aggravated the food security status and incidence of poverty in the city region. This clearly indicates that these shocks and their impacts should be addressed to ensure resilience and improved food security in the TCRFS.

The question is however: have these shocks and their impacts been adequately addressed, if yes how and if not why?

Plate 1 Shade for livestock to protect against excessive heat

Table 1 The most important shocks and stresses in the past five years and their impacts on the Tamale city region food system

Shock/ Stresses	Impact	Actors affected
Drought and erratic rainfall	A short rainy season in the city region is followed by a long period of dry season (November-May). Recently, rainfall in the shortened rainy season has become very erratic. This situation has been exacerbated by climate change with an expected increase in its impact on the TCRFS.	• Low/reduced crop yield, mostly cereals. • Loss of income/revenue. • Reduced availability of food in markets. • Increased food prices. • Changes in consumption patterns. • Poor animal growth. • Death of animals.
Excessive rainfall/ flooding	Apart from the erratic nature of the rainfall, it falls heavily and within a relatively short period causing flooding in some parts of the city region. Comparatively, the northern region is relatively flat is easily flooded during heavy rains. Some production areas closer to the White and Black Volta may also flood when excess water in the Bagre dam (in Burkina Faso) is spilled	• Low yield. • Crops are destroyed. • Increased post-harvest losses due to poor storage. • Displacement of people and destruction of houses along the banks of the Volta River rendering victims homeless. • Lack of access to the farms affecting farming activities. • Reduced food for the market since flooded roads make it impossible/ difficult to transport food from the villages to the urban/peri-urban markets. • Increased cost of food transportation due to the use of alternative routes. • Loss of income as drivers cannot access these roads.
High temperatures and excessive heat	The Tamale city region experiences high temperatures sometimes exceeding 40 oC. This is associated with the excessive and increasing heat over a greater part of the year. The increase in temperature and excessive heat is expected to increase with the changing weather conditions.	• Death of animals. • Loss of income. • Lack of food for animals. Animals are confined (see plate 1) against high temperatures. • Extra burden on the farmers searching for animal feed.
Fall armyworm (FAW)	The Fall armyworm (FAW) is a pest that causes severe damage to crops. These worms attack and destroy several crops especially rice and maize, which is the main staple food in the city region. Most farmers lost expected revenue and decided to switch to crops that are not attacked by the fall armyworms, e.g. soybean.	• Reduced crop yield. • Loss of income. • High cost of treatment due to high cost of pesticides. • Increased food prices. • Limited amount of food for the market/ unavailability of food in the markets • Changes in consumption patterns.
Covid-19	Covid-19 and its associated illnesses, as well as measures put in place for its prevention have adversely affected the TCRFS. Measures adopted to minimize the impact of Covid-19 include restricted movement, school closures, closure of borders, both land and air, ban on social gatherings, etc.	• Sickness/death. • Lack of communal farming and labour shortage including tractor services. • Lack of access and high cost of farm inputs (fertilizer/pesticides). • Lack of spare parts/mechanical repair services. • Reduced food production leading to increased food prices. • Fewer raw materials for food processing. • Loss of income for farmers, food vendors/ restaurants. • Low demand for food items/food spoilage. • Changes in consumption patterns. • Increased cost of food transportation. • Loss of jobs in different sectors/Loss of income and revenue for caterers. • School closures. • Reduced revenue of the local Assembly and delays in delivery of outputs.

Addressing external shocks and their impact, why and how?

Year after year, authorities and other actors have voiced their concerns (*e.g. increasing challenge for authorities to address actors' worries, decreasing revenues because of food losses by farmers leading to increased cost of living and ill-health, etc.*) about the impact of external shocks on livelihoods, such as drought, erratic rainfall and flooding, especially for the most vulnerable actors in the city region. It is therefore understandable that a number of interventions and initiatives have been put in place, through national policies, non-governmental organizations (NGOs) and donor sponsorship to minimize the impact of these shocks and to ensure the resilience of the food system. The interventions include two preventive initiatives (Buffer Stock and Resiliency in Northern Ghana [RING]) developed in the 2010s, and three recent initiatives: Ghana Agricultural Sector Investment Programme (GASIP), Sustainable Agriculture Productivity Improvement Project (SAPIP), and Village 1 Dam (1V1D). Most initiatives (Table 2) target food production, availability and affordability, which is consistent with the structure of CRFS (75 percent of the population in agriculture and 71 percent of the population food insecure).

Table 2 Main initiatives/public policies to address climate related and other shocks

Date	Initiative	Initiator	Implementer	Description
2010	Ghana National Buffer Stock initiative	Ministry of Food and Agriculture (MoFA)	National Buffer Stock company (NAFCO)	*Initial purpose:* the initiative responded to post-harvest losses related to high temperature and excessive heat, excessive rainfall and flooding that affected poor local storage facilities (see Plate 2a). The activities include purchasing excess produce from all farmers to establish new warehouses for food storage, to ensure farmers a guaranteed income; stabilize food prices and improve food availability in the markets.
2014	Resiliency in northern Ghana (RING)	USAID's Feed the Future programme	Seventeen Metropolitan/ Municipal/ Districts Assemblies (MMDAs) in northern Ghana	The purpose was to improve the livelihoods and nutritional status of vulnerable households in targeted communities in 17 districts of the northern region of Ghana including Tamale. The main beneficiaries were the most vulnerable in the rural communities, mostly women and children. The programme's activities include diversification of crops (e.g. soybean cultivation instead of the traditional staple, maize), village savings and loans, small ruminant rearing as an alternative source of income (e.g. shea nut collection and processing [see Plate 2b] among others when crop production fails), leafy green cultivation, etc. The programme covers about 1 500 communities from 17 (MMDAs) in northern Ghana and a little over 100 000 women benefitted directly.
2016	Ghana Agricultural Sector Investment Programme (GASIP)	Ministry of Food and Agriculture (MoFA) with support from International Fund for Agricultural Development's (IFAD) Adaptation for Smallholder Agriculture Programme (ASAP) and other organizations.	MoFA	This initiative aimed to contribute to sustainable poverty reduction in the rural areas of Ghana, through enhancing the profitability and climate change resilience of agribusinesses and smallholders. The programme covered the entire country including the Tamale city region. Objectives: building the capacity of farmer-based organizations (FBO's) in climate smart agriculture, use of drought resistant varieties and early maturing crops, provision of high-impact weather forecasts for farmers, in collaboration with the Ghana Meteorological Agency.

Date	Initiative	Initiator	Implementer	Description
2018	SAPIP	One of Governments' flagship programmes Planting for Food and Jobs (PFJ) funded by a loan agreement between the Government of Ghana and the African Development Fund (ADF)	MoFA	The programme aims to transform agricultural value chains for food and nutrition security, job and wealth creation within the Savannah zone of Ghana, which includes the Tamale city region. The main activities include development of crop and animal production systems, storage and distribution of breeders, rehabilitation of four seed centres with state-of-the-art equipment, improved mechanization services, supply of farm inputs (e.g. fertilizers and pesticides) to improve poor soil quality, soil sample testing and training in good agricultural practices and provision of subsidies. The main beneficiaries are large-scale actors (crop and animal farmers who are mostly aggregators, and agro-input dealers). The project includes an infrastructure development component, which provides feeder roads, farm-tracks and stock routes, rehabilitation of irrigation schemes and warehouses. The programme could address the perennial destruction of roads from flooding to improve the free flow of food from rural areas.
2018	1V1D	Government of Ghana as one of the its flagship programs)	Ministry of development and special initiatives	This policy was in response to the increasing drought, erratic rainfall and flooding, which have increased over the last five years in the northern regions of Ghana (anticipation). The objective is to help farmers engage in continuous agricultural production (crop production, water for animals and possibly fishing) during the unfavourable farming season and to reduce unemployment in the northern regions of Ghana. It is expected this objective will be achieved by providing water for irrigation, water for animals, and for fishing through the construction of a number of small earth dams in selected villages.
2019	Fall armyworm control	Government of Ghana	MoFA (Agro input dealers also supported MoFA and the government by providing pesticides to fight the invasion)	This initiative aimed to reduce infestation by Fall armyworm to the minimum, or eliminate it completely. Activities include provision of pesticides to farmers and training by agricultural extension officers to ensure farmers can easily identify the worms and report them for immediate action.
2020	Covid-19 response	Government of Ghana (GoG), NGOs and religious bodies	Local authorities of the Metropolitan, Municipal and District Assemblies (MMDA's) Ministry of health, Ministry of local Government	The objectives were to reduce the spread of the disease and improve or sustain markets, accessibility and affordability of food during and after the pandemic. Activities included the provision of subsidized electricity and water to cushion all households in Ghana (especially poor households) and other businesses (including agribusinesses). The government, several NGO's and religious organizations provided financial support, farm inputs to farmers and other key actors (agro input dealers) in the food system as well as cleaning and spraying of markets and schools.

Plate 2a Local food the storage facility constructed with local materials and 2b) Collected shea nuts to process into butter

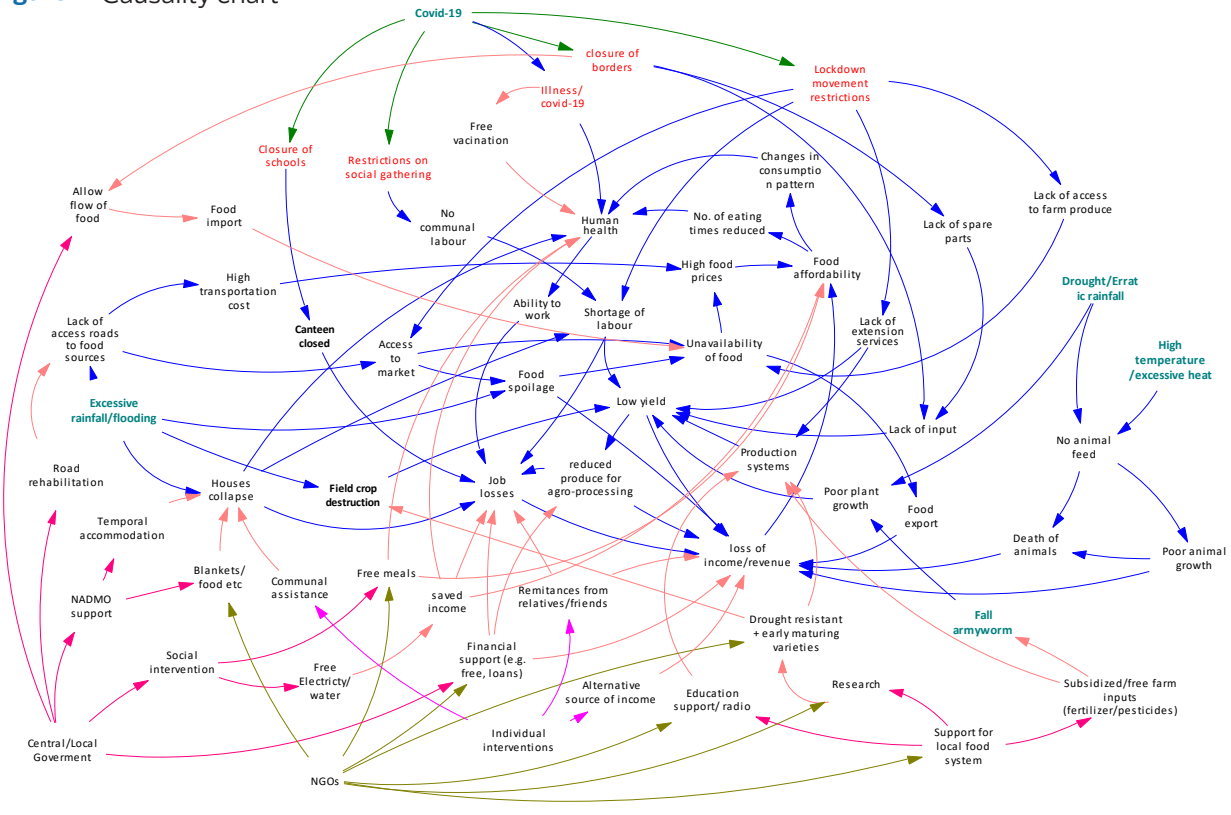
How did the initiatives emerge? Local CRFS actors have no clear recollection about how these initiatives emerged. Some actors believe that a key role was played by agricultural committees at the local authorities, which are made up of representatives of key actors including Agriculture Extensions Agents (AEA's), representatives of farmers from various zones; input dealers; food vendors or marketers; and transporters. These committees, according to the actors, meet regularly to discuss issues about agriculture and to develop annual plans, including resilience strategies. Proposals are formulated from these annual plans and submitted for donor support. Most actors believe that the Ministry of Food and Agriculture (MoFA) initiated programmes such as GASIP and SAPIP, as a follow up to earlier programmes (e.g. NAFCO and RING) to ensure resilience.

Other initiatives (e.g. 1V1D) are part of the ruling government's campaign promise, and it is believed are designed following the party's manifesto committee on agriculture, which interacts with different stakeholders including local authorities and academia and relies on secondary data to create programmes. This clearly creates an issue of governance, specifically, consultation mechanisms (often a weak link) seem to exist. Again, it appears there is a top down approach in governance, as communication channels are lacking, leading to TCRFS actors being unaware of how the initiatives emerged. Despite these challenges, related to programme initiation, a critical role has been played in the TCRFS; the question is how?

Two initiatives were implemented in the 2010s that played an important role in responding to regular climate shocks impacting northern Ghana: the government-led *national Buffer Stock and the NGO-led RING initiatives* (Table 2). The Buffer Stock initiative was to ensure food was available even when shocks created shortages, while RING sought to raise the most vulnerable households out of poverty and reduce the occurrence of food shortages, i.e. increase resilience at the individual level. These policies or initiatives have been in been existence for a long time, and tend to be preventive or adaptive, at times they are even transformative.

Most actors including farmers, marketers, city authorities and consumers believe that the Buffer Stock initiative increased food system resilience: it was one of the key interventions during the shocks of the last 2 to 3 years. Even though actors also rely on food inflows from other parts of Ghana and beyond (Figure 4) at times of limited food availability, the situation has changed with the introduction of the Buffer Stock initiative, which has minimized the reliance on food being brought from other parts of the country to the Tamale region, especially during the lean season. An actor noted that, "this is the first time we have observed that food has not been transported from other parts of the country in our lean season, thanks to the Buffer Stock and a similar initiative known as "*One district One Warehouse" (1D1W) currently being rolled out by the Government of Ghana as one of its special initiatives to enhance the national Buffer Stock programme*".

Figure 4 Causality chart



The RING initiative, which TCRFS actors perceive to be a complement to the Buffer Stock initiative, is among several other NGO initiatives being implemented by local government, funded by the United States Agency for Industrial Development (USAID). The initiatives have broad coverage and NGO activities directly or indirectly affect several food system nodes, see Figure 4 and involve local authorities, academia, regional agricultural departments as well as local consultants in the design and implementation of its activities. It is not surprising that most CRFS actors picked this programme, and not another, as this initiative has the greatest impact.

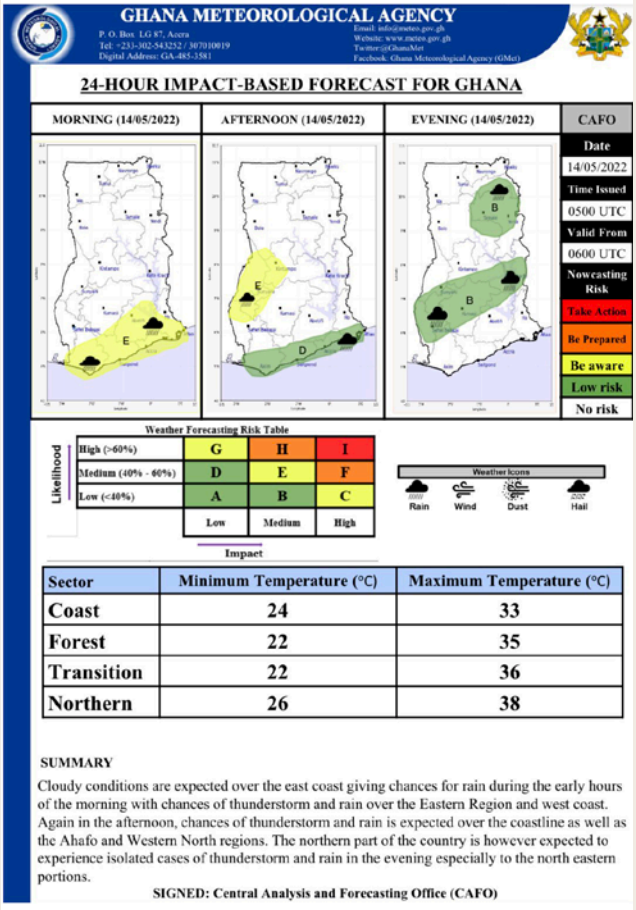
Most actors including farmers, agricultural extension officers and consumers perceived that this initiative minimized the impacts of recent shocks such as drought and floods, which is the reason farmers are looking forward to RING II. Actors further asserted that gains had been made though the programme during the first year of implementation, the key challenge was the slower pace of implementation in the first quarter of the second year because of delays in the approval of Metropolitan, Municipal and District Assemblies (MMDAs) and regional annual workplans. This is believed to be the result of bureaucracy and the high turnover of staff in the assembly Generally, there are limitations to most NGO-led initiatives (RING programme excluded), especially with coordination and building on each other's achievements, which leads to duplication of efforts.

These two initiatives are perceived to be working successfully but the big question is whether the existing measures will continue to be efficient, and under what conditions, when the frequency and intensity of climate shocks increase? This uncertainty may have led to the emergence of recent initiatives: GASIP, SAPIP and 1V1D (Table 2), which seek to complement (i.e. close the gaps in the Buffer Stock and RING initiatives)

Clearly, RING stands out as having mobilized both anticipative and preventive capacities in addressing shocks. The initiative covered alternative sources of income, when crops fail as a result of droughts, floods, etc. but GASIP focuses on changes in practice by employing different means, which goes beyond farmers. The initiative, ,mobilized the preventive capacities of actors and their ability to take early action (*anticipative capacities*) in anticipation of a potential threat to reduce the potential negative impacts of the shocks. One of the key components of the GASIP initiative is the weather forecast: *Champion farmers receive a daily impact-based* (Figure 5) *weather forecast on their mobile phones, which they share with other farmers so they know when to plant and when not to*), and selected radio stations teach farmers and presenters about conservative agriculture. Most actors believe the programme is efficient (*even though a few continue to ignore the forecast and risk planting early*). Mostly, the weather forecast is correct and farmers can receive information from the radio in their local language, which can be easily understood by any who cannot read. Recently, this initiative has played a key role in having farmers plant their crops at the right time so as to avoid crop losses from prolonged drought. Transporters who take food from the villages to the city also rely on the weather forecast to avoid getting stuck on the road after heavy rains and flooding.

Food system actors are aware of the climate or weather related shocks (e.g. drought, floods and excessive heat) and have quickly embraced and adapted to practices (*through the initiatives*) that ensure sustainable production and marketing of their produce. Farmers use drought resistant varieties and early maturing crops and have diversified their crops to secure their livelihoods.

Figure 5 Impact-based weather forecast* from the Ghana Meteorological Agency


GHANA METEOROLOGICAL AGENCY

24-HOUR IMPACT-BASED FORECAST FOR GHANA

MORNING (14/05/2022)	AFTERNOON (14/05/2022)	EVENING (14/05/2022)	CAFO
			Date: 14/05/2022
			Time Issued: 0500 UTC
			Valid From: 0600 UTC
			Nowcasting Risk
			Take Action
			Be Prepared
			Be aware
			Low risk
			No risk

Weather Forecasting Risk Table

Likelihood	Low	Medium	High
High (>60%)	G	H	I
Medium (40% - 60%)	D	E	F
Low (<40%)	A	B	C

Impact

Weather Icons: Rain, Wind, Dust, Hail

Sector	Minimum Temperature (°C)	Maximum Temperature (°C)
Coast	24	33
Forest	22	35
Transition	22	36
Northern	26	38

SUMMARY

Cloudy conditions are expected over the east coast giving chances for rain during the early hours of the morning with chances of thunderstorm and rain over the Eastern Region and west coast. Again in the afternoon, chances of thunderstorm and rain is expected over the coastline as well as the Ahafo and Western North regions. The northern part of the country is however expected to experience isolated cases of thunderstorm and rain in the evening especially to the north eastern portions.

SIGNED: Central Analysis and Forecasting Office (CAFO)

Source: Ghana Metropolitan Agency

**Note: supported by the Ghana Agricultural Sector Investment Programme*

Unlike GASIP, SAPIP does not target resilience directly, but rather efficiency by focusing on large farms to improve productivity. The TCRFS faces many challenges that affect production, which can lead to low productivity, food unavailability or affordability and

loss of revenue (Figure 4). Therefore, a more efficient system of production, as part of the Buffer Stock programme and soil fertility management, contributes to food availability for actors through improved mechanization services; increased input support and provision of a storage facility. According to most actors, the objectives of the programme have been met. However a few stakeholders, including farmers, complained they had not received some of the inputs and financial support because they were unaware of the criteria used to select the beneficiaries, therefore, they doubted the transparency of selection. As with GASIP, several NGOs have strengthened the anticipative and preventive capacities of actors. However, a few food system actors believe the activities of most NGOs are not coordinated well enough to avoid duplication of efforts and ensure that subsequent initiatives build on each other.

The latest of the recent initiatives, the 1V1D, is another government policy that focuses on the prevention and absorption of shocks (Table 2). Actors felt the initiative had improved the availability of water for domestic activities and water for animals. It has also increased crop production in a few affected communities. Some actors believe incomes had increased from sales of animals, as an alternate source of income for farmers in villages. However, actors noted that the objectives of this initiative have not been fully met for the following reasons:

- Some dams were poorly constructed allowing stored water to escape through broken banks.
- The water in some of the dams dried out and did not last long enough to be used for the intended purposes.
- Most constructed dams have become a source of water for domestic activities instead of the main intended purpose as a source of water for irrigation and fishing.
- Local communities were not involved in the selection of the areas the dams are sited.
- Sometimes the water stored in the dams can break through the banks and flood homes, destroying life and property.

Some actors believe the 1V1D initiative could minimize flooding when floodwaters flow into the constructed dams. This has yet to be seen. Most actors perceived excessive rainfall and flooding as one of the shocks that has affected several food system actors including farmers, transporters, marketers and consumers (see Figure 4) and, therefore, requires urgent attention.

Despite these initiatives, many gaps remain in improving resilience to flooding: interventions such as warning potential victims to relocate to safer areas; temporary relocation of victims to schools; churches, mosques; and provision of blankets and food items by the National Disaster Management Organization (NADMO) and other organizations, has been on-going for over three decades. However, the interventions are inadequate, see limited action of NADMO in Figure 4, and require the attention of all stakeholders involved. Given the unfulfilled promises of successive governments to find a lasting solution to this perennial problem, it appears there will be no end to the yearly flooding. Some actors have acknowledged the government's effort to expand the Pwalugu dam since 2019, to accommodate spilled water from the Bagre dam in Burkina Faso and to reduce flooding (mainly floodwaters from the Volta river) and to provide water for irrigation. The intervention should be expedited to ensure the safety of all actors affected.

On top of the climate related shocks, and their negative impacts on the TCRFS, two other shocks have impacted the food system. The shocks were unexpected, contrary to climate shocks, and triggered immediate adaptive interventions to ensure sustainability and resilience. First, the FAW attack, which first appeared in 2017, and there was an outburst in 2019. According to most actors, several initiatives were implemented by different organizations, which were coordinated by MoFA, to minimize the impact of the FAW attack. For example the Centre for Agriculture and Biosciences International (CABI) developed an emergency response strategy that empowered local communities to effectively manage and monitor outbreaks in their respective localities, and helped prevent further spread. Agro-input dealers also supported MoFA and the government by providing pesticides to farmers who continued with maize production to fight the invasion.

The FAW impacted production only, and a few farmers adapted to the situation without external interventions by shifting production from maize and rice to soybean (shift in production), as these crops are not attacked by FAW. This action breaks the life cycle of the worm and prevents loss of crops and income. According to most actors, these measures reduced the pest invasion to the barest minimum. As an anticipative measure, MoFA reminds farmers continuously through national and local radio programmes to report any future attacks by fall armyworm for quick intervention.

Unlike FAW, Covid-19 was systemic and affected all nodes in the TCRFS (Figure 4). Only the government and a few NGO's were able to respond with absorptive and adaptive measures (and later preventive with the vaccine). Other responses were transformative, based on the actor's ability to create a fundamentally new system, e.g. online sales. Currently, online sales continue in sectors such as clothing and electronics, but not the food system. However, restriction in movement may have triggered online sales in the food system, for example sale of fertilizer, pesticides and other farm inputs.

Some of the impacts of Covid-19 were temporary, other impacts such as job losses in the CRFS have not been resolved as companies or institutions attempt to establish strategies to reduce the negative impacts of the pandemic. According to most actors, these initiatives (in particular free water and electricity) had a positive impact on farmers, marketers and input dealers in the food system. For example it was reported that savings were made in free water and electricity, which led to higher purchasing power for food for the household, lower or reduced incidence of disease as a result of the initiation of early preventive measures, the emergence of alternative supply chains, which lead to increased online sales (especially in the urban centres) because of movement restrictions, etc.

What have we learned and how do actors in the food system perceive the way forward?

What have we learned and how can we ensure resilience of the TCRFS to future shocks? Climate change and its related shocks have impacted negatively on the TCRFS and, more recently, the Covid-19 pandemic, which is one of the shocks that has affected several actors in the food system and food nodes, and the situation may get worse. Even though the government, NGOs and donor organizations have set up a number initiatives there are gaps, especially relating to heavy rainfall and flooding and increasing temperatures. Most food system actors acknowledge the positive impacts of these initiatives, however they would like to see more being done to guarantee resilience of the food system to current and future shocks.

The following illustrates how food system actors perceive the way forward to ensure resilience:

- All initiatives should be designed to address the impact of climate change and other future shocks. The local authorities should coordinate initiatives to avoid duplication of effort. This will be possible through the creation of a secretariat (by the district chief executive), made up of heads of key agencies such as MoFA, NADMO, etc. within each of the MMDAs where all new programmes are registered prior to implementation, which should be followed by regular updates. This may require the drafting of a by-law at the Assembly as one of the mandates to register and coordinate NGO activities. Even though the MMDAs may be financially constrained, there is no doubt about the feasibility of this suggestion as no extra personnel will be required for its implementation.

- All programme initiators (NGOs, Government) should involve key actors in the CRFS in initiatives from the planning stage through to the implementation phase through constant engagement (e.g. meetings, workshops, etc.) with the actors. This will ensure actors understand how and why the programme was initiated, obtain their buy-in; acceptance; and active participation in the programme to ensure success. This is a feasible suggestion since a limited budget will be required to organize the meetings or workshops. Currently, this is not happening because the local authority may not see this as its responsibility. Involvement of key stakeholders should be mandatory and be included in the by-laws of the Assemblies.

- Strengthen the capacities of farmers to adapt their practices to ensure production is resilient to shocks. The local government service should recruit more extension service personnel (alternatively, involve national service personnel who have completed their tertiary education) and provide them with resources (e.g. means of transport) to help smallholder farmers understand innovations, technology transfer and best agricultural practices. This will help farmers adapt and transform their productive systems to boost productivity. Eventually the capacities of farmers will be strengthened, as they adapt their practices to ensure production can better withstand shocks. This should be a long-term solution, as it will require the approval of the Government and significant financial resources. Again, current restrictions on public employment because of budget constraints could delay implementation.

- Clearly, issues related to floods are not adequately addressed. One reason is the National Disaster Management Organization (NADMO) does not have the resources and often operates around the provision of relief items to victims. The capacity of NADMO should be improved and the government could provide better equipment to ensure the effective management of anticipated flood situations beyond distribution of relief items. Apart from the funds allocated by the government, which are often inadequate, NADMO could generate additional funds from corporate institutions (e.g. mining companies) that often perceive donations to be their corporate social responsibility, as occurs for other natural disaster situations. Alternatively, the government could explore the relocation of potential victims out of flood prone areas. This may be challenging, since those affected may be reluctant to move to a different location for fear of losing their properties and livelihoods. Sensitization of these individuals should be contemplated to inform them of the dangers of remaining in flood prone areas. The authorities could consider provision of assurances of guaranteed livelihoods, which would encourage people to re-locate.

- Even though there are government initiatives to improve access roads within and between other regions, more and better climate-proof roads are

required to ensure the effective transportation of food and agro-inputs during flooding resulting from heavy rains. Note that that this initiative is capital intensive and would require time for its implementation.

- Donors should mobilize all capacities to ensure resilience. Most initiatives are preventive and anticipative; a few are adaptive or transformative, meaning that not all resilience capacities are mobilized. Programme initiators should ensure actors are able to create a fundamentally new system in terms of finding alternative activities, or perspectives; diversifying livelihoods; modifying or changing the characteristics of the system so as to continue functioning without having to make major qualitative changes in function or structural identity so as to fully utilize most resilience capacities. However, it should be noted that local authorities still have no control over the development of proposals or the implementation of projects. Consideration should be given to the involvement of local authorities for future project proposals and their implementation.

References

Ghana Statistical Service (GSS). 2021. *Population and housing census.* Ghana.

Karg, H., Drechsel, P., Akoto-Danso, E., Glaser, R., Nyarko, G. & Buerkert A. 2016. *Foodsheds and city region food systems in two West African cities. Sustainability* 8:1175.

Karg, H., Bouscarat, J., Akoto-Danso, E.K., Heinrigs, P., Drechsel, P., Amprako, L. & Buerkert, A. 2022 Food Flows and the Roles of Cities in West African Food Distribution Networks. *Front. Sustain. Food Syst.* 6:857567. doi: 10.3389/fsufs.2022.857567

World Bank. 2020. Ghana poverty assessment. Washington, D.C.

Federal Ministry of Food and Agriculture

This factsheet is developed by Philip AMOAH, under the guidance from Thierry Giordano (CIRAD) and support from FAO CRFS team (Guido Santini, Carmen ZuletaFerrari, Roman Malec, Isabella Trapani, Jia Ni), as well as the Municipality of Tamale.