UNIVERSITY FOR DEVELOPMENT STUDIES

EFFECT OF CAPABILITY AND PERCEIVED IMPACTS OF THE COVID-19 PANDEMIC ON FOOD SECURITY RESILIENCE IN SAVELUGU MUNICIPALITY AND NANTON DISTRICT

ESTHER COBBINAH

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BY

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DECLARATION

Student

I, ESTHER COBBINAH hereby declare that this thesis is the result of my original work and that no part of it has been presented for another degree at this University or elsewhere:

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Supervisors

We hereby declare that the preparation and presentation of the dissertation was supervised following the guidelines on supervision of dissertation laid down by the University for Development Studies.

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ABSTRACT

The COVID-19 pandemic has had tremendous impacts on all sectors of the economy, including health, education, and agriculture. Among these impacts are global price hikes on food and non-food commodities. Farm household capability is said to play a major role in ensuring that individuals develop some resilience towards the effects of the pandemic. In this study, factor analysis, 2SLS and RIMA methodology are used to assess the perceived impacts of the pandemic on livelihood activities and measure the effects of farm household capability on coping strategies and food security resilience. The study used primary data based on farm households in Savelugu Municipality and Nanton District in the Northern region of Ghana. A sample of 400 respondents was used for the study from 16 communities and 25 farming households in each community through the use of a semi-structured questionnaire. The results reveal that most of the farm households either agreed or strongly agreed that the Covid-19 pandemic has impacted their livelihood activities, for that matter their welfare. On the Min-Max scale, ranging from 0 (no impact) to 1 (very severe impact), sample households scored 0.641, meaning, the pandemic had a severe impact on livelihood and livelihood activities. Farm household capability increases the ability to cope with the negative impacts of the pandemic and enhances their food security resilience. In addition, the perceived impact of the pandemic, marital status, age, gender, extension services, and years of farming drive farm household food security resilience. Government and local leaders should ensure that basic life-sustaining conditions are provided for rural farmers to help fight the negative impacts of pandemics. Stakeholders should consider the capability of farmers during crises by ensuring that rights and opportunities are not infringed upon, providing room for people to be and do what can help improve their living standards.

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LIST OF ACRONYMS

ABS	Access to Basic Services
AC	Adaptive Capacity
AST	Assets
APRA	Agricultural Policy Research in Africa
BRACED	Building Resilience and Adaptation to Climate Extremes and Disasters
DFID	Department for International Development
DWH	Durbin-Wu Hausman
FA	Factor Analysis
FAO	Food and Agriculture Organization
FBOs	Farmer Based Organization
GSS	Ghana Statistical Service
GLSS	Ghana Living Standard Survey
GNP	Gross National Product
GLM	General Linear Model
HDDS	Household Dietary Diversity Score
HFE	Household Food Expenditure
MIMIC	Multiple Indicator Multiple Cause
NYT	New York Times
NGOs	Non-Governmental Organizations
OLS	Ordinary Least Square
PHC	Population and Housing Census

RCI	Resilience Capacity Index
RIMA	Resilience Index Measurement and Analysis
SARS	Severe Acute Respiratory Syndrome
SDGs	Sustainable Development Goals
SSN	Social Safety Net
TLU	Tropical Livestock Unit
TSLS	Two-Stage Least Square
TAMD	Tracking Adaptation and Measuring Development
TANGO	Technical Assistance to Non-Governmental Organization
UNDP	United Nations Development Programme
UNISDR	United Nations International Strategy for Disaster Reduction
USAID	United States Agency for International Development
WHO	World Health Organization
WFP	World Food Programme

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Typically referred to as SARS (severe acute respiratory syndrome), the COVID -19 is a form of viral respiratory infection. The largest global pandemic that has ever been experienced. The COVID-19 pandemic was initially discovered in the Wuhan province, and it has since spread globally. It has caused a lot of havoc in almost all countries of the world, causing loss of lives and property. The pandemic has brought about a lot of hitches, notably in the food systems in countries with limited resources in Sub-Saharan Africa from which Ghana is not exempted (Asante et al., 2021).

On March 12, 2020, Ghana reported the first (two) cases of the COVID-19 virus, prompting the authorities to impose a lockdown in Greater Accra and Greater Kumasi (Baa-Boateng, 2020). This was to preserve good health and ensure the long life of individuals, especially the most vulnerable in societies. This was required because public health governance and systems needed to pay close attention to how people and society were doing (Anand et al., 2020). The general impact of the COVID-19 pandemic on economic growth and development has been to halt individual freedom of movement, halt agricultural food systems and association with others causing economic growth to decrease (Anand et al., 2021).

The COVID-19 in Ghana had been a tragedy for the government and every

citizen from a larger perspective, since it halted a lot of economic activities, leading to economic hardships, hunger and poverty among the citizens, but more so among the poor and vulnerable in society (Aduhene and Osei-Assibey, 2021). The Sustainable Development Goals (SDGs) aim to achieve certain set targets by 2030. Among these goals are the quest to halt poverty and increase food security by ensuring zero hunger, leading to improved nutrition and sustainable agricultural development. Empirical evidence of poverty reduction suggests that efficient food crop production can raise rural households' incomes (Kansiime et al., 2018). It has always been the policy of the Ghana government to attain food security by ensuring that her citizens can have physical access to enough food to cater for their food needs and ensure a healthy living whether the food is produced domestically or imported (Kansanga et al., 2019). The pandemic came when the government was trying hard to achieve SDGs 1(No poverty) and 2 (Zero hunger) of the Sustainable Development Goalss, which made it difficult to keep track. The economic hardships Ghanaians continued to experience in the COVID-19 era were because most Ghanaian livelihoods depend on the daily wage they get from rendering their labor to sustain themselves. This lifestyle of many Ghanaians triggered the economic hardships experienced in Ghana. Farmers were most hit by the pandemic (Aduhene and Osei-Assibey, 2021). They could not sell their stored commodities to begin their farming activities due to the lockdown and closure of our borders (Aduhene and Osei-Assibey, 2021). It is prudent to note that apart from their inability to access the

markets, there was a great impact on the local economy as other livelihood activities are also severely affected.

The pandemic intensified the already increasing rural poverty in Ghana. Rural poverty in Ghana was estimated to be four times higher than that of the urban in 2012 (Cooke et al., 2016). The same poverty trend is observed in the wide income disparities between the five northern regions (Northern region, Upper East, Upper West, North East and Savannah) of Ghana and the rest of Ghana (Adusah-Poku and Takeuchi, 2019). Despite the fact that other regions of the country, such as Greater Accra, have high rates of poverty, the Northern region of the country has historically had the highest headcount ratios of poverty, far exceeding the national average, according to a United Nations Development Programme report from 2018 (UNDP, 2018). In 2015, the country's greatest rate of poverty and inequality was seen in the Upper West Region (Cooke et al., 2016).

It must be noted that unlike other regions of the country, economic opportunities are also very limited in northern Ghana making the poverty level very high over the years. Over 70% of Northern Ghana's population also relies on unimodal rainfall for their agricultural activities which provides them with food and income (Ali et al., 2021). Low agricultural production and earnings are a result of overreliance on rainfall, inadequate feeder road connectivity from fields to market areas, poor soil fertility, and restricted access to inputs (Ali et al., 2021). High poverty and vulnerability levels in the region are caused in part by climate change and fluctuation. Due to this,

seasonal migration and famine are highly prevalent in the region. The infrastructure to support off-season agricultural activity is underdeveloped or nonexistent, leaving the majority of the agricultural population in the North without an alternate or supplementary means of guaranteeing their livelihoods for a period of 7-8 months out of the year (UNDP, 2018). The fact that the most recent Ghana Living Standards Surveys (GLSS) indicate that poverty is spreading across generations in Northern Ghana is alarming (Sackey et al., 2020).

It should come as no surprise that the unforeseen effects of this pandemic provide a variety of challenges for governments at various levels, policymakers, communities, private and public organizations, households, and individuals. Threats to sustainable development include the economy's slowdown caused by the virus's rapid spread and the collapse of the food and health systems (Biggeri, 2020). Sen (1992) pointed out that we should not just focus on what individuals have or how they feel, but also on what they can do and be, particularly when conducting household-based analyses like poverty analysis. Sen's research suggests that instead of concentrating on people's resources and means, the analysis should concentrate on their capabilities and aims. The capability approach[1] offers a multidimensional framework, focusing on the many ways human lives are disadvantaged. This is because, even though almost everyone would like to have a higher income,

[1] The capability approach by Amartya Sen states that the capability to function is what really matters in identifying an individual as poor or non-poor. Income alone is not a good measure of poverty. What matters is not what a person has or the things he or she can buy with income. What really matters is what a person can be or can do or does or will do.

one's standard of living is also influenced by their ability to access basic social services, which give them the means to improve their abilities and functioning, as well as the environment's sustainability and health (which also affect wealth and functionings). The different "doings" or "beings" that a person is successful in, such as contributing to society, maintaining good health, and so on, are referred to as "functionings." Functioning as defined by (Sen, 1993) "*represents parts of the state of a person, in particular, the various things that he or she manages to do or be in leading a life*". Sen contends that resource-centric theories of inequality are inadequate because

- People require various amounts of resources to accomplish the same capabilities because they have varied requirements (variations he refers to as "conversion factors," and
- One factor influencing what people can accomplish and be is their level of income (Sen, 1999); therefore should not be used as the only measure of inequality.

The COVID-19 pandemic has had a variety of effects on different nations, but in the majority of cases, the fundamental capabilities of health, education, housing, nutrition, and social connection have been undermined (Anand et al., 2020). The capabilities framework facilitates the rapid identification of a variety of deprivations across all spheres of life that may be policy targets. Particularly, the absence of some capabilities, including connection and resilience, may, at least in part, exacerbate the problem (Manley, 2020). The various conversion factors undoubtedly play a role in achieving functionings

and, for that matter, in coping with the COVID-19 and similar pandemics in the future. Therefore, it is relevant to find out how farm households' capabilities might help them stay resilient to the economic, health, social, emotional and spiritual stresses or shocks in northern Ghana notably, Savelugu Municipality and Nanton District already bedeviled with inequality and poverty, in COVID-19 pandemic era.

Over the years, studies have been conducted on resilience to socio-economic shocks in various fields and most of them have indicated that resilience is a difficult concept to operationalize. In ecology, Holling (1973) introduced the idea of resilience, and according to him, resilience is a *system's ability to adapt to changes in the state of its variables, driving variables, and parameters while still maintaining its linkages.* Moser (1998) defines resilience as "*responsiveness in seizing opportunities and fending off or recovering from the negative impacts of a changing environment".* Resilience has also been defined by Wu et al. (2013) as "*the ability to adapt successfully in the face of stress and adversity (shocks)*" while continuing to function normally. Adopting the above definitions, the study defines resilience as the ability of farm households to bounce back from a shock and/or recover from the negative impacts of the shock and persist.

In unexpected and uncertain situations, people need to develop resilience to cope effectively and bounce back from events (Duchek, 2020). An example of such events is the COVID-19 pandemic which has caused and still causing devastating outcomes, especially for farmers and their productivity causing

price hikes on both food and non-food commodities in the country. According to Yegbemey et al. (2021), farmers adopted some coping strategies that helped them develop some level of resilience to the COVID-19 pandemic which include producing fewer crops for sale and producing more for their own consumption, eating more of their own produce instead of purchasing and also storing more of crops produced. Household capability is said to play a major role in ensuring that individuals within the household develop resilience in their quest to fight the pandemic (Liu et al., 2020).

1.2 Problem statement

The COVID-19 pandemic has had many consequences on people's lives. Poor households are projected to be hit harder, especially in resource-constrained economies like Ghana (Asante et al., 2021). Since the commencement of the pandemic, there have been various damages worldwide, especially to health and businesses (agricultural production) and it has rendered human labor unproductive. This has caused inevitable shocks in the economy and other social costs, affecting the functioning of agricultural and food systems worldwide. Asante et al. (2021) did a study on the socio-geographical perspectives of the health and economic effects of the COVID-19 on underprivileged households in Ghana. They discovered that the impoverished households in Ghana suffered significantly from poor socioeconomic outcomes and heavy health burdens. This indicates that the pandemic causes more harm than good, especially to the already underprivileged poor households who are prone to more shocks due to a lack of livelihood

diversification.

Ghanaians rely heavily on local agricultural goods for their basic food needs. With the pandemic and its limitations, there have been disruptions in the food value chain, causing production to cease in numerous agrarian areas (Barrett et al., 2020; Nchanji et al., 2021). The closure of agricultural input markets and the resulting shortages of seed and other farm inputs could have a devastating short and long-term impact on following planting seasons, with some agro-based industries potentially collapsing (Megersa et al., 2020). This would not only cause food instability and malnutrition, but it will also make things worse for farmers in rural areas whose livelihoods depend on agriculture.

According to a United Nations study, sub-Saharan Africa had the lowest farmer earnings worldwide and more than 250 million people lived in the region in severe food insecurity prior to the COVID-19 outbreak (Carreras et al., 2020). The COVID-19 outbreak is simply the most recent in a string of epidemics and catastrophes connected to the industrial food system, and it won't be the last. According to research, the pandemic will cause 83 to 180 million extra individuals to experience hunger (Devereux et al., 2020). More than half of those anticipated to go hungry would likely reside in Sub-Saharan Africa with more households experiencing hunger and food insecurity (Haider et al., 2020), which estimates that the COVID-19 outbreak will cause a doubling of that number. This would be one of the biggest global food crises since World War II (Anthem, 2020; Arnold et al., 2020; Bhavani

and Gopinath, 2020) which is being experienced now in some parts of the world. Most respondents in Ethiopia, Kenya, Malawi, and Tanzania reported no significant changes in their farming operations, in contrast to Ghana, Nigeria, and Zimbabwe where most respondents indicated a decline in their participation in farming and other commercial activities. Agricultural Policy Research in Africa (APRA) undertook this study in seven African nations to investigate the effects of the Covid-19 pandemic on farm households (Carreras et al., 2020).

In reaction to the COVID-19 pandemic threat, a study conducted by Dzanku in 2020 on the impact of COVID-19 on Food Systems and Rural Livelihoods in Ghana revealed that about 71.8% of respondents said they reduced their movement inside their communities, 76.4% said they reduced their movement outside of their communities, and 44.6% said the pandemic also made it difficult for relatives to visit them (Dzanku, 2020). At least 30% of respondents in all countries including Ghana except for Ethiopia reported a decline in the availability of grains, white roots, tubers and plantains in local markets (Carreras et al., 2020). Individuals without social protection, with precarious employment, and with restricted access to and control over resources were, however, the most impacted. These include, among others, migrants, women, landless individuals, indigenous individuals, small-scale producers, and individuals who experience racism or other forms of discrimination. These groups are more vulnerable to COVID-19 because they already experience structural injustices including access to healthcare, clean

water, and sanitation, among other things (Arnold et al., 2020).

Biggeri (2020) asserts that people, households, communities, and territories with conversion variables and resources respond to health emergencies by using various ways. But ambiguity regarding the optimal course of action still predominates, and the current situation poses several fresh issues for policymakers to research to bounce back. Various studies have been conducted concerning capability, COVID-19 impacts and resilience, for instance; (Aduhene and Osei-Assibey, 2021; Amewu et al., 2020; Ansah et al., 2020; Arakpogun et al., 2020) but none of these studies have found out about farm household capability, coping strategies against the impacts of the pandemic and the resilience to food security shock. This remains a gap that needs to be filled to help in the recovery from the pandemic. Therefore, this study seeks to assess farm households' perceived impacts of the COVID-19 pandemic. Also, it seeks to examine how farm households' capabilities influence their coping strategies against the COVID-19 impacts. Finally, the effect of capability on households' food security resilience to the COVID-19 pandemic will be identified.

1.3 Research questions

The study seeks to address the main research question: how do farm households' capability and perceived impacts of COVID-19 pandemic affect food security resilience?

Specific research questions

1. How have farm households' perceived impacts of the COVID-19 pandemic on their livelihood activities?
2. How does farm household's capability influence coping strategies against the COVID-19 impacts?
3. What is the effect of farm household's capability on food security resilience to the COVID-19 pandemic in Savelugu Municipality and Nanton District?

1.4 Research objectives

The main research objective is to examine farm households' capability and perceived impacts of the COVID-19 pandemic on food security resilience.

Specific research objectives

1. To assess farm households' perceived impacts of the COVID-19 pandemic on their livelihood activities.
2. To examine how farm households' capabilities influence their coping strategies against COVID-19 impacts.
3. To measure the effects of farm households' capability on food security resilience to the COVID-19 pandemic in Savelugu Municipality and Nanton District.

1.5 Justification

This study hopes to provide information to various stakeholders, such as the Government of Ghana and researchers, as they embark on interventions that

would help improve farm household capability and livelihood. The study will contribute enormously to literature since first and foremost, knowing households' perceptions about the current and anticipated effects of the COVID-19 pandemic on their activities and livelihoods is important in informing policy direction and implementation in dealing with the pandemic and other future occurrences. Since the inception of the pandemic, the Government of Ghana tried various ways to help the citizens stay safe. Therefore, knowing the perceptions about the pandemic will help put proper measures in place for future pandemics. The study equally helps in gaining adequate knowledge on some mechanisms used as coping strategies by farmers and the capabilities that help them to cope. Knowing this will help policy formulators put in place policies that align with such mechanisms to help citizens cope better throughout the era of the coronavirus. Last but not the least, since the Government of Ghana policies to ensure safety and growth in the agricultural sector in the quest to enhance food security, reduce poverty and increase the living standards of people, it is prudent to understand individual as well as household capability to know their strengths and weaknesses (especially what they can be and do) while implementing policies. This can effectively be achieved when measures are put in place to ensure that the food security resilience of farm households towards the COVID-19 pandemic is improved, which this study seeks to establish. This will help us understand the effects of the pandemic, what ought to be done and what to avoid to reduce the impacts of the shock and stay resilient.

1.6 Structure of the thesis activities

This thesis is divided into the following five chapters: The background of the study, including Covid-19, capability, and food security resilience, as well as the problem statement, the research objectives, the justification, and the study's structure, are all included in the current chapter (Chapter 1). A review of the literature that is relevant to the study's research goals is included in the following chapter (chapter 2). The methodology of the study is presented in Chapter 3 along with the study's study area, sample size and sampling techniques, survey instruments, theoretical framework, conceptual framework, and method of data analysis. The study's results are presented and discussed in Chapter 4 based on the study's various objectives and objective-by-objective analysis. Finally, chapter 5 summarizes the findings and draws some policy implications based on the findings.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

This chapter reviews the literature on capability, perceived impacts of the Covid-19 pandemic, coping strategies to combat the impacts of the pandemic and food security resilience. Section 2.1 reviews literature on perceived impacts of the Covid-19 pandemic on farm households; section 2.2 reviews literature on coping strategies against the impacts of the pandemic; section 2.3 reviews studies on capability; section 2.4 presents a review of resilience measurement and section 2.5 reviews literature on resilience to

food security shocks.

2.1 Concept Reviews

2.1.1 Perceived impacts of Covid-19 pandemic

The novel human coronavirus disease 2019 (COVID-19), which was initially identified in Wuhan, China, in 2019, was the fifth pandemic to be reported since the 1918 flu pandemic (Liu et al., 2020). More than 200 million confirmed cases and more than 4.6 million fatalities from COVID-19 had occurred by September 2021, more than two years after the disease was first discovered (WHO, 2021). The number of cases and fatalities in Africa, however, has not been as high as on the other five continents. As of the end of 2020, there were 64,771 fatalities and 2,728,817 recorded cases on the African continent. The number of cases in Africa may not accurately reflect the pandemic's actual state because several nations did not conduct enough tests due to the significant cost involved (Di Gennaro et al., 2020)

On March 12, 2020, Ghana received its first official reports of two COVID-19 cases. It was discovered that the two incidents involved people who traveled into the country from Norway and Turkey. With the help of these imported cases, Ghana's first contact tracing process was able to immediately identify dozens of instances (Asante & Mills, 2020).

Governments implemented several emergency measures to stop the pandemic transmission because of the COVID-19 outbreak, which first hit China and the Far East, then Italy and Europe, the Americas, and eventually

Africa. A worldwide international economy experienced simultaneous interruptions to supply and demand due to, among other things, mobility constraints and social estrangement. Production fell due to a decline in labor supply brought on by firm closures, infections, and slowdowns in business operations on the supply side. Despite the social safety nets put in place by governments, layoffs, income losses, and worsening economic prospects on the demand side led to a decline in household spending and private investment (Giovanni Abramo et al., 2022).

The world economy has entered the greatest economic depression since World War II, according to the World Bank, as a result of the huge shock of the COVID-19 outbreak and lockdown efforts to contain it (Abramo et al., 2021). The deleterious consequence on economies all over the world was therefore anticipated to culminate into a drop in per capita income in about 90% of countries in the short term not to mention the long-term social effects (Djankov & Panizza, 2020).

The pandemic's epicenters, Accra and Greater Kumasi, Ghana's two major cities, were partially placed under lockdown for three weeks starting at the end of March 2020. The military and police established checkpoints and restricted free movement while doing inspections. Only those working in industries providing essential services (such as healthcare, the media, food vendors/restaurants, and security agents) were allowed to move about in these cities. Everyone in the rest of the country was free to go since there were no known instances at the time (Asante & Mills, 2020).

The Ghanaian government outlawed all public gatherings to stop the spread of the virus, including conferences, workshops, funerals, festivals, political rallies, church and mosque activities, and other events. Additionally closed were the beaches, bars, and clubs. A number of further measures were also taken, such as conducting fumigation exercises in most of the country's market centers (Asante & Mills, 2020). The government's policy responses to restrain the spread of the COVID-19 pandemic posed significant negative impacts on employment, incomes, and the food security and nutrition of smallholder households in Ghana. The impacts are being felt across the population in rural and urban households (Asante & Mills, 2020).

The authorized shutdown orders brought about a considerable reduction in employment by 34.3 percent during the lockdown era. Due to the disruption of their economic activity, employees in informal self-employment may have been most negatively impacted by the lockdown policy requirements given the nature of their business. Despite the health concerns provided by the pandemic, employees in informal self-employment were more likely to continue working during April 2020 in control areas. This finding may be related to their desire to make a living on a daily basis (Durizzo et al., 2021; Kazeem, 2020). Therefore, it was determined that four months after the restrictions were relaxed, the lockdown's potent and profound instantaneous therapy impact had vanished. However, employment and labor earnings in the entire nation continued to fall short of pre-COVID levels. Particularly, self -employed employees' and female workers' salaries continued to be

significantly impacted in the short term, suggesting that the pandemic may have had an uneven overall impact (No et al., 2021).

Because of this, the COVID-19 pandemic was essentially a public health emergency, and the population was urged to practice preventative health behaviors such as avoiding crowded areas and social isolating in order to slow the spread of the pandemic (McKee & Stuckler, 2020). However, these relief measures quickly had unintended consequences that led to a collateral economic crisis in the shape of rising jobless claims, income losses, and pervasive market instability (Ichino et al., 2020). This issue can be viewed as a risk-risk trade-off: attempts to lessen or eliminate one threat to human health unintentionally result in the promotion of another threat that is just as deadly as or even more so than the original threat. A remarkable aspect of this pandemic is the trade-off, which takes place on a worldwide scale (Graham & Wiener, 1995). Hence a need to focus on risk perceptions about the COVID-19 pandemic. Understanding people's attitudes and behaviors in the face of dangers has proven to depend heavily on their perception of risk (Graham & Wiener, 1995), and how people weigh costs versus benefits when tackling hazards (Gregorian et al., 2010). Less attention has been paid to the dynamics that could arise with secondary or collateral risks. But given the current circumstances, it is important to consider this aspect. The economic risk posed by mitigation measures (such as job loss and income reduction) is considered to be a secondary risk that should be accepted in order to address the basic risk in the COVID-19 pandemic era (Nisa et al., 2021).

However, the economic risk has overtaken the health risk as the secondary danger, and some people believe they are opposed to applying mitigation techniques because of worries about the economy (NY Times, 2020).

Even though the pandemic caused more harm than good but some silver linings have been recorded by some studies. Kugbey et al., (2021) in their study claimed that there are some silver linings across several domains such as health and wellbeing, education, eco-system and social connectedness, with the main benefit being adherence to public health measures which will be retained beyond the pandemic. With regards to income and employment, the demand for sanitizers, face mask, detergents, handwashing facilities, water containers and other public health needs rose markedly. The introduction of the online or e-learning systems across the educational systems in both developed and developing countries is a key benefit of the pandemic in the educational sector (Kugbey et al., 2021). The airline sector also benefited during the pandemic due to the social distancing restrictions. Most people preferred the airline option because of maximum protection, Disinfecting aircraft cabins with ultraviolet technology, Flight crew wearing personal protective equipment and others (Amankwah-Amoah, 2021).

Averagely, worldwide risk perceptions are low to moderate. Despite the great concern caused by the COVID-19 pandemic, ongoing media coverage, the high number of cases, and the high death toll, individuals still think that getting the virus is unlikely to happen. The maximum perceived likelihood of

contracting the coronavirus barely reached a 50% chance across all countries (Nisa et al., 2021). The chance of experiencing financial hardship because of the coronavirus is thought to be a more plausible effect. The public has a moderate perception of economic risk; they believe that suffering financial losses is considerably more likely. Regardless of age, gender, education, employment level, financial situation, political philosophy, or any other demographic variable, the higher pattern of perceived economic risk from the coronavirus is surprisingly similar across all nations and socioeconomic groupings (Nisa et al., 2021). For the average person, the risk of contracting the virus is regarded as low to moderate (European Centre for Disease Prevention and Control, 2020), while the probability of experiencing financial losses is about 50% for the global workforce (International Labour Organization, 2020).

Most farmers in sub-Saharan Africa indicated concern about "access to inputs, ability to cultivate, reduction of yields, ability to feed animals, ability to sell livestock, and ability to hire labor". Due to this, the majority of residents in sub-Saharan Africa worry that the COVID-19 pandemic will make it harder for their household to regularly obtain enough food (82.5%), that the markets where they buy food will either be closed or significantly disrupted (79.5%), that food will become more expensive (73.5%), and that the market where they sell their produce/livestock will either be closed or significantly disrupted (73.2%) (Middendorf et al., 2021). Undoubtedly, about 55% of Africans expressed concerns about food security, access to food, and

potential famine. Additionally, about 52% of them said they had zero confidence in their ability to access other social services to support their families, and about 51.8% said they had zero confidence in their ability to access farm credit, subsidies, and other financial assistance (Middendorf et al., 2021).

Among other things, 64.1% of respondents thought that the COVID-19 pandemic would have a substantial impact on the amount of work done by women in the home, including childcare, meal preparation, and water collection. On the other hand, they anticipated a considerable decline in the quantity of work done by women in on-farm activities (56.9%) and a marked increase in off-farm activities (such as wage labor and market activities) (59.3%). About 70% of respondents believe that off-farm activities have significantly increased (such as market activities and wage work), and 75% are concerned about jobs, unemployment, and poverty-related fears (Hammond et al., 2022; Middendorf et al., 2021).

According to how the COVID-19 outbreak was perceived in Ghana, many farmers were concerned about the effects on their livelihood and predicted severe effects because of disruptions to the markets and supply systems for their products. The effects on overall production and its contribution to national economies were also significant as a result of changes in planting sites and yields of important cereal grain crops (Aduhene & Osei-assibey, 2021). Vegetable supply networks are particularly sensitive since these items

are usually perishable and may suffer spoilage and post-harvest losses in the event that there are delays and disturbances along the supply chain, such as in the timely access to labor or transportation to markets (Aduhene & Osei-assibey, 2021).

2.1.2 Coping Strategies against Covid-19 Impacts

The distribution of resources and the choice of commercial endeavors by individuals to achieve their objectives is known as a livelihood or coping strategy (Freduah et al., 2017). Early adoption and modification of livelihood recovery measures can provide both people and families with effective protection while dealing with the effects of the COVID-19 pandemic on livelihoods and assets (Xu et al., 2018). This undermines farmers' ability to not just maintain their current standard of living but also develop resilient livelihoods. Farmers may now effectively manage the risks associated with the pandemic and aid in their survival, mitigation, and recovery from the COVID-19 pandemic by implementing livelihood recovery measures (Zhou et al., 2021). In real life, farmers constantly modify their livelihood methods in response to shifting capitals, regulations, and external shocks. Different approaches have been used by farmers to combat the pandemic's effects. A proactive approach at the individual level typically entails income diversification, such as looking for part-time work or launching an online business. However, some farmers do not embrace recovery measures. They prefer to do nothing to recover but rather wait for the right time to continue their previous activities. To continue the progress made in eliminating severe

poverty worldwide, proactive livelihood recovery techniques must be adopted. This is also a strategy for preventing farmers from entering or re-entering poverty (Zhao et al., 2022).

Households in Ghana have experienced socioeconomic disruptions following the loosening of the COVID-19 restrictions more so than the pandemic itself. Even though these disruptions have only had a minor impact on food production, they have had a significant impact on household income, nutrition, and livelihoods due to a decline in economic activity that led to income losses, a decrease in household purchasing power, as well as a number of food system shocks. Even though the majority of farmers have been able to continue their businesses, there has been a marked decline in employment and income (Hodey & Dzanku, 2021).

The decrease in traders or customers traveling to farming areas to acquire farm produce also had a devastating impact on trading activity. This was made worse by rising transportation costs, which further restricted the movement of commodities to local and provincial markets. In addition, there have been reports of price increases for several basic groceries and other household items. High living expenses resulted as a result, which had detrimental effects on households' access to food and nutrition as well as their general well-being (Hodey & Dzanku, 2021)

Certain households in Ghana were able to recover from or adapt to the socioeconomic disruptions caused by the COVID-19 tragedy thanks to the

relaxation of COVID-19 relieving measures and the comparably low incidence of daily infections. Undoubtedly, some households changed their marketing strategies to target more regional value chains and diversify their off-farm businesses. Businesses and farming ventures carried out by households prior to the epidemic have nearly fully resumed (Hodey & Dzanku, 2021).

The COVID-19 pandemic also embraced some indigenous innovations in the shape of locally produced face masks, alcohol-based hand sanitizers, Veronica hand washing buckets, and improvised hand washing buckets made from local materials. However, by boosting their resilience and adaptation to associated catastrophes, these indigenous inventions showed a strong potential for decreasing households' vulnerability to upcoming local or global health crises (Aday & Aday, 2020).

Most parents and guardians had to deal with extra childcare duties that were frequently shared with the kids because of the closure of schools in March 2020. These extra childcare obligations included more housework, more agricultural work, or occasionally, paid employment away from home (Hodey & Dzanku, 2021). Also, Karpati et al., (2021) established that the countrywide COVID-19 associated school closures culminated into a rise in child labor resulting from socio-economic forces, exposing children to all forms of exploitation, violence and abuse. The resulting deprivations and disparities between children from economically advantaged homes and those from disadvantaged or vulnerable homes have thus been further exacerbated as a result.

The usage of barter trading as a mode of payment for products and services remained minimal; nevertheless, the use of electronic transfers increased significantly, from 31.8% to 53.4% (Hodey & Dzanku, 2021). Despite the possibility that this increase in use is consistent with the general rise in the use of electronic transfer payments over the previous few years, it is obvious that the use of electronic transfer payments was propelled by the limitations on mobility and the rise of online sales and service provision. With this increase, Ghanaians have not completely abandoned using cash to complete transactions (Hodey & Dzanku, 2021).

Therefore, the COVID-19 pandemic continues to have antagonistic effects on small holder farmers and their families. Other families are also dealing with the calamity by participating in non-farm activities, lowering their intake of food and non-food items, and depending on savings. Some families are exhibiting incredible resilience in the absence of much or, in most cases, no external aid. However, a larger portion of families in Ghana experienced severe hardship because of travel limitations, increased childcare and housework duties (especially for women and girls), increased farm work (for boys), decreased participation in farming and business activities, as well as a reduction in the availability of transportation.

To prevent a decline in the sense of control that families feel over their own life, a decrease in the availability and consumption of food, and an overall rise in living expenses that lead to food and nutrition insecurity in Ghana, effective interventions must be implemented right away.

2.2 Empirical Studies

2.2.1 Capability Concept

Recently, academics, practitioners, and policymakers have paid more attention to the human development and capabilities approach to development research (Ibrahim, 2014). 'Capability' is the complete set of achievable alternative lives that a person faces (Gasper, 2006). The concept of human development initially focused on the progress of economic growth indicated by the gross national product (GNP), income levels, or increased industrialization and technological advancements. However, it switched the emphasis of economic development in the 1990s to a paradigm that was people oriented. In order to focus on human welfare in terms of life expectancy, health, and education, the former emphasis on living standards, goods, and economic variables was replaced (Gasper, 2006; Kuhumab, 2018). Therefore, investing in social and public infrastructure will help people become more capable over time, improving their access to health care, higher education, and other opportunities. This is what is meant by human development. (Robeyns, 2005).

Amartya Sen, an economist, and philosopher thought that human development could be effectively analyzed from the standpoint of human well -fare other than progress of the gross national product (GNP). From this thought process, Amartya Sen conceived and developed between 1980 and 1999, the concept of the capability approach which focused on people's capabilities; that is, what people are effectively able to do and to be (Alkire,

2005; Robeyns, 2005). Amartya Sen argues that the concept of "human development" cannot be reduced to the growth of the gross national product (GNP), income increases, or increased levels of industrialization and technical advancement. Sen maintains that resources such as wealth, income, and utilities serve as means to an end for the development of people rather than being goals in and of themselves (Kuhumba, 2018; Robeyns, 2005). Many resources are not inherently valuable; they are influential to other objectives, yet the quality of life relies arguably not on the sheer presence of resources but on what they allow people to do and be (Alkire, 2008). Sen's conception of human growth signifies the elimination of significant obstacles to our freedom. Poverty, limited economic possibilities, oppression, and other issues are a few of these difficulties.

The expansion of freedom is perceived both as a primary end and the primary means for development in this context (Alkire, 2005; Gasper, 2006; Robeyns, 2003). It was the new look at human development that inspired Amartya Sen to develop the Amartya Sen's capability approach for assessing the well-being of individuals and communities. The capability approach has received enormous attention in academia which can be traced back to Aristotle, Adam Smith, Karl Marx, among others. Martha Nussbaum and Sabina Alkire as well, have made significant contributions to the advancement of the capability approach (Kuhumab, 2018; Robeyns, 2005). Fully developed, the capability approach, could accommodate all changes in the quality of life of a person: from knowledge to employment opportunities to relationships and inner

peace, to self- confidence and the several valued activities made possible by the classes of literacy. None of these changes in a person's quality of life are always ruled out as immaterial and places. Thus, one can examine both primary and complex capabilities, and examine the capabilities of a rich and poor person or nation (Alkire, 2005).

The capability approach provides a wider normative framework for assessing and evaluating social structures, policy approaches, and suggestions for societal transformation (Robeyns, 2005). The emphasis placed on what people can do and be successfully, or on their capabilities, is a manifestation of the fundamental concepts of the capability approach. This conflicts with viewpoints that place a heavy emphasis on how people fulfill their desires or are happy, or how they make money, consume things, or spend money (Alkire, 2005; Robeyns, 2005). The capability approach was initially created in the 1980s as a new way of looking at welfare economics. In his capacities approach, Amartya Sen incorporated a variety of ideas that seemed to be missing from traditional welfare economics. The distribution of income has historically been the fundamental focus in traditional "welfarism" (Alkire, 2005). However, according to Amartya Sen, income inequality and economic inequality are not really the same thing.

The rationale for this is that information about people's income does not inform us regarding other things that are relevant to their welfare. Political regimes may limit people's options through discrimination, moral standards, customs, weather, infrastructure, health care system organization,

transportation, etc. For instance, in many cities, the possibility of experiencing assault prevents women from participating in sports and other social activities (Dagsvik, 2012). Nussbaum (2003) notes that economic growth which is demonstrated by Gross National Product (GNP) is an abysmal indicator of life quality because it is unable to reflect how deprived people are doing. They further note that women's character is in the argument as groups who are mostly incapable to enjoy the benefits of a nation's overall success. We advance closer to understanding the impediments societies have staged against full justice for women, if we consider what people are able to do and to be (Nussbaum, 2003).

By evaluating wellbeing in relation to both the chosen functioning and the competence set, we use the capability method. The phrase "beings and doings" refers to the diverse human circumstances and the range of possible human activities (Alkire, 2005; Gasper, 2006). The capability set demonstrates an individual's opportunities to accomplish functionings. In other words, although while "traveling" is a function, having the opportunity to do so is a sign of a person's skill set. According to some estimates, the capabilities approach consists of at least six elements: An emphasis on applying a wide range of information sources; a language with novel categories to define that variety; a prioritization among categories, particularly the prioritization of capability; a conviction that the prioritization of capabilities for individuals should be based on reason; a belief that the prioritization of capabilities for groups should be decided through open discussion and democratic decision-

making; The concept of a list of fundamental skills lies at the edge of the method, along with the classes of basic capabilities and threshold levels (Gasper, 2002; Robeyns, 2003).

Orientation to a broad variety of sources of information: The underlying idea is that there are additional sorts of data that are crucial for assessing wellbeing and quality of life beyond those covered by traditional economics, such as people's incomes, assets, purchases, and implied or expressed degrees of satisfaction or fulfillment of preferences (Kuhumab, 2018; Robeyns, 2003). The foundation of the capability approach is a firmness in referring to a wide range of knowledge types, particularly addressing how people live (what they are and do) and their freedom (what they are able to do and be). Sen adds that in addition to potential outcomes, the choice situation's other components, such as the rights of people and the interpersonal allocation of results, must be taken into account (Alkire, 2008; Gasper, 2006).

A set of categories: Sen's classification system provides a vocabulary for talking about this wider variety of factors. To the well-known ideas in micro and welfare economics, he contributed several others (utility, income and goods). Sen contributed new ideas such as capabilities and functionings (Gasper, 2002; Gasper, 2006). A person's functionings, such as their health or their ability to defend their rights, are aspects of how they live. A person's life is made up of a variety of these functionings. The range of potential functionings that a person has, or the range of possible lives that they could

lead, is what is referred to as their capability. Alternatively, the valuation of a person's potential for positive freedom, or their access to objective well-being, is based on the range and caliber of conceivable logically valued outcomes that they must choose from. Sen's primary concept of capability was well-being freedom, which has to do with the functions that an individual can carry out on their own (Alkire, 2005; Kuhumab, 2018).

A stance concerning which levels have ethical priority: Apparently, proponents of the capability approach classically rank spaces in which to evaluate well-being and equity (Alkire, 2008; Nussbaum, 2003). With freedom and self-responsibility given top emphasis, capability, or the value of the range of possible life choices, was placed first. Functionings and daily living were ranked second. Utility, whether defined as expressed sentiments of satisfaction, the reality of a choice, or the fulfillment of preferences, was rated third because preferences and choices may have been made without enough thought or in situations where exposure to, information about, or access to options was limited. Since agents make choices other than those that are aware and devoid of mistakes, it is impossible to infer how satisfied a person is from her decisions. Despite this, contentment might still be seen as a crucial sort of functioning (Alkire, 2005; Gasper, 2006). Instead of being interpreted as an evaluation rule that "capabilities merit greater value-weighting than do functionings," the normative priority given to capability could be viewed as a policy rule to provide people freedom and "let them commit their own mistakes." Then, rather than well-being—though it may

very well have an impact on the latter—capability is considered as a good measure of advantage, or how fortunate a person is. Being is more accurately described by the word "functioning." Children should not be subject to such a rule; nevertheless, as they grow and learn, it becomes more suitable (Alkire, 2005; Gasper, 2006; Nussbaum, 2003).

Priority capabilities are those which people have reason to value: Priority is given to "what people have reason to value" when we try to order a person's talents. This characteristic comprises two guiding principles: a focus on reason and a liberal assessment that individuals should make for themselves (Gasper, 2002). When people make poor decisions in their selections, competition between them develops. The word "reason" in this context has the implication of "excellent reason" or "well-reasoned," else the phrase "have reason to" would be unnecessary and "what people value" would suffice. It doesn't mean logical thinking can only lead to one conclusion (Gasper, 2006). The likely conflict among philosophies of reason and free will is less clear when we refer to "people," "us," and "they," as opposed to "individuals," "a person," "one," or "she." According to the capacity approach, social arrangements should be evaluated in light of how much freedom people have to "do and be what they value," or to improve or reach functionings they value. Therefore, evaluation must be done by the people themselves, not by anybody else, and according to what they value rather than simply what they should value (Alkire, 2008).

Public procedures for prioritizing and threshold-setting: Sen incorporates a

focus on public discourse and decision-making mechanisms for determining which skills should be given priority (Gasper, 2002). In other words, for the typical areas of public policy and public goods where markets are unable to effectively manage societal choices despite adequate availability for capacities in information receiving and evaluation, preference evaluation, and decision-making. This is for circumstances where the self-deliberative requirement of "anything individuals have reason to value" is insufficient. Additionally, public discourse is crucial for influencing market preferences (Alkire, 2005; Gasper, 2006).

A category, and a list of basic capabilities: With open prioritizing processes, predetermined lists of priority capabilities might be feasible. Nussbaum (2003) argues that for the purpose of constitutional guarantees, a list of central human capabilities must be specified. Hence, unlike Nussbaum, no such formal list is made by Sen. In practice however, Sen applies concepts of primary capabilities and desired thresholds for minimum necessary achievement. Sen, who would probably make the case that being properly fed, healthy, and educated are essential capabilities, accepts this in practice and consistently receives democratic approval (Gasper, 2002; Nussbaum, 2003).

Sen, then, operates with a category of "primary/basic capabilities," an incomplete list of primary capabilities that was not decided upon through democratic decision-making from the bottom up, and acceptance of the idea of longer lists, provided that they were decided upon through democratic

decision-making at each point in time and within each political community (Robeyns, 2003). The World Bank changed its direction from relying solely on economic indicators to being more concerned with how people actually lived, and its input is apparent in the United Nations Development Programme (UNDP) reports due to the capabilities approach's appealing potential (Kuhumab, 2018). Although many academic fields adopt Amartya Sen's capabilities approach, political philosophy, social policy, and development studies stand out. It can be utilized to assess a variety of facets of a person's well-being, including poverty, inequality, a person's well-being, or the overall well-being of a group of people. Additionally, it can be applied as a substitute assessment method for social cost-benefit analysis or as a framework within which to develop and evaluate policies, from the creation of welfare states in developed countries to the formulation of public policies by governments and non-governmental organizations in developing nations (Robeyns, 2003; Robeyns, 2005).

2.2.2 Resilience Measurement

Resilience emerged from psychology and psychiatry in the 1940s, and Werner and Smith were primarily responsible for this development. The word resilience has since been widely used in several disciplines including social science, economy, ecology, and engineering. While such diversity reveals the utility of the terminology, it also contributes to doubt in how it is comprehended and defined (Jones & Samman, 2016; Renschler et al., 2010). The process of responding well in the face of adversity, trauma, tragedy,

threats, or even high levels of stress, according to the American Psychological Association, is known as resilience (Southwick et al., 2014). The National Research Council defines resilience as "the capacity to anticipate, cope with, recover from, or more successfully adapt from real or potential unfavorable experiences" (Rose, 2016). Constas et al. (2013) defines resilience as " the ability to ensure that shocks and stressors do not have long-lasting negative development effects. According to the UNISDR, resilience is "the ability of a system, community, or society exposed to risks to resist, absorb, accommodate, and recover from a hazard in a timely and efficient manner, including through the preservation and restoration of its key basic structures and functions." (Busby & Smith, 2014).

The available definitions of resilience are not uniform, but have some similarities in their mention of system/unit, disturbances, pre-event action, damage limitation, and managing change (Bahadur & Pichon, 2016). Virtually all the frameworks refer to one specific unit or entity (e.g., household, community, city, etc.) that needs resilience support, but some leave the description open-ended by calling it a system. Almost all definitions are in consensus that resilience is crucial in enabling systems to flourish or function when faced with shocks and stresses. Numerous definitions of resilience also point out the steps that must be taken to prepare for pressures and shocks. Most definitions also refer to resilience as reducing disruption damage, which includes absorbing shocks and recovering, as another crucial element. According to the majority of definitions, resilience is the ability to manage or

initiate processes of change in order to adapt to changing conditions (Bahadur & Pichon, 2016).

Although these descriptions are helpful, they do not adequately capture the complexity of resilience. Numerous physiological, biological, cultural, and social variables that interact with one another to control how someone reacts to stressful situations may be among the causes of resilience. It is essential to identify whether resilience is being regarded as a process, a trait, or an outcome when attempting to describe it, and it might be easy to take a binary approach when determining whether resilience is present or missing (Southwick et al., 2014). Natural and human systems are affected by natural hazards including storms, earthquakes, intense precipitations and floods, hurricanes, landslides, droughts, heat waves, thunderstorms, and cold spells. Casualties and fatalities are the immediate consequences of natural disasters; hence, the top priority of disaster risk management is to save lives, particularly in developing countries where these losses occur the most. Aside from casualties and fatalities, natural disasters pose economic consequences which negatively impact welfare (Hallegatte, 2014). When viewed from an economic perspective, a natural event is one that disrupts the way the economy works and has a notable negative impact on assets, production factors, employment, output, or consumption (Hallegatte, 2014). The perturbation caused by the natural disaster affects the economic system in a way that goes beyond the instant loss of assets and the monetary costs to replace damaged property.

The capacity of an economy, society, or household to lessen welfare losses for a disaster of a certain magnitude is frequently referred to as its resilience (Hallegatte, 2014). The distinction between inherent and adaptive resilience is another relevant delineation in resilience. Inherent resilience refers to the capacity for resilience that is already built into the system, such as the ability of an electricity generating facility to use more than one fuel, established government policy levers, and the operation of the market system in presenting price indicators to identify value and scarcity. Contrarily, adaptive resilience entails implementing conservation practices that weren't previously considered likely, advancing technology, creating market mechanisms where none may have previously existed (such as reliability premiums for water or electricity delivery), or creating new government post-disaster support programs (Rose, 2016). It is significant to recognize that the economy already embodies a significant degree of resilience at multiple levels; therefore, policies should be developed to take advantage of the already-existing resilience capability rather than duplicate or hinder it. In addition, policy ought to encourage both innate and resiliency.

The growing importance of the concept of resilience has placed it on an expected journey from scientific niche towards widespread operational applications. Such measurement tools allow for evaluating baseline information in relation to the resilience of the households and identifies potentials for improvement. From a practical measurement perspective, resilience is the capacity of a household, community, or system to handle or

recover from shocks and stresses and takes into consideration whether that recovery occurred with the application of negative coping strategies that underscore the capacity to recover from future shocks and stresses (TANGO International, 2018). The need to translate these definitions into something we can measure is compelling. The more we can learn concerning resilience, the greater possibility for integrating prominent concepts of resilience into relevant fields of social science and economics. To systematically strengthen the resilience of households, measurement tools for measuring household resilience are of enormous value. It is not surprising that a wide range of frameworks and approaches, emanating from a variety of organizations and sectors, exist to diagnose, guide, measure, and evaluate resilience (Bahadur & Pichon, 2016; Rose, 2016; Schulthess, 2017). Household features and abilities that can assist in re-connecting people to such opportunities or create conditions for developing new opportunities are critical for enhancing their ability to facilitate adaptation to and cope with environmental stresses (Lo et al., 2016). In the event of crises, access to these opportunities have been investigated by earlier studies adopting a wide range of attributes, including income or job stability, diversity of productive activities and income sources, occupational mobility, ability to relocate or liquidate key assets, production and consumption elasticity, access to market, degree of asset concentration, access to insurance and credit, likelihood of receiving remittances, diversity of household labor, potential for migration, etc. (Lo et al., 2016).

The capacity to measure resilience includes measuring the associations among shocks, responses, capacities, and states of current and future well-being. That is, there exist no single indicator that measures resilience. Hence, there is a need for a variety of indicators to be used as components of a measurement framework analysis (TANGO International, 2018). When evaluating resilience, four important variables must be taken into account: (1) Recognize the well-being outcomes to be achieved and measure resilience in relation to these outcomes; (2) Recognize the shocks and stresses that systems, communities, households, and individuals are exposed to; (3) Measure the absorptive, adaptive, and transformative capacities with respect to these shocks and stresses at varying levels; and (4) Recognize the responses of systems, communities, households, and individuals (Béné, 2013; TANGO International, 2018).

As much as the increased activity in resilience quantification can be perceived as a positive sign, the increased activity also creates a problem. The proliferation of metrics and approaches makes it problematic to communicate with stakeholders who may endeavor to measure resilience, gather findings across settings and over a period, or compare the outcome of one study to the next. There exist common methods for quantifying resilience, however, there are a variety of differences between these methods. Efforts to compute resilience can be classified into measurement that is centered on i) functionality; ii) access to food, iii) activities; iv) subjective perceptions; v) costs of resilience; and vi) indicators and characteristics (Boudreau, 2016;

Pietrelli, 2020).

The resilience measurement approach based on functionality focuses on infrastructure. It evaluates a functionality whose definition is undisputed and clear. Loss of "functionality" does not differentiate between the ability to resist loss and the ability to recover rapidly since it rarely considers differing thresholds. A system that measures seismic resilience is an example of resilience measurement approach that is based on functionality. The approach or framework based on 'access to food' focuses on household economy and is useful in practice owing to its restricted scope. It delivers logical, measured conclusions that can guide helpful acts, but it makes no attempt to go beyond what it can rationally examine. This approach only evaluates current well-being but lacks the ability to sustain future well-being. The household economy approach is a typical example. The approach based on 'activities' focuses on the cost effectiveness of a prompt action, thus, putting a monetary value on enhancements in resilience level. It shows value for money of investments, delivers headline figures, and allows early evaluation of relative value of interventions. It however does not seek to understand why people are vulnerable/resilient. An example of such approach is the 'Is Early Action Cost Effective' approach. Subjective perception approaches operate by considering an individual's self-assessment of their household's abilities and capacities in reacting to risk. Study subjects focus on the parts of resilience most applicable to them.

There is a risk of tactical responses as respondents may exaggerate their

vulnerability to receive assistance. It may also be difficult for cross-cultural comparison (Béné, 2013; Boudreau, 2016; Jones & Tanner, 2015). The Subjective resilience approach is an example. Béné et al. (2016) suggest that in addition to tangible factors such as income or assets, subjective elements of resilience including self- efficacy, risk perception, and aspirations determine resilience. In the short to long term, people's decisions regarding their coping mechanisms for daily life and their readiness to engage in various types of reactions (absorptive, adaptive, and transformative) are influenced by their perceptions of their capacity to bear future shocks and stressors. Hence, subjective resilience may be as vital as objective resilience. The resilience approach based on 'cost of resilience' works on the principle that going through a shock has cost implications. Thus, the lower the resilience cost, the more resilient a unit or system is. It quantifies resilience across scales and dimensions by offering an independent metric, however, not all the costs are easily measurable (Boudreau, 2016).

Resilience measurement approaches that operate based on objective indicators are the most common ways of quantifying resilience. They use noticeable socio-economic variables such as assets, income, access to safety nets, and social capital as proxies to quantify resilience. They analyze resilience from a diverse range of dimensions. They may however neglect less tangible, but important considerations. Comparing across different dimensions and networks is difficult. Also, they may not capture interactions between dimensions and scales. Food and Agriculture Organization's

Resilience Index Measurement and Analysis (RIMA) (FAO, 2016; Ngesa et al., 2020; FAO, 2015), Oxfam GB Multi- Dimensional Approach to Measuring Resilience and Livelihoods Change Over Time Model (Hughes & Bushell, 2013; Serfilippi & Ramnath, 2018) are common examples of resilience measurement approaches based on indicators and household characteristics. Resilience measurement approaches focusing on other dimensions include; ARUP/Rockefeller Foundation City Resilience Framework; DFID Building Resilience and Adaptation to Climate Extremes and Disasters (BRACED); Feinstein International Center, Tufts University/World vision; Tracking Adaptation and Measuring Development (TAMD); USAID Measurement Framework for Community Resilience, etc. (Béné et al., 2016; Boudreau, 2016; Jones & Tanner, 2015). Better measuring of the traits and factors of resilience has been called for by the growing attention on it. The resilience capacity index (RCI), focusing on the robust methodology known as the resilience index measurement and analysis II (RIMA II), which has been used in many contexts in Africa and the Middle East, is one approach that takes these demands into account (FAO, 2016; Ngesa et al., 2020). The household is the unit of analysis in the RIMA II methodology. There are four pillars to consider in RIMA II framework which are assets (AST), access to basic services (ABS), adaptive capacity (AC), and social safety nets (SSN) (FAO, 2016; Ngesa et al., 2020). The FAOs Resilience Index Measurement Analysis module (RIMA) is the most widely used approach by international institutions and organizations for measuring resilience (Boudreau, 2016; FAO, 2015). Since its inception, the

RIMA module has been applied extensively in about 10 countries including West Bank/Gaza, Niger, Ethiopia, Kenya, Sudan, Somalia and South Sudan for resilience measurement and analysis (Boudreau, 2016).

The Food and Agriculture Organization (FAO) of the United Nations has a rich array of experience in attempting to measure resilience and has been the first organization to apply the resilience concept in the context of food security. In 2008 the FAO proposed an econometric approach called the Resilience Index Measurement Analysis (RIMA) module, for quantifying resilience (FAO, 2016). Every available resilience measurement strategy must be built upon a specific definition of resilience. According to the FAO, resilience is "the capacity to foresee, absorb, accommodate or recover from disasters and crises in a timely, efficient and sustainable manner." The RIMA module, however, was created with the concept in mind: "Resilience is the capacity of a household to bounce back to a previous level of well-being (for example, food security) after a shock" (FAO, 2015). RIMA is a new quantitative approach that clarifies why and how some households are better able to handle shocks and stressors than others. Households can be affected by several types of shocks ranging from relatively minor to severe ones. In this regard, RIMA runs regression analyses that considers: 1) idiosyncratic shocks, including death of livestock, illness and job loss of a household member. These shocks are all reported directly by households in survey studies; 2) covariate shocks, which in turn are classified into: climate shocks, like temperature variations, droughts, rainfalls, floods, and other natural

hazards and; conflict shocks like public disorders, fighting, and murders (FAO, 2016; FAO, 2015).

Following the extensive application of the RIMA resilience module in evaluating the resilience of 10 countries since its inception in 2008, the need to review it was compelling. A review of it resulted in the creation of a new and improved version (RIMA-II) out of the old version (RIMA-I). Access to basic services, assets, social safety nets, sensitivity, and adaptive capacity serve as the foundational pillars of resilience. Because shocks and food security indicators are seen as exogenous, they are excluded from estimating techniques. (FAO, 2016; FAO, 2015).

Access to Basic Services (ABS): A household's ability to meet its fundamental needs, as well as its ability to receive and effectively distribute basic services, shows that it has access to those services. Resilience is fundamentally dependent on access to essential services including schools, neighboring markets, health care facilities, water, and energy. First, access to market institutions as well as non-market ones, such as public policy and the delivery of public services, restricts one of the most important aspects of resilience—the capacity to generate income from assets (Ngesa et al., 2020 FAO, 2016; FAO, 2015). For instance, the returns for farmer households can vary greatly depending on whether crops are sold at the farm gate or at the district market. Second, ABS is crucial in determining how much risk households and communities are exposed to. For instance, the likelihood of being sick is frequently linked to specific environmental dangers related to

inadequate waste management, water sources, and sanitation. Thirdly, the interactions between the state and civil society are crucial to adaptation. Ineffective state institutions are more prone to overlook the need for adequate healthcare, housing, and sanitation, which results in inadequate responses to shocks. It's vital to remember that the ABS discusses both access and service quality. Services to be taken into consideration include hospitals and other healthcare facilities, schools, paved roads, markets, shops, safe houses, water systems, and waste disposal facilities. The cost of using a service in terms of money might serve as a rough indicator of how well it is accessible (Béné et al., 2016 FAO, 2016; FAO, 2015). As arbitrary indications of quality, the general public's perceptions of the caliber of services in the neighborhood where the family resides can be used (FAO, 2016; FAO, 2015).

Assets (AST): Both productive and non-productive assets are considered assets. A household's ability to produce trade or consumable items is enabled by productive assets, which are crucial components of a livelihood. Livestock, land, and durables are examples of productive indicators. In contrast, non-productive assets like a car, house, and household comforts show how wealthy and affluent a family is (FAO, 2015). Income generally refers to the returns from productive activities as well as current transfers. Income is one of the best ways to directly measure standard of life, however it's not always simple to calculate income. Data on income is difficult to get because it is only obtained sporadically, whereas consumption levels off over time. Knowing that income-generating potential is captured by taking into

account assets, educational characteristics, employment information, and other proxies, is consoling (FAO, 2016).

Social Safety Nets (SSN): The SSN pillar quantifies the capacity of households to access support from friends and relatives, government, NGOs, international agencies, and charities. In many developing countries, access to transfers (cash or in-kind) characterizes a major source of poverty alleviation. Both public and private transfers form a bigger section of poor households' annual income. Formal transfers made possible by expanded credit availability and credit subsidization are among the key areas of action for providing social protection and lowering poverty. A large source of social security is also provided by the informal financial sector, particularly in places with limited access to the formal financial system. In the event of a shock, transfers and income are likely used as the initial response strategy (FAO, 2016; FAO, 2015).

Adaptive Capacity (AC): The AC refers to the capacity of a household to adapt to a relatively new situation and develop new strategies for their livelihoods. Thus, the AC symbolizes household capacity to adapt to the evolving environment in which it functions. Economic and ecological systems are non-linear and adaptive), hence, adaptive capacity of a household must be considered. The AC in social systems is only possible when there are networks and institutions that represent learning, store information, and experience, allowing for flexibility in problem-solving and power-balancing between interest groups (Béné et al., 2016 FAO, 2016; FAO, 2015). Being

adaptable means being able to reconfigure without significantly reducing vital functionality. Learning from technical advances is directly tied to being able to adjust to disturbances and shocks. The adaptive capacity often increases as the literacy rate does. Years in school have frequently been used as a stand-in for knowledge and ability (FAO, 2016; FAO, 2015). In terms of livelihoods, the less educated and skilled members of society are most susceptible to climatic dangers (FAO, 2016; FAO, 2015).

Sensitivity (S): Sensitivity deliberates on exposure to risk and resistance or persistence to shocks. The extent to which the livelihood of a household is impacted by a specific shock is described as risk exposure. There is more difficulty managing if severe shocks occur repeatedly over time. The amount of shock that a system can withstand before exploding into subsequent reactivity is probably a good way to define persistence. Resistance could also be described as the period of time before a shock threatens to undermine a household's entire system of support (FAO, 2016; FAO, 2015).

A resilience-focused approach is critical to assure successful humanitarian and development interventions. In general, the Resilience Index Measurement Analysis module (RIMA) is a rigorous methodology that adds on to a framework for humanitarian and long-term development interventions to build resilient and food secure livelihoods (FAO, 2015).

2.2.3 Resilience to Food Security Shocks

For human life to exist, enough and nutritious nourishment is essential. Food

security is a problem that affects everyone, but it affects children more than anybody else because of the long-term repercussions that early malnutrition causes. The capacity of rural communities to adapt, the effectiveness of food production processes, and price volatility are all factors that affect food security (Dornan et al., 2014). "there is food security when all people, at all times, have physical and financial access to sufficient quantities of safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life," according to the World Food Programme. (FAO, 2008). According to this idea, food security has four basic elements: physical food availability, economic and physical access to food, food consumption, and stability of the other three components across time. The amount of food produced, stock levels, and net trade all play a role in determining the supply side of food security, which is addressed by food availability. A sufficient food supply on a national or global scale cannot guarantee food security at the home level. General worries about insufficient food access have led to a greater governmental emphasis on incomes, expenses, markets, and prices in accomplishing the goals of food security. It is common knowledge that the body uses food to obtain the maximum nutrients from it. Individuals that receive enough care and feeding will consume enough energy and nutrients because of good food preparation, a varied diet, and distribution of food throughout the home. This affects how effectively people's bodies use the food they eat, which also affects their nutritional status. A person is food insecure even if they consume enough food since they regularly lack access

to it, which increases the likelihood that their nutritional state may deteriorate. All four requirements must be met for food security to be established: Food insecurity stems from anything lacking (FAO, 2008).

For many years, low- to middle-income countries relied heavily on agriculture as their primary source of revenue to provide for a sizable number of their populations. It has been an important sector that has helped up to 70% of the rural population find work and contributed the most to the countries' gross domestic product (Abegaz, 2017). However, a growing number of internal and external shocks have posed a threat to agricultural output. These shocks result from environmental and climatic changes as well as human-caused calamities like civil war and protracted war. In fact, factors that affect food insecurity in Ethiopia include rain shock, a lack of off-farm income, and household geography, with rain shock serving as the primary factor (Abegaz, 2017).

Agricultural activities ranging from field preparation to planting, growing, harvesting, storing, and distribution of the finished product can all have an impact on agricultural productivity to varied degrees. The characteristics of agriculture have made the industry more vulnerable to a wide range of natural and man-made shocks, which in turn increases the risks of food insecurity. As a result, these shocks reduce agricultural output, increasing the risk of food insecurity for rural residents. Therefore, it is logical that unfavorable weather, economic circumstances (unemployment, increased food prices), or political instability could have an impact on a person's level of

food security (Abegaz, 2017; FAO, 2008). Knowing how long a group of individuals have been in a difficult position is not sufficient; it is also crucial to understand how dangerous the effect of the issue is on the group's general nutrition and food security condition. This information will have an impact on the type, level, and urgency of the help that the impacted population groups will need (FAO, 2008).

It is crucial to understand the significant connection between food insecurity and hunger, malnutrition, and poverty. Most people think of hunger as a painful or uncomfortable feeling brought on by not getting enough food to fuel their bodies. Hunger is referred to be food deprivation from a scientific standpoint. It is crucial to emphasize that while all individuals who are hungry are food insecure, not all people who are food insecure are, as there are other forms of food insecurity, such as those caused by inadequate ingestion of micronutrients. Malnutrition consequently arises from excesses, shortages, or imbalances in the consumption of macro- and micronutrients. Malnutrition may result from a lack of food, but it may also be caused by other things, such as unhealthy environments, inadequate childcare procedures, and insufficient health care. Hunger clearly has a connection to poverty, but inadequate nutrition is a primary cause of poverty in the first place. According to one definition of poverty, it is the lack of basic human rights, dignity, and security as well as of health, education, consumption, and food security (FAO, 2008).

The household is the unit of decision-making, and it is here that the most

crucial decisions about how to handle uncertain events, both endogenous and exogenous, including those impacting food security, are made. Examples of such decisions include what kinds of income-generating activities to participate in, how to distribute the consumption of food and non-food items among household members, and what strategies to put into place to respond to and cope with risks. For the examination of food security, households can now be seen as the best starting point (Alinovi et al., 2010). Households with higher levels of resilience are more likely to have reliable and effective food security response plans as compared to those with lower levels of resilience. However, it is still possible that a household will be better able to choose strategies or develop mechanisms that increase their resilience to food-related shocks the more food secure they are. Additionally, it is helpful to be aware that some family actions may expose them to shocks; as a result, some shocks may not be exogenous to the household (Ansah et al., 2019). Food and nutrition security are differently influenced by the economy, food production, consumption patterns, food commerce, food preservation and storage facilities at all levels, food international trade, etc. The household resilience to food and nutrition insecurity in RIMA (FAO, 2016) assumes that local, community, provincial, and national situations impact well-being status (d'Errico et al., 2018). By using proxies as indicators, such as scores of food intake, months of adequate food supply, and household food expenditure, food security can be measured. As a result, the RIMA calculates food spending and dietary variety as proxies for household food security.

Household food security is at risk from two different types of shocks: covariate and idiosyncratic shocks. Idiosyncratic shocks, on the other hand, include illnesses/diseases or deaths that affect single homes or individuals, while covariate shocks include low rainfall that causes drought or floods, which affect many people at once (Ansah et al., 2019; d'Errico et al., 2018; Sibrian et al., 2020).

Household location, household head's gender, and size of household were reported by (d'Errico et al., 2018) to significantly affect household resilience to food security shocks in Uganda and Tanzania. The probability of suffering a food security shock increases if a household is in a rural setting. Also, the likelihood of suffering a food security shock is high when a household is headed by a female. Lastly, a larger household has a lesser likelihood of achieving dietary diversity. It is recommended that households apply various strategies such as contract farming, crop diversification, agricultural intensification, and vertical and horizontal integration to respond and adapt to these shocks (Ansah et al., 2019). Rural households who depend on agriculture for their survival are less able to withstand food insecurity or are more prone to it than non-agricultural households in five nations in Central America and the Caribbean. Farm diversity can be assessed by the variety of dry-season crops grown, the variety of livestock raised by families, and the distribution of land ownership (Sibrian et al., 2020). It would seem obvious that households that largely consume what they produce would have more varied diets because of more diversified agricultural production. More varied

production methods result in more varied household diets, which in turn improves household members' nutritional status and resiliency (Sibrian et al., 2020).

CHAPTER THREE

3.0 METHODOLOGY

3.1 Introduction

This chapter provides a vivid presentation of the study area, sampling and sampling techniques, data type and the source of data. It also presents analytical frameworks, empirical model estimations and how the variables used in the study are measured.

3.2 Study area

The Savelugu Municipality and Nanton District in Ghana's Northern Region, specifically, were the locations of the study. They share borders with West Mamprusi to the north, Karaga to the east, Kumbungu to the west, and

Tamale Metropolitan Assembly to the south. With a population density of 76.9 persons per square kilometer, the Savelugu Municipality has a total land area of 1599 km2 (PHC,2021). The Savelugu Municipality as projected by the 2021 population and housing census (PHC) has a population of 122,888 (GSS, 2021) representing 5.3 percent of the region's total population. Males are 60,390 and constitute a percentage of 49.14, females are 62,498 representing 50.86 percent. About 37.1 percent of the municipality's population lives in the rural area (GSS, 2021). The total number of households in the district is 23,085 with a mean household's size of 5.2 (GSS, 2021). As high as 89.3 percent of the households and 74.1 percent of the economic active population in the district are engaged in agriculture (GSS, 2014), with majority in food crops production at the subsistence level (GSS, 2014). The dominant food crops cultivated in the district includes maize, millet, rice amongst others. Cash crop production in the area is very minimal and includes Shea nut, soybean, cotton and Cashew. The Municipality is made up of one hundred and forty-nine (149) communities. The Nanton district has a total land area of 693.1 square kilometers with an annual population change of 0.81% and a population density of 73.25 persons per kilometer square. The total population of the district according to the 2021 PHC is 50, 767. Males constitute 25,257 while females constitute 25,510 (GSS, 2021). A total number of 37,639 of the district's population lives in the rural areas while 13,125 of the population lives in urban areas. About 9,487 of the inhabitants are literates while 21,680 are not (GSS, 2021). Subsistence farming is

practiced by about 68% of the work force in the active state. The district's main industry is the cultivation of crops like guinea corn, yam, rice, soybeans, and maize (Ministry of Finanance, 2020). They also raise and maintain a variety of livestock and poultry, including goats, sheep, donkeys, cattle, chickens, and guinea fowl. The district contains 67 communities in all (Ministry of Finance, 2020).

Poor road conditions exist across the district. Two major roads connect the district's two main towns: Nanton and Savelugu. One of the routes connects Nanton to the regional capital Tamale. Feeder roads, most of which are in bad condition, connect most of the settlements. These roads cannot be driven on during the wet season. Farmers find it challenging to transport goods from their farms to marketplaces as a result, which results in losses, particularly with perishable vegetables and other products (Ministry of Finance, 2020).

With regards to COVID-19 situation in the study area, respondents made mention that they were living in fear due to upsurge in the cases in the municipality. The municipal hospital had to close for two weeks because 60 of the staff had contracted the virus. Some residents had to relocate to other areas whiles others said they were afraid to walk outside of their houses or go to their workplaces due to the upsurge of the cases.

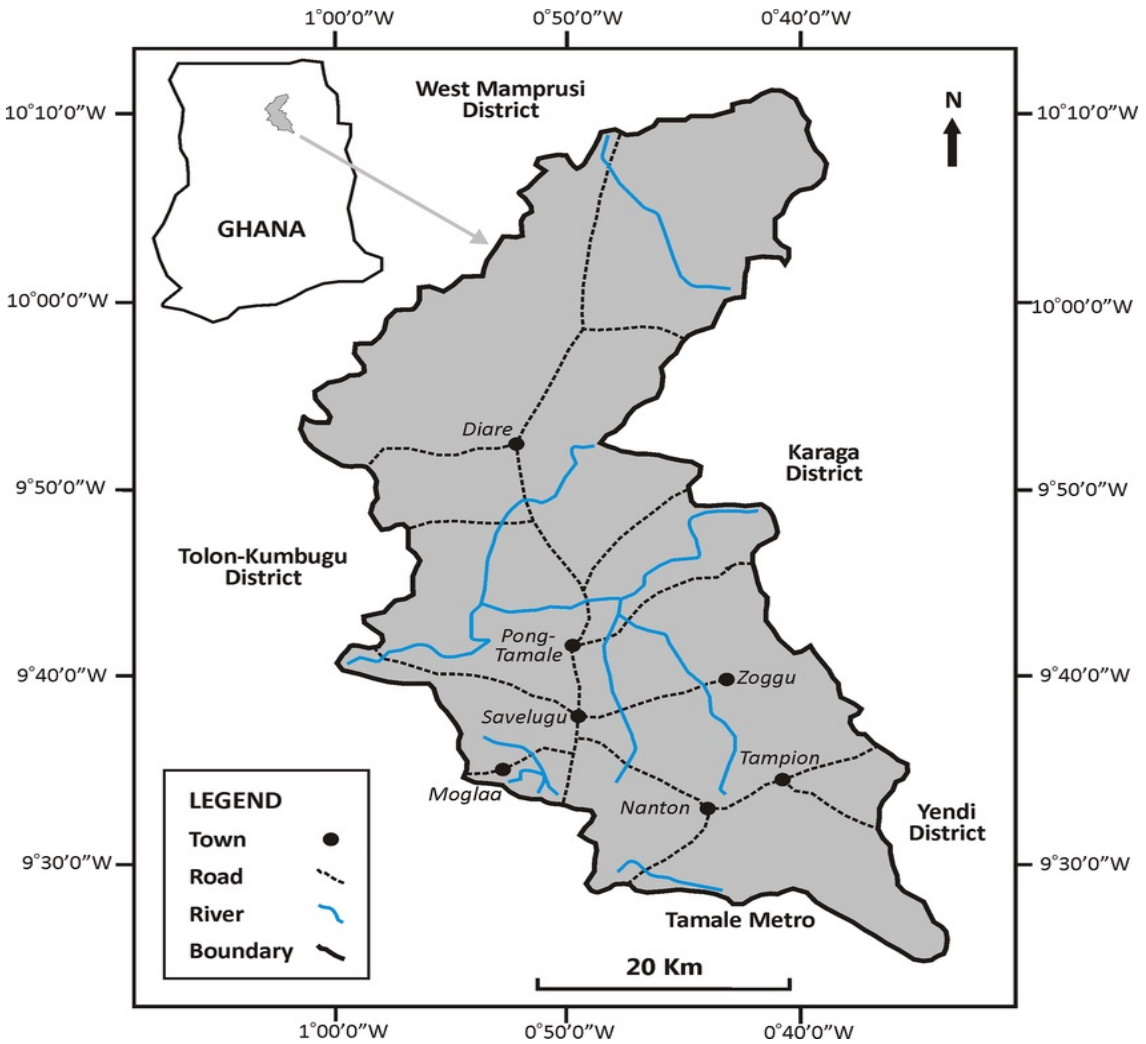

Figure 3. 1: Map of Study Area

3.3 Sample size and sampling techniques

Data for the study was obtained through a cross-sectional survey of farm households in Savelugu Municipality and Nanton District. This study employed a multistage sampling methodology. Firstly, the Northern Region of Ghana was specifically chosen for this study due to the importance of agriculture to the national economy of Ghana. Also, most of the dwellers are predominantly farmers. The Savelugu municipality and the Nanton area were selected for the study because they were two of the few districts in the Northern region to have documented major cases of the Covid-19 epidemic (Saba et al.,2020). Using a probability proportion by size sampling technique, 10 communities in the Savelugu Municipality and 6 communities in the Nanton District were chosen during the second stage. This was so because Savelugu Municipality has a larger population compared to Nanton district. In total sixteen (16) communities were selected from the study areas. Again, a simple random sampling technique was used to select twenty-five (25) farming households from each selected community given an equal chance of being selected. The total sample size for the study was 400 respondents.

The sample size (400 farm households) was determined using the Yamane (1967) formula given by the expression

$$n = \frac{N}{1 + N(e)^2}$$

where N is the number of farm households in the study areas and e is the margin of error (0.05).

3.4 Sources of Data and Survey Instrument

The study employed cross-sectional survey to collect primary data from rural farm households in some selected communities in Savelugu Municipality and Nanton district through the administration of semi-structured questionnaire, focus group discussions and individual observations. In the Savelugu Municipality, a total of ten (10) communities and 25 households in each community were interviewed making a total of 250 respondents in the municipality. In the Nanton District, a total of 6 communities and 25 respondents in each community were interviewed making a total of 150 respondents. This was so because Savelugu Municipality has a larger population compared to Nanton district. The data encompassed information on farm households in Savelugu Municipality and Nanton District. Specifically, the information entailed household knowledge and perceptions on the impacts of Covid-19 pandemic. Questions on capability were included to measure their capability to cope with the negative impacts of the pandemic and how their capabilities influence their coping strategies against Covid-19 impacts. Questions on resilience using the various indicators of resilience measurement were also included along with food security indicators to measure the effects of capability on food security resilience to Covid-19 pandemic.

3.5 Theoretical framework

The capability approach, a theoretical framework that emphasizes the value of freedom to achieve well-being, views this freedom in terms of people's opportunities to choose how they want to be. The method was invented by Amartya Sen, although it has since been greatly improved by several other people (Alkire and Deneulin, 2009; Berges, 2007; Robeyns, 2011). This is the case because, in addition to income, the capability approach tries to take individual variation in decision opportunities into account. Some have argued that using income as the sole indicator of economic disparity may be inadequate. This is so because knowing someone's income does not reveal what they are able to buy with it. People's options may be limited because of prejudice, traditions, morals, political systems, weather patterns, transportation systems, healthcare systems, and other factors. Sen contends that the range of options a person has access to is like the concept of capability. The capability theory serves as the foundation for this study because it is crucial for comparing interpersonal wellbeing. The level of social, economic, human, and cultural capital that individuals possess, in Sen's opinion, serves as a measure of their capacities. By extending the fundamental framework to examine how social, political, and economic structures, as well as rights, freedoms, and laws, affect people's wellbeing, the capabilities method can be used to examine these relationships.

Sen emphasizes the interconnectedness and potential for mutual reinforcement of freedoms. For instance, social possibilities like education

encourage economic engagement, which in turn aids in generating public cash for social facilities. As such, these opportunities are crucial in deciding welfare (Sen, 2005). The capability approach advocated by Amartya Sen emphasizes what people are capable of. Sen contends that while examining well-being, we should turn away from "the means of life," such as income, and instead pay attention to the "real opportunities a person has," namely their functionings and capabilities (Amartya and Amartya, 2009). "Capabilities" refer to a person's real or substantive freedom to carry out these "functionings," whereas "functionings" refer to the various things that a person is successful at "doing or being," such as participating in societal life, maintaining good health, and so forth. Real or substantive freedom should be prioritized over formal freedom since capabilities are opportunities that can be used as needed. Regardless of whether a person chooses to use their skills or not, the capacity approach lays special attention on everyone's capabilities.

3.6 Conceptual framework

This research sought to find out how the various capability capitals could influence coping strategies against the impacts of Covid-19 pandemic and similar pandemics along with food security resilience to Covid-19 pandemic. The study's conceptualization of capability was that it is a factor that cannot be measured but can be quantified based on its characteristics, some of which may be shown to have instrumental power in particular situations. Direct empirical assessments of people's skills to do specific functions are

obviously very difficult to describe (Alkire and Santos, 2013). In relation to rural households in Savelugu Municipality and Nanton district dealing with the effects of Covid-19 pandemic and food security resilience to Covid-19 pandemic, the dimensions of capability and its factors are shown in Figure 3.2 below.

In the conceptual framework of the study, it is believed that the stocks of human, social, institutional, and cultural capital are crucial in defining capability. Muffels and Headey (2013) indicated that human capital can be seen as a capability affecting people's well-being over time and has placed emphasis on the need for education and training as important investment in human capital as they are important personal conversion factors from the capability perspective. There is also the need to invest in healthy lifestyles and health infrastructure so that people's capability can be improved. This is due to the fact that a person's capacity for health depends on his or her availability to resources and a variety of psycho-social qualities that allow them to convert those resources into healthy behavior and, eventually, improved health outcomes (Gombert et al., 2017).

According to (Putnam, 2000), one's sources of social capital can be determined by their membership in organizations and associations or clubs like trade unions, social, and sport clubs. Social capital also includes one's level of trust in others and the social networks they can create, which can be determined by how often they interact with others and the support they receive from those in their network.

Cultural opportunities and liberties are those that are related to the cultural and customary background. Women and young people face significant barriers in many Sub-Saharan African communities, particularly in Northern Ghana, in terms of possibilities and freedoms to pursue worthwhile endeavors (Ansah et al., 2020; Apusigah, 2009). When it comes to selecting jobs or goods in society, culture expects that young people and women will respect and prioritize older people and men, which has a significant impact on how well people do and how their lives turn out.

The capacity to obtain extension services and have access to good roads are just two examples of possibilities and freedoms that are not directly related to an individual's ability but are important for the achievement of worthwhile beings and doings. This may have an impact on a person's "agency," or capacity to seek and achieve one's goals, which is a crucial component of the capability approach (Ibrahim, 2006).

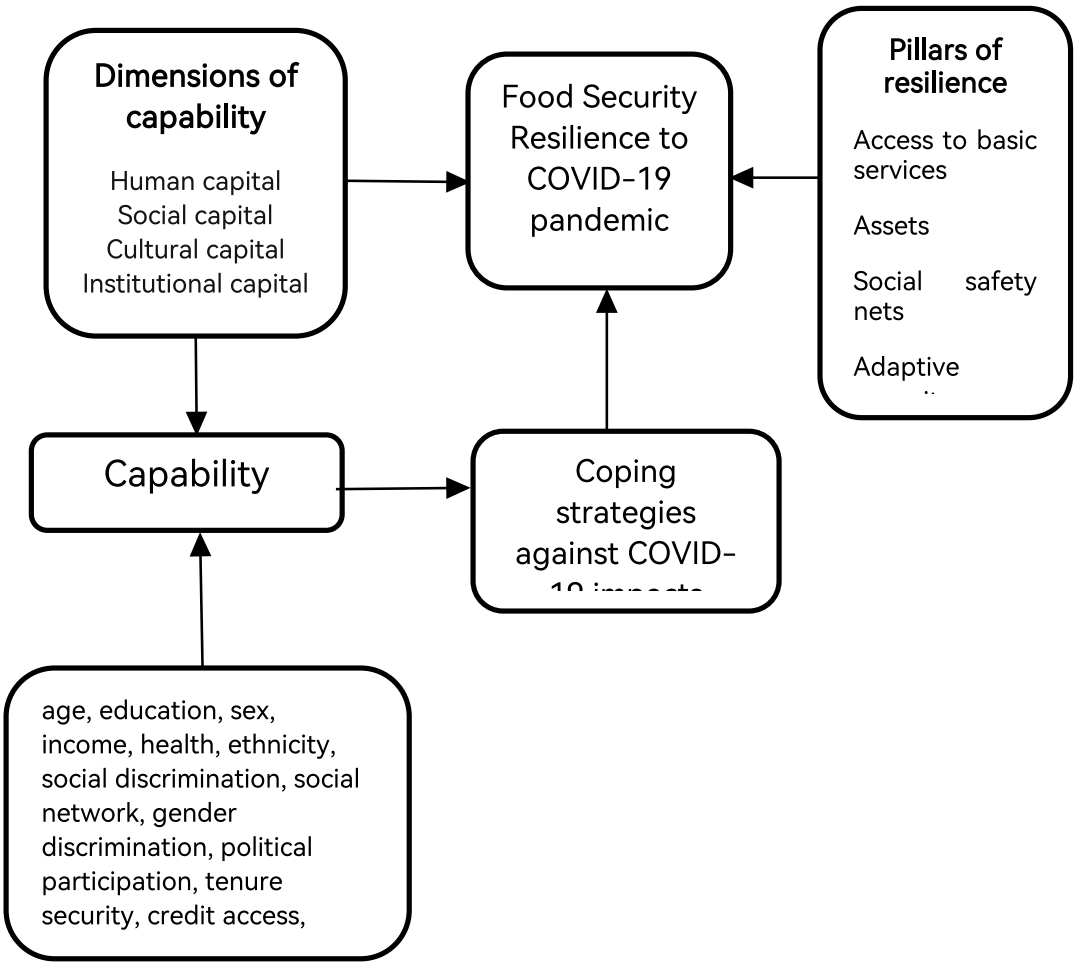

Figure 3. 2: A framework showing the relationship between capability and resilience and other socio-demographic characteristics
Source: Author's own conceptualization

3.7 Method of data analysis

To accomplish the various specific objectives, econometric models were employed to analyze the various objectives. To unravel farm households' perceptions about the impacts of the COVID-19 pandemic on their livelihood activities, factors analysis was used to identify how farm households

perceived the impacts of the pandemic and a mean score was generated to measure the level of the impact using the Min-Max procedure. To measure how farm households' capabilities influence their coping strategies against the COVID-19 impacts, factor analysis, ordinary least square (OLS) and Two-stage least square (2SLS) were used to analyze it by generating an index for capability and coping strategy to make them continuous variables. To estimate the effect of farm household capabilities on their food security resilience to the COVID-19 pandemic, the MIMIC model in the resilience index measurement and analysis (RIMA) methodology by FAO in 2016 was used to generate resilience scores and OLS and 2SLS were used for analysis because the resilience becomes a continuous variable making it easy to use the OLS to estimate.

3.7.1 Farm households' perceived impacts of the COVID-19 pandemic on their livelihood activities.

To identify farm households' perceived impacts of the COVID-19 pandemic on their livelihood activities, factor analysis was employed to generate a single score for the various perceived impacts of the pandemic on farmers' livelihood. The goal of factor analysis is to describe each independent variable as a linear combination of a smaller group of shared factors. Given the observed variables $Y_1, Y_2, Y_3 \ldots\ldots\ldots\ldots Y_k$, with common factors that cannot be measured or latent factors that determine the severity of the impacts of the COVID-19 pandemic which is represented by F. The variables may be expressed in a linear relationship in terms of F as:

$$Y = \delta F + \epsilon \quad (1)$$

where Y = perceptions of farm households in Savelugu Municipality and Nanton District about the impacts of COVID-19 pandemic on their livelihood activities; F = inherent factors that determine the perceived impacts of the pandemic; ϵ = error term; δ= is the coefficient of *F* in the linear combination describing Y. This term is referred to as the loading of the ith variable of the jth factor. According to Child (1990), Factor analysis is based on some assumptions which states that there is no association between the factors and the measurement's error [*Cov (F, e) =0*].

In generating the perceived impacts of the COVID-19 pandemic, twelve variables which included some impacts of the pandemic on farm households' livelihood were taken from respondents on a five-point likert scale (1 – strongly disagree, 2 – Disagree, 3 – Neutral, 4 – Agree, 5 – Strongly agree). These variables include; reduction in the quality and quantity of food consumed, reduction in their income, reduced social contacts of family and friends, made movement from one place to another very difficult, reduced level of production, reduced the ability to acquire inputs, the pandemic decreased access to social services, increased cost of inputs, decreased access to market, reduced commodity storage due to low production, it reduced the ability to participate in social activities such as durbars, funerals, weddings etc. and it reduced the links with FBOs. After running the factor analysis, only six variables out of the twelve variables were found to be reliably contributing to perception scale with one factor loading which was

then used to generate a score. After generating the score using factor analysis, a mean score was generated to determine if farmers were indeed affected by the pandemic (impact intensity), using the Min-Max scaling formula below. The min-max scaling method will replace every value in a column with a new value.

$$x' = \frac{x\text{-min}\quad(x)}{\max(x)\text{-min}\quad(x)}$$

where x' is the intensity of the impact, x is the total factor of the perceived impacts of the pandemic. To know the level of impact, the mean score should be between the range of 0 to 1, where a value closer to 0 means less impact and a value closer to 1 means severe impact.

3.7.2 How farm households' capabilities influence their coping strategies against COVID-19 impacts.

To examine how farm households' capabilities influence their coping strategies against the COVID-19 impacts, first factor analysis was used to generate a single score for capability and the OLS and Two-Stage Least Squares (2SLS) were used to analyze how capability influences farm households' coping strategies against COVID-19 impacts. Factor analysis is a technique for segmenting large sets of variables into smaller sets of components. The most frequent variance among all the components is selected in this procedure to provide a common score. As a result, a variable index is produced that can be used for further investigation. The general linear model (GLM) includes factor analysis as one of its components. The

GLM is based on many of the same assumptions as factor analysis, including the linearity of the relationship, the absence of multicollinearity, the inclusion of relevant variables in the analysis, and the existence of real correlation between variables and factors (Lawley & Maxwell, 1962). Given the observed variables $C_1, C_2, C_3 \ldots\ldots\ldots\ldots C_k$, with a common factor or latent variable capability represented by F, the variables may be expressed in a linear relationship in terms of F as:

$$c_1 = \delta_{11}F_1 + \epsilon_1$$

$$c_2 = \delta_{21}F_2 + \epsilon_2$$

$$c_3 = \delta_{31}F_3 + \epsilon_3$$

$$c_k = \delta_{k1}F_k + \epsilon_k$$

which could be written in a compact matrix form as:

$$C = \delta F + \epsilon \quad (2)$$

where C = indicators of capability; F = capability; ϵ = error term; δ= is the coefficient of *F* in the linear combination describing c_k. This term is referred to as the loading of the ith variable of the jth factor. According to Child (1990), Factor analysis is based on some assumptions which states that there is no association between the factor and the measurement's error [*Cov (F, ej) =0*].

Farm households' capabilities are the things available for a farmer to be able to function well in a particular setting. To be able to measure the capability

variable, four dimensions of the concept (human capability, cultural capability, institutional capability and social capability) adopted from (Ansah et al., 2020) were used. Since capability is a variable that cannot be measured, some observable variables were taken from farmers using a questionnaire to generate the capability index. Factor analysis was used to generate an index for capability using the variables from the field survey. Fourteen (14) variables were used to run the factor analysis. After the analysis, twelve (12) of the variables were found to be reliably contributing to the capability scale which formed the basis for measuring the capability variable. An index was then generated for capability so that a regression analysis can be estimated using capability index as a continuous independent variable. Since coping strategies is a dependent variable and contains multiple variables, factor analysis was used to generate an index for coping strategies.

In the survey, sixteen (16) variables were used to measure coping strategy. Farmers were asked the various strategies they used to combat the impacts of the COVID-19 pandemic using dummy responses (either yes or no). After the factor analysis, thirteen (13) out of the 16 coping strategies were found to be reliably, contributing to the measurement of coping strategy index. After the factor analysis, the coping strategy index was used as a dependent variable being regressed on other independent variables (eg; capability). After generating indices for capability and coping strategies, an OLS and a 2SLS regression models were adopted to examine how farm households' capabilities influence their coping strategies against COVID-19 impacts. The

2SLS model was used because endogeneity was suspected to be existing in an independent variable which the OLS model cannot correct. The study, therefore, applied Durbin-Wu-Hausman (DWH) test for endogeneity to determine whether there is endogeneity before analyzing with the 2SLS model to correct for endogeneity through instrumental variable approach. After applying the DWH test for endogeneity on the capability variable, it was found to be significant, implying endogeneity.

The OLS and 2SLS models are specified as follows:

3.7.2.1 OLS model specification

$$y_i = \beta_0 + \beta X_i + e_i \quad (3)$$

$$y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + e$$

where y is the dependent variable, coping strategies, β's are the parameters to be estimated, X_1 to X_9 are the various explanatory variables and e is the error term.

3.7.2.2 2SLS model specification

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \varepsilon \quad (4)$$

where X_1 is an endogenous variable.

To correct for endogeneity, valid instruments are introduced which correlates with the endogenous variable but not with the error term. For the instruments to be valid, it must meet both the relevance condition and

exogeneity condition which are:

1. Relevance condition: $\text{corr}(Z_i, X_i) \neq 0$
2. Exogeneity condition: $\text{corr}(Z_i, u_i) = 0$

$$\hat{X}_1 = \gamma_0 + \gamma_1 Z_1 + \gamma_2 X_2 + \gamma_3 X_3 + \gamma_4 X_4 + \gamma_5 X_5 + \gamma_6 X_6 + \gamma_7 X_7 + \gamma_8 X_8 + \gamma_9 X_9 + v \quad (5)$$

where $Z_1$is the instrumental variables which include **district of a farmer** and **distance from house to farm**. These instrumental variables are the valid instruments used in correcting for endogeneity in the capability variable. These instruments were tested to prove their validity before using them. The instruments are regressed with other exogenous variables to produce $\hat{X}_1$ after which it is put back into the equation.

$$Y = \beta_0 + \beta_1 \hat{X}_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + v \quad (6)$$

where v is a composite error term that is uncorrelated with $\hat{X}_1$, X_2, X_3,X_4,X_5,X_6,X_7,X_8,X_9.

X_1 = capability, X_2 = Marital status, X_3 = Gender,X_4 = Level of education,X_5 = access to extension services, X_6 = Land ownership,X_7 = farm size,X_8 = age,X_9 = years of farming

3.7.3 The effects of farm households' capability on food security resilience to Covid-19 pandemic

A household's ability for resilience is both complex and unobservable. Finding a proxy indicator and estimating the value of the unobservable/latent variable using a factor analysis approach based on certain directly observable variables is a common strategy in the analysis of such variables. One such strategy is the RIMA methodology developed by the FAO in 2016 and extensively evaluated by numerous research in Africa (FAO, 2016; Ansah et al., 2019; Ngesa et al., 2020; Chiwaula et al., 2022; Tambe, 2022). This approach uses a two-step process to calculate the resilience capacity index. In the first step, observable variables gathered at the household level are used to compute the four pillars of resilience (Savelugu Municipality and Nanton District) using factor analysis. The table 1 below shows the four pillars of resilience with observable variables that are taken from a field survey using a semi-structured questionnaire alongside impacts of COVID-19 pandemic.

Table 3. 1: Observed variables used in the construction of the pillars of resilience

Resilience pillars	*Definition*	*Indicators and variables*

Access to basic services- ABS	Availability of essential services demonstrates a household's capacity to meet fundamental requirements by having access to and effectively using basic services such educating children, having access to water, power, and sanitation, selling goods at the market, etc.	proximity to medical facilities, from home to school (s), the availability of food markets and the sale of agricultural products, Existence of networks for electricity, water, and telephones
Assets- AST	The main components of a livelihood are assets, both productive and nonproductive, because they allow households to generate and consume products. Land and agricultural machinery are examples of productive assets, whereas household appliances are examples of non-productive assets.	housing type and size the quantity and kind of family assets (television, cellphone, radio, bicycle) the quantity of tropical livestock possessed (TLUs) Land size per household
Social safety nets- SSN	The social safety net pillar assesses a household's ability to receive official and unofficial assistance from institutions, as well as from friends and relatives.	Obtaining and receiving monetary social assistance, including remittances, Assistance frequency (number of times assistance was received in a given period), involvement in social networks, such as farmer groups, cooperatives, etc.
Adaptive capacity- AC	The power to adjust to a new environment and create fresh means of subsistence is known as adaptive capability. For instance, proxies for the AC could be things like the average number of years of schooling for household members or how each home feels about how their community makes decisions.	sources of revenue for each home, household employment ratio and household education levels (ratio of the number of employed divided by household size), Food expenditure divided by total household expenditures equals the food consumption ratio. ratio of household reliance.

(Ngesa et al., 2020)

In the subsequent stage, resilience capacity index (RCI), a latent variable created by using the four pillars, was linked to a set of outcome indicators

using structural equation models to estimate multiple indicator multiple cause (MIMIC) (food security indicators). The MIMIC model uses two indices of food security: household food expenditure (HFE) and the household dietary diversity score (HDDS). The HDDS evaluates how many different food kinds or food groups that households eat or consume, often assessed during a specific time. The households were questioned about whether they had eaten any of the listed food groups in the previous 24 hours. The responses were recorded as yes/no dummy variables. The HDDS was then calculated by adding these variables together. The amount of household income that is spent on food is evaluated by HFE. Figure 2 below shows the structural equation model (MIMIC) in generating the RCI.

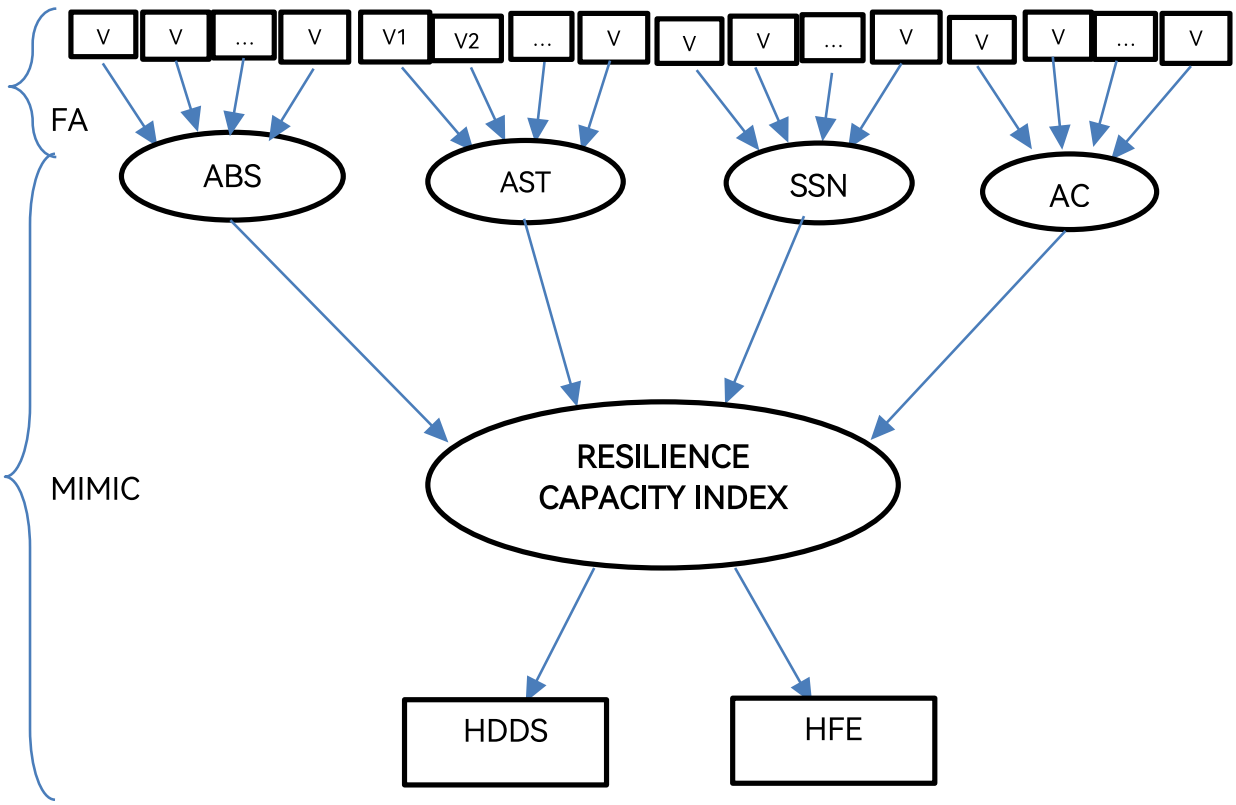

Figure 3. 3: A representation of the two-step approach for estimating

Resilience Capacity

Source: Adopted from FAO 2016 and d'Errico 2014 framework

V1 – Vn represents explanatory variables for measuring the various indicators of resilience which were taken from the field survey, ABS, AST, SSN and AC are the various unobserved indicators of resilience and HDDS and HFE are the various indicators of food security and FA is the factor analysis.

Resilience capacity index (RCI) was measured using four indicators of the RIMA approach. These indicators include Access to Basic services (ABS), Social Safety nets (SSN), Assets (AST) and Adaptive Capacity (AC). Since resilience is a latent variable, various measurable variables were taken from the field under the four indicators to run a regression analysis. Factor analysis was used to generate an index for resilience by using the various variables. Indices were generated for ABS namely Access to health (whether a farmer has access to healthcare facility or not, if a farmer has access to sanitation or not and which form of sanitation, if a farmer has access to toilet facilities or not and the form of toilet facility, if a farmer has access to potable drinking water or not and the source of drinking water), Access to energy (if a farmer has access to electricity and the source, firewood, gas cooker, charcoal, electric burner and biogas) and Access to social infrastructure (if a farmer has access to school, if a farmer has access to market and if a farmer has access to phone network in the community). Indices were generated for AST namely Agricultural assets (tractor, plough etc.), Household assets (television, radio, cellphone, bicycle, motorbike/car) and Tropical livestock unit which

comprised the addition of the number of total livestock a farmer has including cattle, sheep, goat, donkey, rabbit, pigs, fowls, guinea fowls, turkey etc. Variables for SSN include Access to social assistance from friends and family, if a farmer participated in social networks such as cooperatives, farmer groups, political associations and if farmers get access to support from NGOs. For AC, the following variables were used; if a farmer had other sources of income apart from farming and how many other income sources, number of adults in the family with formal education, number of children who still depend on the family for their basic needs, if a farmer make Use of improved varieties, Use of manure, Use of fertilizer, Crop diversification and Use of pesticides. To be able to generate the resilience index, food security variables must be incorporated so the Household Dietary Diversity Score (HDDS) and Household food expenditure (HFE) were adopted to measure the food security aspect where food security was regressed on resilience capacity index through the MIMIC approach as shown in figure 2 above.

After generating indices for all the variables, a resilience capacity index (RCI) was then generated and used as a dependent variable which was run on other explanatory variables. The values for the various indicators were rescaled to generate values between 0 and 100 where a value closer to 100 means farmers were resilient and values closer to 0 means less resilient.

The OLS and 2SLS models are specified as follows:

3.7.3.1 OLS model specification

$$y_i = \beta_0 + \beta X_i + e_i \quad (7)$$

y

$$= \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8$$

$$+\beta_9 X_9 + \beta_{10} X_{10} + e$$

where *y* is the dependent variable, coping strategies, β's are the parameters to be estimated, X_1 to X_{10} are the various explanatory variables and e is the error term.

3.7.4.1 2SLS model specification

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \varepsilon \quad (8)$$

where X_1 is an endogenous variable.

$$\hat{X}_1 = \gamma_0 + \gamma_1 Z_1 + \gamma_2 X_2 + \gamma_3 X_3 + \gamma_4 X_4 + \gamma_5 X_5 + \gamma_6 X_6 + \gamma_7 X_7 + \gamma_8 X_8 + \gamma_9 X_9 + \gamma_{10} X_{10} + v \quad (9)$$

where $Z_1$is the instrumental variable. which include **district of a farmer** and **distance from house to farm**. These instrumental variables are the valid instruments used in correcting for endogeneity in the capability variable These instruments were tested to prove their validity before using them. The instruments are regressed with other exogenous variables to produce $\hat{X}_1$ after which it is put back into the equation.

$$Y = \beta_0 + \beta_1 \hat{X}_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + v \quad (10)$$

where v is a composite error term that is uncorrelated with $\hat{X}_1$, X_2, X_3,X_4,X_5,X_6,X_7,X_8,X_9,X_{10}.

X_1 = capability, X_2 = Marital status, X_3 = Gender,X_4 = Level of education,X_5 = access to extension services, X_6 = Land ownership,X_7 = farm size,X_8 = age,X_9 = years of farming, X_{10} = perceived impacts of Covid - 19 pandemic

Table 2 presents some explanatory variables used for analyzing the various objectives and their a priori expectation.

Table 3. 2: Some Explanatory variables and their a priori expectation

Variable	Measurement	Resilience	Coping strategies
Age	Years	+	+
Household size	Number of individuals using the same pot for meals	+	+
Education	total number of school years	+	+
Gender	Dummy, 1 if male, 0 if female	+	+
Distance from house to farm	Minutes by walking	+/-	_
Availability of input market	Dummy, 1 if input market is available in community, 0 otherwise	+	+
Availability of output market	Dummy, 1 if input market is available in community, 0 otherwise	+	+/-
Type of road	Dummy, 1 if road is tarred, 0 otherwise	+	+

Land tenure system	Dummy, 1 if farmer owns the land, 0 otherwise	+	+/-
Farm Experience	Number years spent in farming	+	+
Total land size	Acres	+	+
Agricultural extension officer	Dummy, 1 if farmer receives extension services, 0 otherwise	+	+
Non-farm income	Dummy, 1 if farmer earns non-farm income, 0 otherwise	+	+
Distance to the nearest access road	Minutes by walking	+	+/-
Distance to district capital	Minutes by walking	+/-	+/-
Capability	Measured as standardized factor scores from factor analysis	+	+
Distance to input dealer	Minutes by walking	+/-	+/-
Distance to output market	Minutes by walking	+/-	+/-
Fertilizer application	Dummy, 1 if farmer applies fertilizer, 0 otherwise	+	
Use of pesticides	Dummy, 1 if farmer applies pesticides, 0 otherwise	+	
Use of improved seeds	Dummy, 1 if farmer uses improved seeds, 0 otherwise	+	
Use of manure	Dummy, 1 if farmer uses manure, 0 otherwise	+	
Crop diversification	Dummy, 1 if a farmer diversifies, 0 otherwise	+	

Source: Field Survey 2022

CHAPTER FOUR

RESULTS AND DISCUSSION

4.0 Introduction

In this chapter, the findings of the study project are presented and discussed. Section 4.1 presents and explains the demographic and other farm characteristics of the respondents in Savelugu Municipality and Nanton district, In Section 4.2, findings related to perceptions of the effects of the COVID-19 pandemic on farm households' livelihoods in the study area are discussed. In Section 4.3, findings related to ability to deal with the effects of the COVID-19 pandemic are elaborated. Finally, in Section 4.4, findings related to the impact of farm households' capability on food security resilience to the COVID-19 pandemic are presented and discussed.

4.1 Descriptive Statistics of Data from respondents

Age, household size, education level, farm size, distance between home and farm, number of children enrolled in school, and years of farming are only a few of the characteristics stated in the study's context. With the help of these traits, we can describe the different respondents and how they affect the key study variables. The demographic and farm characteristics of respondents are displayed in Table 4.2 as a frequency distribution.

Table 4. 1: Demographic and farm characteristics of respondents

Variable	Mean	Std. Dev	Min	Max
Age	40.367	8.771	24	68
Household size	9.232	3.937	1	27
Years of education	3.979	5.715	0	20
Farm size	5.570	4.828	0.3	30
Distance from house to farm (in minutes)	83.944	70.125	10	500
Years of farming	21.584	14.239	3	60
Number of children in school	3.434	2.146	0	13

Source: Field survey 2022

From Table 4.1 above, the average age of a respondent is approximately 40 years with the highest being 68 years and lowest being 24 years old. The average household size in the sample is approximately 9 members with a maximum of 27 members, which is far more than the estimated average household size of 3.6 approximately 4 members in Ghana (GSS, 2021). This

average household size can serve as a platform for increase in COVID-19 cases in the communities. This is because during the pandemic, individuals were asked to stay home for a while and ensure social distancing. With this population in one household, there could be breeding grounds for higher cases of the pandemic since an infected person in the household could easily spread the virus to others.

Education, measured as the number of years a respondent has spent in school, is an important factor that can determine individuals' knowledge of the pandemic, their perceptions about the pandemic, their coping ability or capability and their level of resilience to the shock. The average years a farmer spent in school is approximately 4 years which means that averagely a farmer has been to primary school with about 62.17 % of the farmers having no form of education and the maximum years of education attained by some farmers was tertiary/vocational education.

The average distance covered by a farmer to reach his or her farm from the house is approximately 84 minutes walking distance with a minimum distance of 10 minutes and a maximum of 500 minutes. The average years of farming is approximately 22 years. In a household there were still farmers whose children are in school with some having no children in school. Averagely, a farmer had 3 school going children which can determine if a farmer had enough money to save before the pandemic except children are in public schools.

In Table 4.2, of all the respondents who took part in the survey, only 25.51% were females, while the remaining 74.49% were males. This is an indication that male household heads dominated in the study area. This attests to the fact that household heads in northern Ghana are almost always dominated by the males with the belief that females are not supposed to be household heads. About 93.55% of the respondents were married while 6.45% were either single, divorced or widowed. Moreover, farmers who owned their own land for farming activities were 98.15% while the remaining 1.85% rented the land for farming activities. Also, about 55.43% of farmers reported that they had extension agents in their communities while about 44.57% of the farmers reported that they had no extension agents in their communities. This might disadvantage farmers from getting useful information that can help them in their farming activities. Farmers with extension agents might have a higher probability of receiving information on their farming activities to help them maximize yield.

Agro-inputs dealers are individuals who sell inputs in the communities for farmers to use on their farms. During the pandemic, input dealers had to lock down for some time to ensure safety. This made it difficult for farmers to acquire inputs for farming activities. From the table below, about 65.10% of the respondents reported that there are agro-input dealers in the community while 34.90% reported that there were no agro-input dealers in the community. This indicates that majority of the communities had agro-input dealers in their communities so getting inputs for farming was a bit easier but

also faced challenges during the pandemic because there was shortage.

Output market is the place where farmers sell their produce after harvesting and purchase other raw materials. Respondents were asked if they had access to output markets for the sale and purchase of items. Most of the farmers reported that they had challenges getting access to buyers to purchase their produce, representing about 73.61% while the remaining 26.39% reported that they had access to buyers to purchase their produce. This means that most farmers had to keep their produce in the house after harvesting which leads to huge losses especially for the perishable produce or they had to go to other communities to sell their produce.

Table 4. 2: Frequency distribution of some Demographic and farm characteristics

Variable	Frequency	Percentage
Gender		
Male	254	74.49
Female	87	25.51
Total	**341**	**100**
Marital status		
Married	319	93.55
Others	22	6.45
Total	**341**	**100**
Educational level		
No Education	212	62.17
Primary	16	4.69
JSS/JHS/Middle School	45	13.2
SSS/SHS	30	8.8
Vocational/Technical School /Tertiary	9	2.64
O-Level/A-Level	2	0.59
Non-Formal	9	2.64

Other	18	5.28
Total	**341**	**100**
Farm Ownership		
Owned farmland	319	98.15
Rented farmland	6	1.85
Total	**325**	**100**
Extension agents		
Yes	189	55.43
No	152	44.57
Total	**341**	**100**
Agro-input dealers		
Yes	222	65.10
No	119	34.90
Total	**341**	**100**
Output market		
Yes	90	26.39
No	251	73.61
Total	**341**	**100**

Source: Field survey 2022

Below is a table 4.3 presenting results on the knowledge individuals had about the COVID-19 pandemic. In Table 4.3, all respondents had knowledge about the pandemic. This means that respondents had ideas about the pandemic, or they had heard about the pandemic and the damage it can cause to people. Majority of respondents reported that they became aware through the radio, followed by family and friends, through television, the news and lastly, through social media. About 77.42% of the respondents reported that they became aware through the radio, approximately 64.81% of the respondents reported that they heard it from family and friends, about 64.81% reported watching it on television, about 9.68% reported listening to it on the news and 8.80% reported hearing about the pandemic through

social media. About 98% of the respondents reported that they believed that the pandemic was in Ghana. Respondents were made to mention some of the symptoms of the virus. About 80.94% of them reported dry cough, followed by sneezing representing 72.72%, then fever, representing 63.64%, about 67.15% reported difficulty in breathing, followed by sore throat representing 23.75% and finally tiredness, representing about 11.14%.

Results on the preventive measures, thus, measures put in place to minimize or curb the spread of the pandemic indicate that about 98.53% of the respondents reported handwashing as a preventive measure to prevent the spread of the virus. The handwashing measure was suggested by healthcare professionals including all other preventive measures to citizens so that in case an individual encounters an infected person through handshake or in case an individual mistakenly touch an infected surface, there will be a lower chance of being infected. About 96.19% reported that the wearing of nose masks helps to prevent the spread of the virus, to avoid inhaling the virus. Also, about 80% indicated that hand sanitizing was a way of preventing the spread of the virus, about 74.19% indicated that social distancing was a preventive measure and finally covering of nose while sneezing, representing about 50.45% was also reported.

Respondents were asked if the pandemic had any impact on their livelihood activities when it first occurred in 2020, livelihood activities in 2021 and if the pandemic will have an impact on their livelihood activities in the future. About 98% of respondents indicated that the pandemic affected their

livelihood activities when it first occurred in 2020. This could be attributed to the fact that the pandemic had been recorded in Ghana on March 12th, 2020 and almost all activities were affected including farming. The virus continuously spread throughout the country through to 2021 which deprived farmers their source of income. Respondents also indicated that it affected their livelihood activities in 2021 representing about 89.71% and about 87.39% indicated that the pandemic will affect their livelihood activities in the future. This is in line with various studies which have indicated that the pandemic will have a long-lasting effect especially on food systems in Sub-Saharan Africa in which Ghana is of no exception.

Table 4. 3: Knowledge about the COVID-19 pandemic

Variable	Mean	Std. Dev	Min	Max
Heard of the pandemic	1	0	1	1
Through what means				
Television	0.648	0.478	0	1
Radio	0.774	0.419	0	1
News	0.097	0.296	0	1
Social media	0.088	0.284	0	1
Friends and family	0.648	0.478	0	1
Believe in the pandemic in Ghana	0.979	0.142	0	1
Symptoms				
Dry cough	0.809	0.393	0	1
Sneezing	0.727	0.446	0	1
Fever	0.636	0.482	0	1
Sore throat	0.238	0.426	0	1
Difficulty in breathing	0.672	0.470	0	1
Tiredness	0.111	0.315	0	1
Preventive measures				
Handwashing	0.985	0.120	0	1

Wearing of nose masks	0.962	0.192	0	1
Social distancing	0.742	0.438	0	1
Hand sanitizing	0.801	0.400	0	1
Covering nose when sneezing	0.504	0.501	0	1
Pandemic affect livelihood activities				
First occurred	0.979	0.142	0	1
Livelihood activities in 2021	0.897	0.304	0	1
Livelihood activities in the future	0.874	0.332	0	1

Source: Field survey 2022

Table 4.4 contains information on the perceptions about the COVID-19 pandemic. Respondents were asked to rate their perceptions about the pandemic on a scale of 1 to 5 where 1 is strongly disagree to 5, strongly agree. Respondents disagreed that the pandemic is an exaggerated event. They also disagreed that it is a naturally occurring human virus. They disagreed that it affected only the elderly and people with chronic illnesses. Respondents agreed that it is a punishment from God or Allah. They also agreed that it is serious and fatal, while they also agreed that it was to cause fear and panic. Some respondents had neutral perceptions about the pandemic. Variables such as the virus was engineered in the lab, an animal disease transmitted to humans, caused by bacteria, an attack by the Western world, not as serious as the authorities made it look, an intention to reduce African population, all had neutral responses from farmers.

Table 4. 4: Perceptions about the COVID-19 pandemic

Variable	Mean	Std. Dev	Min	Max
Exaggerated event	2.444	1.352	1	5
Naturally occurring virus	2.254	1.018	1	5
Engineered in the lab	3.192	1.157	1	5

Affect elderly and people with chronic illnesses	2.481	1.124	1	5
Animal diseases transmitted to humans	2.827	1.164	1	5
Caused by bacteria	3.395	1.208	1	5
Punishment from God/Allah	3.623	1.106	1	5
Serious and fatal	3.901	1.010	1	5
Attack by the Western world	3.183	1.116	1	5
Not as serious as the authorities made it look	3.287	1.135	1	5
Caused fear and panic	3.730	1.078	1	5
Reduce African population	3.003	1.191	1	5

Source: Field survey 2022

Information on how the COVID-19 pandemic is considered to have affected people is provided in Table 4.5. On a scale of 1 to 5, where 1 is strongly disagree to 5, strongly agree, respondents were asked to rank their opinions of the pandemic. Respondents agreed that the pandemic reduced the quality and quantity of food consumed in the house, representing about 43.70% while about 28.45% strongly agreed. This is normal because farmers had it difficult to produce which reduced their source of income, hence their inability to get enough food to consume and limited resources to purchase food. This is confirmed by a study conducted by Carreras et al. in 2020 who indicated that the majority of respondents reported a decrease in their participation in farming and other business activities (Carreras et al., 2020). They agreed that the pandemic reduced their source of income especially farmers who produced to sell and had no other sources of income, representing about 86.81% of respondents. The COVID-19 pandemic required citizens to purchase some items that could help minimize the spread

of the virus, which included Veronica buckets, hand sanitizers, nose masks etc and this required money and this was available to a few well-to-do people.

They had limited inputs to produce, hence their inability to sell for income. They agreed that the pandemic reduced regular visits from families and friends, representing about 76.42%. This is due to the social distancing restriction that was given by government to prevent the spread of the virus. A study conducted by Dzanku in 2020 reports that about 71.8% of respondents reported the COVID-19 pandemic reducing their movement within their communities, 76.4% outside their communities and some 44.6% indicated that relatives were also prevented from visiting because of the pandemic (Dzanku, 2020). Respondents also agreed that the pandemic made movement from one place to another very difficult, representing about 83.29% of the respondents. The pandemic brought fear and panic to almost all individuals so to be safe from the virus, people chose to stay home rather than going out to be infected by the virus. They agreed that it reduced their level of production representing about 84.45% of the respondents because of their inability to acquire inputs. The respondents also reported that the pandemic also increased the cost of inputs, representing about 76.54%. Due to the closure of borders, imports were also restricted making it difficult to acquire inputs therefore making the few that were available very expensive. It also reduced ability to store commodities due to low production which is reported by about 69.05% of the respondents.

Table 4. 5: Perceived impacts of the COVID-19 pandemic

Variable	Strongly disagree %	Disagree %	Neutral %	Agree %	Strongly agree %
Reduced quantity and quality of food	4.99	9.97	12.90	43.70	28.45
Reduced source of income	0.59	6.16	6.45	42.82	43.99
Reduced regular visits	5.28	6.16	11.14	49.85	27.57
Made movement difficult	3.81	6.16	6.74	42.82	40.47
Reduced production	1.47	5.28	8.80	45.45	39.00
Reduced ability to acquire inputs	0.88	5.28	6.45	35.19	52.20
Decreased access to basic services	8.53	12.35	11.18	50.88	17.06
Increased cost of inputs	2.64	13.20	7.62	32.55	43.99
Decreased access to output market	2.68	10.42	13.99	41.67	31.25
Reduced ability to store commodities	2.38	15.18	13.39	40.48	28.57
Decreased ability to participate in social activities	10.36	21.01	18.34	29.88	20.41
Destroyed links with FBOs	6.78	22.42	11.21	34.51	25.07

Source: Field survey 2022

Table 4.6 is a table showing the various determinants of capability of farm households in the two districts. These determinants are based on Amartya Sen's capability approach and chosen to suit the study. These determinants include Human capital, Cultural capital, Institutional capital and social capital as measures of capability. There are various variables that define the various determinants which were taken from respondents in the field survey. Respondents were asked to rate the variables on a scale of 1 to 5, where 1 is

strongly disagree and 5 is strongly agree.

Table 4. 6: Capability to cope with the pandemic

Variable	Strongly disagree %	Disagree %	Neutral %	Agree %	Strongly agree %
Human capital					
The status of your health limit your ability to cope with the pandemic as compared to most people of your age.	18.21	32.24	15.22	29.85	4.48
Your health problems limit your amount and type of work making it difficult to cope with the pandemic.	12.17	35.91	19.58	22.85	9.50
Being highly educated will positively influence your ability to cope with the pandemic.	4.13	27.14	18.58	24.48	25.66
Your level of income influences your ability to cope with the pandemic since you can purchase some of the safety items.	28.96	20.60	15.82	28.06	6.57
Cultural capital					
Cultural choices through investment in cultural activities such as durbars in your community improved your coping strategies.	10.51	30.33	19.22	29.73	10.21
You can participate in any political activity that affects your life positively if you want which help you to cope	11.98	35.63	16.47	22.46	13.47

with the pandemic.					
Good tenure security increases your ability to cope with the covid-19 and similar pandemics.	4.82	27.11	26.20	30.72	11.14
Institutional capital					
The presence of a health facility in your community increases your access to healthcare which influences your ability to cope with the pandemic.	26.81	28.61	17.77	18.98	7.83
The nature of feeder roads in your community influences your ability to trade and cope with the pandemic.	7.53	29.22	17.47	33.13	12.65
Good access roads help you to engage in off-farm agricultural activities.	3.30	20.20	21.62	35.74	19.22
Your access to extension services in your community serves as an incentive in your coping with the pandemic.	15.11	39.88	17.82	18.73	8.46
Social capital					
Your trust and the good relationship you have with other people in your community helped you to cope with the pandemic.	4.20	32.73	23.12	28.53	11.41
Your ability to build social networks with others provided you with support during the	3.93	32.93	27.49	19.03	16.62

pandemic.					
Your membership in organizations and associations or clubs helped in your coping with the pandemic.	30.67	38.96	16.87	11.96	1.53

Source: Field survey 2022

Table 4.7 presents results on various strategies used by farmers to cope with the COVID-19 pandemic and how effective these strategies were on a scale of 1 to 4 where 1 is very ineffective and 4 being very effective. With borrowing, about 30.50% of the respondents indicated that they borrowed to survive the pandemic while indicating that this strategy was ineffective. About 49.39% of respondents indicated that they had to increase production with their available resources to survive. They reported that the strategy was effective. Taking support from financial institutions, about 8.92% of the respondents indicated that they received support from financial institutions. This means that only a handful of Individuals benefited from financial institutions to survive the pandemic. Majority of individuals had to survive on their own. Those who received from financial institutions indicated that the strategy was ineffective. Only a few respondents indicated that they received support from NGOs as a way of coping with the pandemic, representing about 10.97% and the strategy was ineffective. Respondents who indicated that they participated in political activities to generate income in order to cope with the pandemic were about 7.62% and the strategy was ineffective. About 28.93% of respondents indicated that they depended on friends and

other family members for survival, and it was ineffective. This could be because they were also trying to cater for their own families, so they did not have enough resources to cater for others.

About 28.43% of respondents indicated that they sold their livestock to buy food which was ineffective. Most households especially in Northern region have a lot of livestock which they keep as assets, so they do not sell them even if they are dying accounting for the ineffectiveness. Respondents were asked if they received support from government. About 2.92% of respondents indicated that they had the support of government, and it was ineffective. This is not encouraging in the least because during the pandemic, government indicated that they provided relief services to individuals especially those in rural areas to cope with the pandemic, but it was not so in some parts of Northern region. Majority of respondents indicated that they depended on their savings in order to cope with the pandemic, representing about 59.63% and the strategy was effective. This could mean that individual savings is a best option to cope with pandemics. Some respondents also indicated that they reduced their spending to cope with the pandemic, representing about 23.15% and it was ineffective.

About 70.86% of respondents said that their off-farm activities were successful in helping them earn extra money to support their families. Livelihood diversification is a good practice because they provide extra income. Engaging in multiple activities help to become better off during crises. About 24.15% of the respondents reported that they had to reduce

their consumption level to cope with the pandemic, but it was ineffective. Majority of respondents reported that they had to depend on stored food from previous farming season, representing about 78.10%. This strategy was effective indicating that it is good to increase the level of production so that some can be stored for future use. Only 6.19% of the respondents indicated that they received support from religious organizations, but it was ineffective. About 86.67% of respondents indicated that they used improved farming practices to increase yield and the strategy was effective. Practices such as the use of improved varieties, the use of fertilizer, pesticides help to improve and increase yield hence should be encouraged. Farmers who sold their assets to survive the pandemic were about 24.18% which they reported was not effective.

Table 4. 7: Coping Strategies against the COVID-19 impacts

Variable	Yes %	No %	Effectiveness (Mean)
Borrowing from friends and family	30.50	69.50	2.487
Increase production	49.39	50.61	2.628
Support from financial institutions	8.92	91.08	1.950
Support from NGOs	10.97	89.03	2.000
Participate in political activities	7.62	92.38	1.993
Depend on friends and family	28.93	71.07	2.215
Sell livestock to survive	28.43	1.57	2.500
Support from government	2.92	97.08	2.023
Depend on savings	59.63	40.37	2.606
Reduce spending	23.15	76.85	2.423
Engage in off-farm activities	70.86	29.14	2.871
Reduce consumption	24.15	75.85	2.108
Depend on Stored food	78.10	21.90	2.907
Support from religious organizations	6.19	93.81	2.047

Use improved practices to increase yield	86.67	13.33	3.028
Sell assets to survive	24.18	75.82	2.458

Source: Field survey 2022

It is recommended that in times of shocks or pandemics, households can adopt various strategies such as contract farming, crop diversification, agricultural intensification, and vertical and horizontal integration to respond and adapt to the negative impact of the shocks or pandemics (Ansah et al., 2019). The results show that farmers used some coping strategies more than others to cope with the impacts of the pandemic.

Table 4.8 presents summary statistics of variables measuring resilience. Taking ABS into consideration, about 30% of respondents reported that they had healthcare services. Having access to healthcare services would provide respondents with healthcare in times of sickness. Majority (80%) of the respondents reported that there was a school facility in their communities to educate their children. Having an educational facility in communities will somehow encourage farmers to educate their children which will in turn help to increase their knowledge about the occurrence of pandemics and the best way to handle the negative impacts. With children being educated, they would be able to explain the occurrences of certain phenomena and the best way to stay safe from the negative impacts. All (100%) indicated that they had access to electricity through the national grid. This means that every community has access to electricity. Electricity is an important facility that will help members of communities especially those who have access to electrical gadgets. This will help access information especially on the television and

sometimes radio about the pandemic and the safety measures that were put in place to ensure safety. All respondents (100%) indicated that they had access to potable drinking water including pipe-borne water (about 12%), borehole (about 92%), river (about 39%) and well (about 41%). Water is an essential element of life. Having access to potable drinking water will help farmers with their farming activities. Being able to get access to water especially for agricultural activities will ensure all year-round production for consumption and for sale. With enough income and food, farmers can be food security resilient.

Almost (about 99.7%) all respondents indicated that there was a phone network in their communities which are MTN (about 99.4%) and Vodafone (about 96.8%). About 92% of the respondents had access to toilet facilities including KVIP (about 52%), households' own dugout (about 2%), open defecation (about 71.3%). Respondents indicated that they had access to sanitation facilities such as public dumpsites (about 30%), dumping pit (about 51%), burning (about 65%) which will help to keep their environments clean and prevent the spread of diseases. All (100%) respondents indicated that they used firewood as a source of energy for the cooking of food, and about 81% of respondents indicated that they use charcoal as a source of energy. Firewood is the most common source of energy in the northern part of Ghana especially in the rural areas because it is almost always readily available hence 100% access. Charcoal use is for community members that can afford it.

For SSN, about 17% of the respondents indicated that they had assistance from friends and family in times of need. Taking participation in social networks into consideration, about 29% of the respondents indicated that they participated in social networks such as cooperatives (about 8.2%), farmer groups (about 22.9 %) and political associations (about 6.5%) in their communities. Farmers were asked if they had access to any help from NGOs, only about 26.7% of the respondents indicated that they had access.

For the AST indicator, respondents were asked which type of assets they have in their household. About 87.7% of them had television, 98.2% of them had mobile phones 94.1% of them had radio, 81.8% of them had bicycle, 51.6% of the respondents had motorbike, 8.5% of them had tractor and 4.4% of them had plough.

Taking AC into consideration, farmers were asked if they had other sources of income, about 61.3% of them indicated that they had other sources of income apart from farming. With the use of improved technology for farming activities, about 57.2% of respondents indicated that they use improved varieties for planting, 28.2% indicated the use of manure, 86.8% indicated the use of fertilizer, 17.3% acknowledged they use crop diversification and 97.7% indicated they use pesticides.

Table 4. 8: Summary statistics for categorical variables for measuring food security resilience index

Variable	Yes %	No %
Access to Basic Services (ABS)		
Access to health facility	27.90	72.10

Access to school facility	80.10	19.90
Access to electricity	100	0
Source of electricity		
National grid	100	0
Access to potable water	100	0
Source of potable water		
Pipe-borne water	12.30	87.70
Borehole	91.50	8.50
River	38.70	61.30
Well	40.80	59.20
Access to phone network	99.70	0.30
Type of phone network		
MTN	99.40	0.60
Vodafone	96.80	3.20
Access to toilet facilities	91.50	8.50
Type of toilet facility		
KVIP	51.60	48.40
Own dugout	2.10	97.90
Open defecation	71.30	28.70
Access to Sanitation facilities		
Public dumpsites	29.60	70.40
Dumping pit	50.70	49.30
Burning	64.50	35.50
Source of energy		
Firewood	100	
Gas cooker	1.80	98.20
Charcoal	80.90	19.10
Social Safety Nets (SSN)		
Access to social assistance	16.70	83.30
Participation in social networks	29.00	71.00
Cooperatives	8.20	91.80
Farmer groups		
Political associations	22.90	77.10
Access to help from NGOs	26.70	73.30
Assets (AST)		

Television	87.70	12.30
Mobile phone	98.20	1.80
Radio	94.10	5.90
Bicycle	81.80	18.20
Motorbike	51.60	48.40
Tractor	8.50	91.50
Plough	4.40	95.60
Adaptive Capacity (AC)		
Other income sources	61.30	38.70
Use of improved varieties	57.20	42.80
Use of manure	28.20	71.80
Use of fertilizer	86.80	13.20
Crop diversification	17.30	82.70
Use of pesticides	97.70	2.30

Source: Field survey 2022

With the Tropical Livestock Unit (TLU), averagely, a farmer had approximately 3 livestock unit, and the maximum number of livestock a farmer had was approximately 41 including cattle, sheep, goat, pig, donkey, rabbit, guinea fowl, fowl and turkey. Respondents were asked how many adults in the household had formal education. Averagely, a household had approximately 1 adult with formal education with a maximum of 6 adults in a household. Some households did not have any adult with formal education. The number of children who were depending on others for their basic needs is averagely 3 with a maximum of 13 children. Two household food security variables were used to measure the food security dimension of resilience, which are Household dietary diversity score (HDDS) and Household Food expenditure (HFE). The average HFE was reported to be 205.557 Ghana cedis and a maximum amount of 500 Ghana cedis in a regular month. Some

respondents indicated that they spend little or no money on food in a regular month but depend on their own farm produce and other food items they receive as gifts. Moreover, since there was decrease in the purchasing power of people making them to cut costs or find other ways to feed instead of purchasing to consume.

Table 4.9: Summary statistics for continuous variables for measuring food security resilience index

Variable	Mean	Std. Dev.	Min.	Max.
Total livestock unit	2.539	5.528	0	41.2
Adaptive Capacity (AC)				
Number of other income sources	0.845	0.729	0	3
Number of adults with formal education	0.950	1.400	0	6
Number of dependent children	3.062	2.271	0	13
Food security variables				
Household food expenditure per month	205.557	130.079	0	500
HDD	8.713	3.985	0	12

Source: Field survey 2022.

Note: Tropical livestock unit (TLU) is calculated using the total number of livestock owned by a farmer using the various units of livestock measurement, including Draught animals (1.2), Cattle (1.0), Sheep (0.1), Goat (0.1), Pig (0.2), Poultry (chicken/Guinea Fowl / Duck/Fowl/Turkey) (0.01)

4.2 Farm households' perceptions of the impacts of COVID-19 pandemic on livelihood activities.

The objective was to assess the perceived impacts the COVID-19 pandemic on the lives of farm households in Savelugu municipality and Nanton district. Factor analysis was used to generate a factor for the perceived impacts

which was followed by a Min-Max scaling method to measure the intensity of the impact. After running the factor analysis, only six variables out of the twelve variables were found to be reliably contributing to perception scale. An eigen value greater than 1 was obtained for the selected factor. The summaries of the six variables are presented in the table 4.10:

Table 4. 10: Summary statistics of variables measuring perceived impacts of COVID-19 pandemic using factor analysis.

Variable	Strongly disagree %	Disagree %	Neutral %	Agree %	Strongly agree %
Reduced quantity and quality of food	4.99	9.97	12.90	43.70	28.45
Reduced income	0.59	6.16	6.45	42.82	43.99
Reduced social contact	5.28	6.16	11.14	49.85	27.57
Made movement difficult	3.81	6.16	6.74	42.82	40.47
Reduced production	1.47	5.28	8.80	45.45	39.00
Reduced ability to acquire inputs	0.88	5.28	6.45	35.19	52.20

Source: Field survey 2022

Statements were measured using a 5-point Likert scale for all the items: 1 – strongly disagree, 2 – disagree, 3 – neutral, 4 – agree, 5 – strongly agree. Higher scores imply agreement while lower scores imply disagreement. Selected variables have factor loadings greater than 0.3.

From table 4.9, it can be observed that respondents agreed that all the perceived impacts affected their livelihood. They either agreed or strongly agreed that the pandemic had impact on them which indicates that respondents agreed that the pandemic affected their livelihood activities. Only a few were neutral, disagreed or strongly disagreed that the pandemic had impact on their livelihood. The Min-Max scaling which is between 0 (no impact) to 1 (severe impact) gave a value of 0.641 which means that the

pandemic had a severe impact.

4.3 The influence of farm households' capabilities on the COVID-19 impact coping strategies

This objective looks at how farm household capability influences their coping strategies against the impacts of the COVID-19 pandemic. Factor analysis was used to generate an index for both capability and coping strategies making them continuous variables which were then regressed using coping strategies index as a dependent variable. An eigen value greater than 1 was obtained for the selected factor. Considering all the variables, it was observed that at least a farmer used one coping strategy to cope with the impacts of the pandemic. After the factor analysis, the coping strategy index was used as a dependent variable being regressed on other independent variables (e.g., capability).

Table 4. 11: Summary statistics of explanatory variables for regression analysis

Variable	Mean	Std. Dev.	Min	Max
Capability index	-9.41e-10	0.913	-2.257	2.599
Marital status	0.935	0.246	0	1
Extension	0.554	0.498	0	1

Land Ownership	0.982	0.135	0	1
Farm size	5.570	4.828	0.3	30
Years of farming	21.584	14.239	3	60
Age	40.367	8.771	24	68
Education	0.378	0.486	0	1
Coping strategy index	1.46e-09	0.911	-1.011	2.661
Food security resilience index	52.492	27.405	0	100

Source: Field survey, 2022

Table 4.12 presents results of farm household capability on coping strategies. OLS and 2SLS models were used for the analysis. OLS model produced bias estimates since capability was suspected to be endogenous. The capability variable was found to be endogenous because it seemed to be correlated with the error term. The Durbin Wu-Hausman test for endogeneity was used to determine it, therefore 2SLS model was used to correct for endogeneity. The capability index in the table below is no more endogenous because it has been corrected for using instrumental variable approach. Table 12 shows the results for both OLS and 2SLS analysis.

Table 4. 12: Farm household capability and coping strategies

	2SLS	OLS

Variables	Coping strategies index	Coping strategies index
Capability index	0.538**	-0.015
	(0.244)	(0.056)
Marital status	-0.026	0.029
	(0.254)	(0.211)
Gender	-0.211	-0.231**
	(0.138)	(0.115)
Extension	-1.974***	-1.283***
	(0.341)	(0.146)
Land ownership	0.914*	0.860**
	(0.473)	(0.394)
Farm size	0.012	0.009
	(0.017)	(0.014)
Years of farming	0.014*	0.013**
	(0.008)	(0.007)
Age	-0.005	-0.008
	(0.010)	(0.008)
Education	0.104	0.084
	(0.106)	(0.088)
Constant	-0.887	0 .153
	(0.750)	(0.506)
R-squared	0.522	0.684

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Comparing the OLS regression (column 2 of Table 4.12) with the 2SLS regression, it can be observed that there are differences in the outcome. Coefficients in the OLS model are lower than that of the 2SLS model, which means that the OLS is showing biased outcomes. This shows that the assumption of endogeneity is true because after correcting for endogeneity using Durbin-Wu Hausman test and after, the 2SLS model, capability which had a negative relationship with coping strategies and not significant showed a positive coefficient and significant. Discussions of the results on how farm households' capabilities influence their coping strategies against COVID-19 impacts will focus on the 2SLS model. In this model (Column 1 of Table 4.12),

four (4) out of nine (9) independent variables were statistically significant in determining changes in farmers' coping strategies. These included farmer-specific characteristics such as land ownership and farming experience as well as institutional factors (access to extension services) and the key independent variable of interest – households' capability index.

Experience in farming increased farm households' capacity to cope with the impacts of COVID-19 pandemic by 0.014% at 10% significance level. This implies that as a farmer's number of years used for farming activities increase by a year, the coping ability increases by about 0.014% holding all other factors constant. This could mean that experienced farmers are aware of and practice activities that will help improve their farming activities and help them in times of shocks such as the COVID-19 pandemic due to more years used for farming activities. This is because they have studied and know what to and what not to do, how to increase output so that they can cope with the impacts of the pandemic. This could be done by storing some of their produce, selling some and consuming some. Years of agricultural experience may be a sign of the practical knowledge farmers possess, and this could help to overcome challenges associated with the adoption of coping mechanisms (Smiles et al., 2018) that could help farmers overcome the negative impacts of COVID-19 pandemic. Smiles et al. (2018) conducted a study and found that farming experience has a positive relationship with the ability to cope in times of climate change. This could be compared with this study in the sense that experienced farmers were able to cope with the

COVID-19 pandemic. Bhata (2020) also conducted a study on coping strategies and found that there was a negative relationship between farm experience and coping strategies.

Similarly, landowners also exhibited greater coping strategies (0.914%) than their renting counterparts at 10% significance level. A farmer who does not rent land for farming copes better with the COVID-19 pandemic compared to farmers who rent, holding all other factors constant. This could be because landowners do not have to pay for the land, they use but rather use the money for other things such as engaging in activities that can help the farmer cope with the impacts of the pandemic. According to a study by Adnan et al. (2021), owning farmland provides an advantage over farmers who rent the land in that owners may make decisions directly without any restrictions. This allows owners to choose a risk management coping approach.

With regards to public institutional support, contrary to *a priori* expectation, the study found that access to extension services reduced coping strategies (1.97%) for farm households. This means that if a farmer has access to extension services, the level of coping reduces holding all other factors constant. This might seem surprising but realistic. Farmers with higher standards of living, thus, with high earning jobs such as government workers, people with high social status, may have their own ways of coping which may be better than what extension agents provide. Extension agents can help farmers improve their risk management skills as well as ways to cope with the impacts of shocks. Additionally, they can aid farmers in identifying and

comprehending their issues and in making better decisions regarding farm management, particularly those that can help them enhance their agricultural practices in order to maximize productivity (Ranjbar et al., 2019). This requires that extension services and agents be equipped and regulated to achieve the needed outcomes. If these requirements are not put in place, services provided by extension agents have no effects. Despite the relatively low use of extension services by farmers in the study area, a study on "Extension Services And Behavioral Strategies of Farmers To Deal With Risk" found a strong positive correlation between coping mechanisms and extension services (Ranjbar et al., 2019). This was different in this study, there was a negative significant relationship between coping strategies and extension services which could be attributed to the fact that extension services provided to farmers especially the ones concerning coping strategies.

With regards to capability, the *a priori* expectation was met, the study found that farm household capability positively affect farmers' coping strategy by 0.538% at 5% level of significance. This means that as a farmer's capability increases, the ability to cope with the pandemic also increases by 0.54% holding all other factors constant. Household capability when improved has the tendency of helping farmers cope with the effects of a disaster as it increased the ability to cope with the pandemic. Household capability helps farmers to cope with the impacts of the pandemic. This is affirmed by a study which indicated that farm household capability plays a major role in ensuring that individuals develop some level of resilience towards the pandemic (Liu et

al., 2020).

4.4 Effects of farm households' capability on food security resilience to COVID-19 pandemic

This objective was to determine farm household capability on food security resilience to the pandemic. Both OLS and 2SLS models were used for the estimation. 2SLS was used because capability was found to be endogenous. Below is a table showing the Durbin Wu-Hausman test for endogeneity.

Table 4.13: Test for endogeneity

Tests of endogeneity *Ho: variables are exogenous*					
Durbin (score) chi2 (1)	=	*7.0116*	*(p*	=	*0.0081)*
Wu-Hausman F (1,246)	=	*6.8722*	*(p*	=	*0.0093)*

Since the p-value is less than 0.05, we reject the null hypothesis that there is no endogeneity in favor of the alternate hypothesis. We therefore conclude that there is endogeneity and needs to be corrected, hence the Instrumental variable approach.

Table 4.13 presents results on farm household capability and food security resilience to the pandemic comparing both OLS and 2SLS analysis.

Table 4. 13: Farm household capability and food security resilience to COVID-19 pandemic

Variables	2SLS Resilience capacity index	OLS Resilience capacity index
Capability index	50.856*	-5.617
	(27.205)	(4.843)
Perceived index	-20.974***	-12.039 ***
	(6.467)	(4.034)
Marital status	-9.080**	-8.947***
	(3.922)	(3.219)
Gender	-5.377**	-5.031**
	(2.406)	(1.970)
Extension	-57.092***	-42.781***
	(7.442)	(2.608)
Farm ownership	8.143	1.655
	(6.511)	(4.721)
Farm size	-0.327	-0.179
	(0.243)	(0.191)
Years of farming	0.465***	0.429***
	(0.147)	(0.120)
Age	-0.398**	-0.468***
	(0.179)	(0.145)
Education	0.871	0.928
	(1.989)	(1.632)
Constant	85.759***	107.271***
	(13.432)	(7.253)
R-squared	0.764	0.848

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Discussions on the effects of farm households' capability on food security resilience to COVID-19 pandemic will focus on the 2SLS models. Seven (7) out of the ten (10) independent variables used for the analysis were statistically significant in determining the food security resilience level of farmers. These variables include capability, perceived impacts of the COVID-19 pandemic, Marital status, Gender, extension, years of farming, and Age of respondents. It is observed that the 2SLS model corrects for biasness in the

OLS model after a robustness check. In particular, the capability of farmers increases the food security resilience. When capability of farm households increases, the capacity to stay resilient increases by 50.86%, holding all other factors constant. This means that capability is important when it comes to being food security resilient to pandemics, because what really matters is what households can be or would be and what they can do or does. As indicated by Liu et al. (2020), that capability plays a role when farm households want to become resilient during pandemics.

Perceived impact of the pandemic reduces the food security resilience of respondents at 1% level of significance, holding all other factors constant. As perceived impacts of the pandemic increases, the capacity to become resilient decreases by 20.97%. This meets *a priori* expectation since the negative impacts of the pandemic is supposed to reduce the level of food security resilience of farmers. This is because if farmers are affected by the negative impacts of the pandemic, it will be difficult for them to develop some level of resilience if they do not have any form of coping mechanism. Ferreira et al. (2020) accounted that the COVID-19 pandemic reduced the resilience level of respondents in a study they conducted. They claimed that the different steps implemented to ensure that the virus spread as little as possible diminished the capacity for resilience, which is consistent with the results of the present study. People with higher levels of resilience are less vulnerable to the negative consequences of the epidemic, per a study on the perceived effects of the COVID-19 pandemic and resilience (Paredes et al.,

2021). Their results imply that resilience equips people to deal with the negative effects of the pandemic. Resilient people expressed lower levels of fear about the future and reported being better able to deal with the pandemic's emotional toll (Paredes et al., 2021).

There is a significant negative relationship between marital status and food security resilience which means that being married gives a farmer a lower chance of being food security resilient compared to their unmarried counterparts. This can be logical because generally, being married is associated with larger family size, increased responsibilities with related increase consumption expenditure (Alhassan, 2020). To reduce financial pressure and meet basic consumption costs for the family's upkeep, a farmer must engage in various non-farm occupations (Alhassan, 2020). Due to the impacts of the pandemic, it was difficult for farmers to engage in activities that can help earn income to cater for various family needs to ensure that they are food security resilient, hence the finding in this study.

With the gender variable measured as 1 for males and 0 for females, there is a negative relationship between gender and food security resilience at a 5% significance level. This implies that male farmers have a resilience capacity of 5.38% less than their female counterparts, holding all other factors constant which signifies that females have a higher resilience capacity, more capacity to bounce back from the negative impacts of the COVID-19 pandemic and persist. Since women play a central role in ensuring that household members are food secured (Nkengla-Asi et al, 2022), they might also play a significant

role in terms of ensuring that they are resilient in times of crises to be able to cater for household food needs.

Taking extension services into consideration, it is observed that having access to extension services reduce the capacity to become food security resilient to the pandemic which means that there was a negative relationship between extension services and food security resilience capacity at 1% level of significance. A farmer who had access to extension services has a food security resilience of 57.09% less than farmers who had no access. This does not meet a priori expectation since having access to extension agents is expected to increase the capacity to be resilient to the COVID-19 impacts. A study by Ranjbar et al. (2019) indicates that access to extension agents can provide farmers with extensive education on various farming practices, training programs to reduce their risk or manage it. This will have a significant economic impact in terms of raising productivity and overall output while also assisting in the development of risk management abilities.

Alhassan (2020) also conducted a study on food security resilience in the Upper East region and found that access to extension services had a positive significant impact on the choice to use only on-farm strategies to maintain resilience. This is because extension officers are required to inform farmers about improved farm technologies that will help increase yield and also connect farmers with input sellers. This information is supposed to enlighten the farmer to undertake helpful decisions in their farming activities. This contradicts the findings of this study because there was rather a negative

relationship between extension services and food security resilience which could mean that extension agents do not provide the required information to farmers to enlighten them on practices that could help to stay resilient in times of shocks.

With farmers' years of farming or farming experience in the 2SLS models, as the years of farming increases for a farmer, the food security resilience also increases. This is significant at 1% level of significance in both models. A year increase in the years of farming increases the food security resilience by about 0.47% in 2SLS model, holding all other factors constant. Farmers gain more experience as years go by, especially in dealing with shocks that may affect their farming activities. This helps them to develop strategies that will prevent them from experiencing the severe impacts of pandemics such as the COVID-19, making them become resilient.

A year increase in the age of a farmer increases the food security resilience of farmers. An increase in the age of a farmer by a percentage reduces food security resilience by 0.40%, ceteris paribus at 5% significance level in both models. This meets a priori expectation because as farmers advance in age, they become weaker hence their inability to engage in a lot of activities. Therefore, the farmers are unable to fight the impacts of shocks and unable to become resilient to the impacts of the COVID-19 pandemic. Advancement in age comes with a lot of disadvantages especially in terms of health, the older a farmer, the more he or she is prone to diseases and infections since the immune system is weak hence the inability to fight or withstand shocks.

Therefore, they usually experience weakness preventing them from having the capacity to stay resilient to the pandemic. Ferreira et al. (2020), in a study on '*COVID-19: Immediate Predictors of Individual Resilience*' found that age of respondents has a positive relationship with resilience which means that as age increases, the resilience level of respondents also increases. They admitted that their finding is surprising because the virus was said to affect the aged more therefore as age increases, food security resilience decreases in that regard.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

The summary of the research is covered in this chapter. The important findings from the analysis are summarized in Section 5.1, and the study's conclusions are given in Section 5.2 based on the results. Finally, section 5.3 addresses policy recommendations that could assist decision-makers in addressing issues that were discovered throughout the study.

5.1 Summary of Key Findings

The objectives for the study were to assess farm households' perceived impacts of COVID-19 pandemic on their livelihood activities, to examine how farm households' capabilities influence their coping strategies against the COVID-19 impacts and to measure the effects of farm households' capability on food security resilience to the COVID-19 pandemic in Savelugu Municipality and Nanton District. To achieve these, the study used primary data which was taken from the field using semi-structured questionnaire comprising 400 farming households. Factor analysis, Two-stage Least Square and the Resilience Indicator Measurement Analysis methodology were employed to the data. After the analysis, the following results were obtained.

After the analysis, the study showed that, on a scale of 0 (no impact) to 1 (very severe impact), a value of 0.641 (severe impact) was obtained implying that farmers perceived a severe impact of the COVID-19 pandemic on their livelihoods. These results indicate that the COVID-19 pandemic caused more

harm than good especially on farm households in Savelugu municipality and Nanton district. Farm household capability was also found to increase both the extent of coping strategies adopted and farm household food security resilience by 0.538% and 50.856%, respectively. This indicates that capability, as indicated by some studies play a role when it comes to farmers ability to overcome the negative impacts of a shock, especially the COVID-19 pandemic. Farmers perceived negative impacts of the COVID-19 pandemic decreased their food security resilience of farm households by 20.97%. As expected, the perceived impacts of the pandemic made it difficult for farmers to stay food security resilient because activities that could help farmers adapt to the impacts were hindered therefore making it uneasy to be resilient.

Male farmers have a food security resilience of 5.38% less than their female counterparts, indicating that female farmers are more food security resilient to the negative impacts of the pandemic. Females might have the capacity to be food security resilient compared to the males because females are said to quickly bounce back from the negative impacts of a shock and persist. The number of years of farming increases food security resilience of farmers which means that an experienced farmer has a higher capacity of being food security resilient. The more years a farmer uses to farm it gives him or her broad knowledge in farming activities which will allow him or her know the kinds of practices to undertake in order not to suffer the impacts of shocks such as the COVID-19 pandemic and how to improve production and increase output. Increase in the age of a farmer decreases their food security

resilience by 0.398% indicating that as a farmer advances in age, his or her capacity to be resilient to the COVID-19 impacts reduces.

5.2 Conclusions

The following conclusions have been reached based on the study's findings:

Farmers in Savelugu Municipality and Nanton District perceived that the COVID-19 pandemic had a severe impact on their livelihoods and livelihood activities. The capability of farm households in the Savelugu Municipality and Nanton District to withstand the effects of the pandemic is a factor in farmers' ability to manage their livelihoods. The COVID-19 pandemic had negative impact on the food security resilience capacity of farm households in Savelugu Municipality and Nanton District.

5.3 Recommendations

From the research findings and conclusions, the following recommendations are made for policy planning and implementation:

Government and local leaders should ensure that basic life sustaining conditions such as basic services and social infrastructures which will serve as lifeguards are provided for rural farmers to help them fight the negative impacts of pandemics. Since farm household capability play a role in the food

security resilience capacity of farmers, stakeholders should consider the capability of farmers during crises by ensuring that individual rights and opportunities are not infringed upon providing room for people to be and do what can help improve their living standards. Further, the study established that the pandemic reduces the food security resilience of farmers. Hence, the Government should ensure that proper measures are put in place to reduce the impacts of pandemics by ensuring that in times of pandemics, individuals still have access to safe and nutritious food and all year-round production for storage which will ensure that the impacts of pandemics are not felt.

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APPENDICES

APPENDIX A: Questionnaire

UNIVERSITY FOR DEVELOPMENT STUDIES

FACULTY OF AGRICULTURE, FOOD AND CONSUMER SCIENCES

DEPARTMENT OF AGRICULTURAL AND FOOD ECONOMICS

This questionnaire is a survey to investigate the capability of farm households and the effects on food security resilience to the Covid-19 pandemic. We seek your kind participation in this survey since the outcomes can help inform

ongoing and future policy formulation and implementation. Please any information you provide will be used for research purposes only and strictly confidential.

Please are you willing to participate in the survey? A. Yes [ ] B. No [ ]

Please respond to the following questions if you are willing to participate. Thank you.

Name of interviewer……. …….	Interviewee contact:
Community…… …….	Interview Date:

SECTION A: SOCIOECONOMIC INFORMATION

1. Household size……

2. Age of respondent……

3. Sex of respondent. 0 Male [ ] 1 Female [ ]

4. Age composition of household members, please complete the following table. Number of household members in the following age categories.

Age	Male	Female
a. Children (Less than 18 years)		
b. Youth (18-30years)		
c. Adults (31-60years)		
d. Aged (Above 60years)		

5. Educational level of respondent a. No education [ ] b. KG [ ] c. Primary [ ] d. JSS/JHS/Middle School [ ] e. SSS/SHS [ ] f. Tertiary [ ]

vocational/Technical [ ] h. Non-formal [ ] i. Other (specify)……..

6. Years of education……

7. Occupation: a. Farmer [ ] b. Trader [ ] c. Teacher [ ] d. other (specify)……..

8. Farm size……(in acres)

9. Distance from house to farm (in minutes) ……

10. Years of farming…….

11. Is the farm owned or rented? a. owned [ ] b. Rented [ ]

12. Number of children in school……

13. Is there any Agricultural extension agent in your community? a. Yes [ ] b. No [ ]

14. Does the community have any agro-input dealers? a. Yes [ ] b. No [ ]

15. If yes, how long does it take you from your house to the dealer? (in minutes…….

16. Is there an output market in the community? a. Yes [ ] b. No [ ]

17. If yes, what is the distance from your household to the output market? (in minutes) …….

SECTION B: KNOWLEDGE ON COVID-19 PANDEMIC

18. Have you by any chance heard of the COVID-19 pandemic? a. Yes [ ] b. No [ ]

19. If you have heard of it, through what means? a. television [ ] b. Radio [ ] c. news [ ] d. social media [ ] e. a friend/family member [ ] e. other (specify)……..

20. Do you believe in the existence of the pandemic in Ghana? a. Yes [ ] b. No [ ]

21. What are the known symptoms of the virus? Tick as many as may apply. a. dry coughing [ ] b. fever [ ] c. sneezing [ ] d. sore throat [ ] e. difficulty in breathing [ ] f. Tiredness [ ] g. others (specify)…….

22. What are the known safety measures to prevent the spread of the virus? a. Hand washing with soap under running water [ ] b. Wearing of nose masks [ ] c. Social Distancing [ ] d. The use of hand sanitizers [ ] e. Other (specify)……..

23. Do you perceive that the pandemic had influence on livelihood activities when it first occurred in 2020? a. Yes [ ] b. No [ ]

24. What about livelihood activities now? a. Yes b. No

25. What about livelihood activities in the future? a. Yes [ ] b. No [ ]

SECTION C: PERCEPTIONS ABOUT THE COVID-19 PANDEMIC.

ON A SCALE OF 1 TO 5 RATE THE FOLLOWING.

(1) Strongly disagree (2) disagree (3) Neutral (4) Agree (5) Strongly agree

26. The pandemic is an exaggerated event.

[1] [2] [3] [4] [5]

27. A naturally occurring human virus.

[1] [2] [3] [4] [5]

28. It was engineered in the lab.

[1] [2] [3] [4] [5]

29. Affect the elderly and people with chronic illnesses.

[1] [2] [3] [4] [5]

30. The pandemic is an animal disease transmitted to human.

[1] [2] [3] [4] [5]

31. It is caused by bacteria.

[1] [2] [3] [4] [5]

32. It is a punishment from God/Allah.

[1] [2] [3] [4] [5]

33. It is serious and fatal.

[1] [2] [3] [4] [5]

34. The pandemic is an attack by the Western world.

[1] [2] [3] [4] [5]

35. It was not as serious as the authorities made it look.

[1] [2] [3] [4] [5]

36. The pandemic is a source of fear and panic.

[1] [2] [3] [4] [5]

37. The pandemic is an intension for corruption.

[1] [2] [3] [4] [5]

38. An intension by the Western world to reduce African population.

[1] [2] [3] [4] [5]

SECTION D: PERCEPTIONS OF THE IMPACTS OF COVID-19 PANDEMIC ON LIVELIHOOD ACTIVITIES

To what extent did the COVID-19 pandemic affect your livelihood activities.

On a scale of 1 to 5, rate the impacts.

(1) Strongly disagree (2) disagree (3) Neutral (4) Agree (5) Strongly agree

39. The pandemic reduced the quantity and quality of your food consumed.

[1] [2] [3] [4] [5]

40. it reduced your income

[1] [2] [3] [4] [5]

41. the pandemic reduced the social contact between friends and family

which ruined your relationship

[1] [2] [3] [4] [5]

42. it made movement from your household to other places difficult because of the social distancing restriction

[1] [2] [3] [4] [5]

43. the pandemic reduced your level of production since there was limited supply of inputs causing farm activities to cease.

[1] [2] [3] [4] [5]

44. it reduced your ability to acquire inputs due to the lockdown and border closure

[1] [2] [3] [4] [5]

45. increased the cost of farm inputs due to shortages

[1] [2] [3] [4] [5]

46. the pandemic decreased your access to basic services such as access to healthcare, education, water, electricity

[1] [2] [3] [4] [5]

47. it decreased your access to output market which reduced your sale of commodities for income

[1] [2] [3] [4] [5]

48. it reduced your ability to store commodities due to low production

[1] [2] [3] [4] [5]

49. the pandemic decreased my ability to participate in political and other social activities

[1] [2] [3] [4] [5]

50. it destroyed the links I have with Farmer Based Organizations (FBOs)

[1] [2] [3] [4] [5]

SECTION E: CAPABILITY TO COPE WITH THE COVID-19 PANDEMIC

Rate on a scale of 1 To 5 the extent to which the following influence your ability to cope with the impacts of the pandemic.

(1) Strongly disagree (2) disagree (3) Neutral (4) Agree (5) Strongly agree

Human capital as a measure of capability

51. The status of your health limited your ability to cope with the pandemic as compared to most people of your age.

[1] [2] [3] [4] [5]

52. Your health problems limited your amount and type of work making it difficult to cope with the pandemic.

[1] [2] [3] [4] [5]

53. Being highly educated positively influenced your ability to cope with the pandemic.

[1] [2] [3] [4] [5]

54. The knowledge you have about the pandemic increases your ability to cope.

[1] [2] [3] [4] [5]

55. Your level of income serves as an incentive to cope with the pandemic since you were able to purchase some of the safety items.

[1] [2] [3] [4] [5]

56. Your gender plays important role in getting access to casual work and favor from people in your community which help to cope with the pandemic.

[1] [2] [3] [4] [5]

Cultural capital as a measure of capability

57. Cultural choices through investment in cultural activities such as durbars in your community improved your coping strategies

[1] [2] [3] [4] [5]

58. Cultural demands such as customs and values practiced in your community increased your ability to cope with the covid-19 pandemic.

[1] [2] [3] [4] [5]

59. You can participate in any political activity that affect your life positively if you want which help you to cope with the pandemic.

[1] [2] [3] [4] [5]

60. Good tenure security increased your ability to cope with the covid-19 and similar occurrences.

[1] [2] [3] [4] [5]

61. Your participation in political activities won favor in your access to support from friends.

[1] [2] [3] [4] [5]

Institutional capital as a measure of capability

62. The presence of a health facility in your community increases your access to healthcare which increases your ability to cope with the pandemic.

[1] [2] [3] [4] [5]

63. Good access roads help you to engage in off-farm agricultural activities.

[1] [2] [3] [4] [5]

64. Your access to extension services in your community serves as an incentive in your coping with the pandemic.

[1] [2] [3] [4] [5]

Social capital as a measure of capability

65. The rights you have over resources in your community influence your access to these resources when the need arises during the pandemic.

[1] [2] [3] [4] [5]

66. Your trust and the good relationship you have with other people in your community helped you to cope with the pandemic.

[1] [2] [3] [4] [5]

67. Your ability to build social networks with others provided you with support during the pandemic.

[1] [2] [3] [4] [5]

68. Your membership in organizations and associations or clubs such as trade unions, sport clubs, Farmer Based Organizations etc. helped in your coping with the pandemic.

[1] [2] [3] [4] [5]

SECTION F: FOOD SECURITY RESILIENCE TO COVID-19 PANDEMIC

PILLARS OF RESILIENCE USING THE RESILIENCE INDEX AND MEASUREMENT ANALYSIS (RIMA) BY FAO.

Access to Basic Services

1. Do you have access to healthcare services in the community? a. Yes [ ] b. No [ ]
2. If yes, how far is the healthcare center from your household (in km)?.....
3. Is there a school in the community? a. Yes [ ] b. No [ ]
4. If yes, how far is the school from your household (in km)?.....

5. Is there any source of potable water in the community? a. Yes [ ] b. No [ ]
6. If yes, what is the source? a. pipe borne water [ ] b. borehole [ ] c. river [ ] d. lagoon [ ] e. well [ ] f. others (specify)……
7. How far is the source of drinking water from your household (in km)?.....
8. Does the community have electricity? a. Yes [ ] b. No [ ]
9. If yes, what is your source of electricity? a. National grid [ ] b. Mini-grid [ ] c. Solar panel [ ] d. other (specify)……
10. Is there any nearby market for food and sale of agricultural produce in the community? a. Yes [ ] b. No [ ]
11. If yes, how far is it from your household (in km)?
12. Is there any phone network in your community? a. yes [ ] b. no [ ]
13. If yes, which phone network? a. MTN [ ] b. Vodafone [ ] d. Other (specify)……
14. How far is the district capital from your household (in minutes)?
15. Do you have access to sanitation facilities? a. Yes [ ] b. No [ ]
16. If yes, what form of sanitation facility?

a. Dustbin [ ] b. a dumping pit [ ] c. burning d. public dumping site e. other (specify)……..

17. Is there a toilet facility in your community? a. Yes [ ] b. No [ ]

18. If yes, what type of toilet facility? a. KVIP [ ] b. own dugout in my house [ ] c. open defecation [ ] d. other (specify)…….

19. What is your source of energy?

a. Stove [ ] b. Gas cooker [ ] c. Charcoal [ ] d. electric burner [ ] e. biogas [ ] f. other (specify)……

Social Safety Nets

20. Do you have access to any social assistance from friends, family or other financial institutions? a. Yes [ ] b. No [ ]

21. If yes, what form of assistance? a. cash [ ] b. kind [ ] c. others (specify)……..

22. How much do you usually receive (in Ghana cedis)?

23. How often do you receive assistance? a. very often [ ] b. often [ ] c. rarely [ ] d. other (specify)…….

24. Do you participate in any social networks? a. Yes [ ] b. No [ ]

25. If yes, which social network? a. cooperatives [ ] b. farmer associations [ ] c. other (specify)……..

26. Is the credit conditional or unconditional? a. conditional [ ] b. unconditional [ ] c. others (specify)……

27. Do you get any help from any NGO? a. Yes [ ] b. No [ ]

28. If yes, in what form is the help? a. cash [ ] b. kind [ ] c. others

(specify)……..

29. Do you receive any help from other financial institutions? a. Yes [ ] b. No [ ]

30. Do you receive help from international donors? a. Yes [ ] b. No [ ]

31. If yes, in what form? a. cash [ ] b. kind [ ] c. others (specify)……..

Assets

32. What type of household assets do you have? Please tick

Asset	*Yes*	*No*
a. Television		
b. cellphone		
c. radio		
d. bicycle		
e. motorbike		
f. car		
g. Tractor		
h. other (specify)		

33. Do you own any livestock? a. Yes [ ] b. No [ ]

34. If yes, what are the types and number of owned livestock? Please tick

Type of livestock	*Yes*	*No*	*Number of livestock*
a. Cattle			
b. Sheep			

c. Goat			
d. Donkey			
e. Horse			
f. Pigs			
g. Fowls			
h. Guinea fowls			
i. Turkey			
j. Rabbits			
k. Other(specify)			

35. Do you rent out any of your assets? a. Yes [ ] b. No [ ]

36. If yes, what kind of asset do you give out as rent?

a. Television [ ]
b. cellphone [ ]
c. radio [ ]
d. bicycle [ ]
e. motorbike [ ]
f. car [ ]
g. Tractor [ ]
h. other (specify)……

Adaptive Capacity

37. Do you have other sources of income apart from on-farm activities?

a. Yes [ ] b. No [ ]

38. If yes, how many income sources?.....

39. What are the types of other income sources (off-farm icome)?

a. Trading [ ]

b. Teaching [ ]

c. Carpentry [ ]

d. Masonry [ ]

e. Other (specify)…….

40. How many members of your household are still in school?.....

41. What is their level of education?

Level of education	*Number of household members*
a. KG	
b. Primary	
c. JSS/JHS/Middle School	
d. SSS/SHS	
e. Tertiary	
f. vocational/Technical	

42. How much money do you spend on food (in Ghana cedis)?.....

43. How many members of your household depend on you for their basic needs?.....

44. Do you practice any of the following intensification practices?

a. Planting of improved varieties. Yes [ ] No [ ]

b. The use of manure. Yes [ ] No [ ]

c. The use of fertilizer. Yes [ ] No [ ]

d. Crop diversification. Yes [ ] No [ ]

e. The use of pesticides. Yes [ ] No [ ]

SECTION G: HOUSEHOLD FOOD CONSUMPTION SCORE

Please indicate the number of times your household members prepared or consumed the following food items at home.

Days (past 7 days)

45. Please answer the following questions in your capacity as the person responsible for food provision/preparation in the household in the past one week. Could you please tell me how many days in the last 7 days your household has eaten the following foods? (One week recall period)

Food items	*Day 1*	*Day 2*	*Day 3*	*Day 4*	*Day 5*	*Day 6*	*Day 7*
1. Maize							
2. Millet/Sorghum							
3. Rice							
4. Bread/Wheat							
5. Tubers (yam, cassava, plantain, others)							
6. Groundnuts and							

pulses (beans, other nuts)							
7. Fish (eaten as a main food)							
8. Fish powder, small fish (used for flavour only, Maggi)							
9. Red meat (sheep/goat/beef /etc)							
10. White meat (poultry)							
11. Vegetable oil, butter, shea butter, fats							
12. Eggs							
13. Milk and dairy products (main food)							
14. Milk in tea in small amounts							
15. Vegetables (including green leaves)							
16. Fruits							
17. Sweets, sugar, honey							

SECTION H: HOUSEHOLD DIETARY DIVERSITY SCORE

46. Please describe the kind of foods that you consumed for the past 24 hours during the day and night, whether at home or outside the home. Start with the first food or drink consumed in the morning.

Question number	*Question*	*Yes/No*
1	Was there any bread, margarine, butter, porridge, wheat, oats, tuozaafi, banku, kenkey or any other foods made from cereals?	
2	Did you consume any yam, cassava, potato, konkonte, cocoyam or any other food from roots and tubers?	

3	Did you consume any meat or meat products and poultry products such as beef, mutton, chicken, guinea fowl or other products from animals and birds?	
4	Did you consume any fish, fresh or dried?	
5	What about eggs?	
6	Did you take in any milk and dairy products such as powdered milk, evaporated milk, fresh milk, cheese, yoghurt, wagashi?	
7	Did you consume any fruits?	
8	Any vegetables in your diets such as cabbage, carrot, cucumber, kontomire, ayoyo, alayafu?	
9	Did you consume any food made from beans eg: gari and beans, tubaani or other beans products and groundnut products?	
10	Any sweets such as candy, toffees, honey, drinks etc.	
11	Was there any spice or any other condiments in the food consumed?	
12	Did you consume any beverages like tea, coffee, juice, beer, soft drinks etc.	
Total		

47. How much do you spend on food in a regular month? In Ghana cedis……..

48. How much do you spend on non-food items (eg. Health, education etc) in a regular month? In Ghana cedis……..

49. Other expenditures (eg. Funerals, remittances, weddings, gifts etc) over the past year? In Ghana cedis……..

SECTION I: COPING STRATEGIES

50. *Which of the following did you use as a coping strategy to cope with the impacts of the pandemic and how effective were they? Please tick what*

applies.

Strategy	*Yes/No*	*Very Effective*	*Effective*	*Neutral*	*Very Ineffective*	*Ineffective*
1. Increase production						
2. Reduce consumption						
3. Sell assets to buy food						
4. Sell livestock to buy food						
5. Depend on stored food from previous farming season						
6. Reduce spending						
7. Depend on family and friends for assistance						
8. Depend on borrowing						
9. Use improved farming methods to increase yield						
10. Depend on savings						
11. Engage in off-farm activities						
12. Receive support from financial institution						
13. Receive support from NGOs						

14. Receive support from government						
15. Receive support from religious organizations						
16. Participate in political activities to generate income						
17. Others (please specify)						

Table 4.11: Summary statistics of variables contributing to capability measurement

Variable	Strongly disagree %	Disagree %	Neutral %	Agree %	Strongly agree %
Human capital					
High level of education	4.13	27.14	18.58	24.48	25.66
Level of income.	28.96	20.60	15.82	28.06	6.57
Cultural capital					
Cultural choices through investment.	10.51	30.33	19.22	29.73	10.21
Participation in political activities.	11.98	35.63	16.47	22.46	13.47
Good tenure security	4.82	27.11	26.20	30.72	11.14
Institutional capital					
The presence of a health facility	26.81	28.61	17.77	18.98	7.83
The nature of feeder roads	7.53	29.22	17.47	33.13	12.65
Good access roads	3.30	20.12	21.62	35.74	19.22
Your access to extension services	15.11	39.88	17.82	18.73	8.46
Social capital					
Your trust and the good relationship	4.20	32.73	23.12	28.53	11.41

Your ability to build social networks	3.93	32.93	27.49	19.03	16.62
Your membership in organizations and associations or clubs	30.67	38.96	16.87	11.96	1.53

Source: Field survey 2022

Statements were measured using a 5-point Likert scale for all the items: 1 – strongly disagree, 2 – disagree, 3 – neutral, 4 – agree, 5 – strongly agree. Higher scores imply agreement while lower scores imply disagreement. Selected variables have factor loadings greater than 0.3.

Table 4.12: Summary of variables contributing to the measurement of coping strategies

Variable	Yes %	No %
Borrowing from friends and family	30.50	69.50
Increase production	49.39	50.61
Support from financial institutions	8.92	91.08
Support from NGOs	10.97	89.03
Participate in political activities	7.62	92.38
Depend on friends and family	28.93	71.07
Sell livestock to survive	28.43	71.57
Depend on savings	59.63	40.37
Reduce spending	23.15	76.85
Engage in off-farm activities	70.86	29.14
Reduce consumption	24.15	75.85
Support from religious organizations	6.19	93.81
Sell assets to survive	24.18	75.82

Source: Field survey 2022

Factor analysis of perceived impacts of Covid-19 pandemic

Factor	Eigenvalue	Difference	Proportion
Factor1	1.224	0.538	0.808
Factor2	0.687	0.365	0.453
Factor3	0.321	0.130	0.212
Factor4	0.192	0.040	0.127
Factor5	0.152	0.171	0.100

Factor6	-0.019	0.062	-0.013
Factor7	-0.082	0.011	-0.054
Factor8	-0.092	0.066	-0.061
Factor9	-0.159	0.009	-0.105
Factor10	-0.168	0.081	-0.111
Factor11	-0.249	0.043	-0.164
Factor12	-0.291	.	-0.192

LR test: independent vs. saturated: chi2(66) = 289.80 Prob>chi2 = 0.0000
Source: Field survey 2022

Factor analysis of capability index

Factor	Eigenvalue	Difference	Proportion
Factor1	2.795	2.101	0.818
Factor2	0.694	0.097	0.203
Factor3	0.597	0.373	0.175
Factor4	0.224	0.066	0.066
Factor5	0.158	0.058	0.046
Factor6	0.100	0.050	0.029
Factor7	0.049	0.102	0.015
Factor8	-0.052	0.011	-0.015
Factor9	-0.063	0.065	-0.019
Factor10	-0.128	0.047	-0.038
Factor11	-0.176	0.036	-0.052
Factor12	-0.212	0.052	-0.062
Factor13	-0.264	0.040	-0.077
Factor14	-0.304	.	-0.089

LR test: independent vs. saturated: chi2(91) = 662.79 Prob>chi2 = 0.0000
Source: Field survey 2022

Factor analysis of coping strategy index

Factor	Eigenvalue	Difference	Proportion
Factor1	3.324	2.890	0.904
Factor2	0.433	0.048	0.118
Factor3	0.385	0.099	0.105
Factor4	0.287	0.056	0.078

Factor5	0.231	0.079	0.063
Factor6	0.152	0.076	0.041
Factor7	0.076	0.092	0.021
Factor8	-0.016	0.020	-0.004
Factor9	-0.036	0.020	-0.010
Factor10	-0.056	0.020	-0.015
Factor11	-0.076	0.057	-0.021
Factor12	-0.133	0.025	-0.036
Factor13	-0.158	0.044	-0.043
Factor14	-0.201	0.053	-0.055
Factor15	-0.255	0.026	-0.069
Factor16	-0.281	.	-0.077

LR test: independent vs. saturated: chi2(120) = 718.59 Prob>chi2 = 0.0000
Source: Field survey 2022