LIVELIHOOD DIVERSIFICATION AND FOOD SECURITY OF YOUTH HEADED HOUSEHOLDS IN COASTAL FISHING COMMUNITIES IN GHANA

BY

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DECLARATION

I, Esther Aba Eshun, do hereby declare that except for the references and literature cited, which have been duly acknowledged, this thesis titled, **"Livelihood Diversification and Food Security of Youth Headed Households in Coastal Fishing Communities in Ghana"** is the result of my own research. This thesis has never been presented either in whole or in part for any other degree.

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This thesis is dedicated to my parents and siblings for their immense support throughout my life.

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ABSTRACT

There is mounting evidence of the significance of gender equality and women's empowerment in obtaining positive livelihood outcomes in fisheries. The contribution of fisheries to GDP of the Ghanaian economy keeps declining due to many factors. Some of these factors are open access nature of the sea, overexploitation, ambiguous policies and climate change. Additionally, the yearly *"closed season*" have exacerbated the negative effect of reduced income of the youth who depend on fisheries as a source of livelihoods, further impacting their food security. Livelihood diversification is linked to food security which is very important for every household. Communities, households and individuals employ different means to serve as "safety nets" to diversify their income, improve well-being and increase food security. There is however little gendered research on small-scale fisheries and related livelihood enhancement projects. The study assesses the factors that determine the choice of livelihood diversification strategies of youth headed households. It also estimates the impact of livelihood diversification on the food security of these youth headed households. A mixed methods approach was employed to analyze fisheries and livelihood diversification in coastal fishing communities from a gendered perspective. A multistage sampling technique was used to collect primary data from 424 households in 14 coastal communities across the Greater Accra and Central Regions. A probit model was employed to estimate the determinants of livelihood diversification. Except primary education which influence diversification positively, HH characteristics are not significant, implying similar traits of YHH. Ownership of assets are significant and influence diversification positively except TV. Social grouping (group membership) and institutional characteristics (training in current livelihood activities) positively influence diversification. To estimate the food security status, household dietary diversity score (HDDS) and household food insecurity access scale (HFIAS) measure were employed. The inverse probability weighting regression adjustment (IPWRA) estimation procedure is used for the food security estimate. Increased income has a positive correlation to livelihood diversification, which further has a direct correlation to food security for YHH. Results using the content analysis showed a very gendered fisheries supply chain with different roles played by men, women and the youth and their ability to diversify. Men, women and youth experience negative impact of the decline in fisheries on their livelihoods and further their food security status. Skills development programmes targeting YHH to enable effective livelihood diversification should be implemented. Socioeconomic and institutional support systems such as access to education, group membership, etc. to aid YHH to make informed choices about livelihood strategies should be strengthened. Livelihood diversification as a pathway to food security for YHH in coastal fishing communities in Ghana should be encouraged. Finally, livelihood diversification activities must be implemented with a gendered lens in terms of access to the different assets for men and women to achieve equal and greater impact in coastal fishing communities.

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LIST OF ABBREVIATIONS AND ACRONYMS

AfDB	African Development Bank
AGRA	Alliance for a Green Revolution in Africa
AIDS	Acquired Immunodeficiency Syndrome
AU	African Union
AUC	African Union Commission
CEWEFIA	Central and Western Fishmongers Improvement Association, Ghana
DAA	Development Action Association
DFID	Department for International Development
EEZ	Exclusive Economic Zone
FAO	Food and Agriculture Organization
FoN	Friends of the Nation
GDP	Gross Domestic Product
GEC	Ghana Energy Commission
GIH	Global Infrastructure Hub
GNCFC	Ghana National Canoe Fisherman Council
GoG	Government of Ghana
GSS	Ghana Statistical Service
GWA	Gender and Water Alliance
HDD	Household Dietary Diversity
HFIAS	Household Food Insecurity Access Scale
HIV	Human Immunodeficiency Virus
HLPE	High Level Panel of Experts
HM	Hen Mpoano
ILO	International Labour Organization
IMF	International Monetary Fund
IUU	Illegal, Unreported, and Unregulated
JMP	Joint Monitoring Programme
MOFAD	Ministry of Fisheries and Aquaculture Development
MOGCSP	Ministry of Gender, Children and Social Protection
MT	Metric Tonnes
MNL	Multinomial Logit
NAFPTA	National Fish Processors and Traders Association
NGOs	Non-Governmental Organization
NSPP	National Social Protection Policy
OECD	Organization for Economic Co-operation and Development
RFMOs	Regional Fisheries Management Organizations
SDGs	Sustainable Development Goals
SIDs	Small Islands Developing States
SRID	Statistical Research and Information Directorate
SSA	Sub-Sahara Africa
SSF	Small Scale Fisheries
UN	United Nations
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization

UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
WEF	World Economic Forum
WHAT	World Humanities Action Trust
WFP	World Food Programme
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION

1.1 Background

Generally, households and communities employ different strategies to secure and improve their livelihoods. These strategies are critical for coastal communities and developing countries (Rasmussen et al., 2017; Cinner & Bodin, 2010). Whilst efforts in improving livelihoods compete for limited resources, it does contribute to increased income, improved well-being and food security (Diedrich et al., 2022). The ability of an individual to improve capabilities, earn an income, reinforce the value in the community and reduce their vulnerability is termed as a livelihood (Allison & Ellis, 2001; Chambers & Conway, 1992; Maru et al., 2014). Such livelihoods are sustainable when they can cope with, recover from stresses and shocks, maintain, or enhance its capabilities and assets. These maybe in the present and the future while not undermining the natural resource base (Allison & Ellis, 2001; Carney, 1998; Chambers & Conway, 1992; Maru et al., 2014).

The ability and capacity of households to engage in multiple occupations has direct outcomes on their ability. For example, to engage in different management systems for their households and environment, exit a particular livelihood (e.g. fisheries), reaction to policies directly affecting the sector and many others. Three main strategies are employed by rural households as a means of livelihood and these are agricultural intensification; livelihood diversification; and migration (Barrett, Bezuneh, & Aboud, 2001). The study explains livelihood diversification as the different means employed by households or individuals to supplement their income in addition to the main

source of income for the household. This is in an effort to improve their well-being and overall standard of living.

Livelihood diversification is a significant characteristic of rural households and is a means to stabilize household income and manage risks (Ellis, 2009; Gautam & Andersen, 2016). It serves as a response to opportunities that enhances the welfare of the household. It is also a means for households to earn and accumulate income (Lay & Schüler, 2008). Diversification tend to assist in smoothing the effects of resource variations of households by engaging in different economic and income-generating activities. These activities lead to different livelihood outcomes. Other households improve their wellbeing and food security through asset accumulation. Asset accumulation by households is associated with transaction costs (Ellis, 1998) for which the additional income supports.

New strategies introduced into households show an upward trend in changes in income from diversification over a period for forest-dependent communities. The new strategies adopted these communities contribute to increased income with effort and time committed to such activities (Nerfa et al., 2020). Choices of livelihoods depend on many factors such as access to resources of land, labour, with additional factors which include institutional and socio-demographic characteristics, e.g., household size, age and gender contributing to decisions to diversify (Baffoe & Matsuda; 2015, 2018; Dash et al., 2016; Rahu, 2016; Hussain et al., 2019). Households, in their quest for improved well-being, may end up prioritizing less viable livelihood strategies (Baffoe & Matsuda, 2017). The decision to prioritize less viable livelihood strategies by households are dependent on non-economic reasons such as the absence of entry restrictions to prioritized

activities, and barriers to undertake more profitable ventures (Loison, 2015; Baffoe & Matsuda, 2017). Despite the varying approaches linked to rural livelihoods diversification, there seems to be a convergence that diversification is mainly to build household resilience in tropical regions of the world (Baffoe & Matsuda, 2015, 2018). Interventions are mostly directed toward livelihood diversification in the Global South, particularly SSA, where it can potentially increase resilience and reduce persistent poverty (World Bank, 2007; Alobo Loison, 2015).

Households experience many positive outcomes through diversification. These include expansion of income, accumulation of wealth, reducing the risk associated with loss of income and stabilizing household income (Davis et al., 2010; Nielsen et al., 2013; Seng, 2015; Amevenku, 2019). Further, such households involved in diversification are associated with greater food security (Abdulai et al., 2011; Zereyesus et al., 2017). Another benefit of diversification is the ability of households to solve the many challenges caused by poverty and reducing degradation of the environment (Delden et al. 2015; Ito et al. 2016). Some intra-household responses to diversifying can be the allocation of family labour in a time of need or modifying their consumption pattern in acceptance of income fluctuation.

Different strategies are adopted in agriculture, fisheries, non-agricultural economic activities and or other informal economic activities. Other non-farm / off farm economic activities are post-harvest activities, wage employment, provision of agricultural services (McClanahan et al., 2010; Asravor, 2017; Amevenku, 2019). For fisher folks, diversification is an option to households dependent on fishery resources to engage in different strategies other than fishing. These options include on-farm /off -farm activities, self-employment and non-agricultural wage activities.

Diversified and alternative livelihood lead to poverty alleviation in fisheries (Neiland, 2004). It is therefore important to note that livelihood diversification is both a coping and a thriving mechanism for households in a more flexible and growing economy. The 'coping' dimension for households dominates where diversification is an enforced response to failing agriculture, recession and retrenchment (e.g. Davies, 1996; Scoones, 1998; Francis, 2000). Economists view non-farm and off - farm activities as one of the many means of diversification beyond agriculture. Agriculture has been and continue to be the main stay of the Ghanaian economy and impacts growth.

Globally, agriculture reduces poverty, generates income, and improves food security for 80 percent of the world population who are in rural areas. It accounts for 4 percent of the global GDP and 25 percent in least developing countries (World Bank, 2023). The sector plays an important role in contributing to food and nutritional security, employment, and livelihoods in sub-Sahara Africa (SSA) and the African continent (OECD, 2016). Generally, the sector has a high contribution to total gross domestic product (GDP) compared to other sectors of most countries' economies globally. It has an average contribution of 15 percent to the total GDP and ranges from country to country, below 3 percent in Botswana and South Africa to more than 50 percent in Chad (OECD, 2016). The sector employs over 50 percent of the continent's total labour force (IMF, 2012) and provides a livelihood for many small-scale producers within the rural population. Sub Saharan Africa (SSA) has over 80 percent of smallholder farms and this creates direct employment for close to 175 million people (AGRA, 2014). Women are close to half the labour force in Sub Sahara Africa (SSA) (FAO, 2015).

Ghana's economy is categorized into three main sectors: Service, Agriculture & Industry (SRID, 2022). Agriculture is key to Ghana's economic growth and livelihoods (FAO, 2015) and continues to be the second largest employer to the economy of Ghana after the services sector. It employed 33.5 percent of the population in 2019 whilst contributing 19.7 percent to Ghana's GDP in 2021 (World Bank, 2022).

Fisheries constitute an important sector in national economic development. The highest year-on-year growth rate recorded in recent times demonstrate the importance of fisheries contribution to the agricultural sector and the overall economy of Ghana. Three main areas make up the fishery sector in Ghana, the marine fishery, inland (fresh water) fishery and aquaculture fishery. The marine sector is the highest contributor of about 70 percent to the total fish output for the country. Marine fisheries output was 362,292MT (68.1 %), inland fish production was 86,353.33MT (16.2 %) and aquaculture was 83,150 MT (15.7 %) of the total 531,795 MT for the year 2021 (MoFAD, 2022; GSS, 2008). About 10 percent of the Ghanaian population are involved in all aspects of fisheries (fish catch, storage, preservation, marketing and distribution) for which as their source of livelihood in these activities (Entee, 2015; Nunoo et al., 2015; Amevenku et al., 2019). These activities are carried out along Ghana's five hundred and fifty (550 km) kilometers coastline. The country's coastline stretches from Aflao in the east to Half Assin in the West (Dadson et al., 2016; Evadzi et al., 2017; Wiafe et al., 2013). The coastal zone covers 6.5 percent of the land area and is inhabited by a quarter of Ghana's population and is part of the total land area of 238,539 km^2 (DeGraff-Johnson et al., 2010).

1.1.1 The role of fisheries in economic development

Globally, the importance of the fisheries sector cannot be over emphasized as it directly feeds into the sustainable development goals (SDGs) dealing with poverty, hunger, gender equality, life below water, etc. (HLPE, 2017). The sector also serves as a major contributor to livelihoods of many coastal communities in the world (Asiedu & Nunoo, 2013; BNP, 2008; Hicks et al., 2019). Fisheries are part of dietary needs and important for both food and nutrition security for households (FAO, 2016; Hicks et al., 2019; Hasselberg et al., 2020). Globally, over 3.3 billion people obtain about 20 percent of their average per capita intake of animal proteins from fisheries. Specifically, countries such as Bangladesh, Cambodia, the Gambia, Ghana, Indonesia, Sierra Leone, Sri Lanka, and other small islands developing states (SIDS) depend on it for 50 percent of animal protein. Fish consumption in 2017 was about 17 percent of the total intake of animal proteins, and 7 percent of all proteins (FAO, 2020).

About 97 million rural households in developing countries are estimated to be in the fisheries supply chain: fish catch, processing (drying, smoking, frying, salting, etc.), and marketing (Almine, 2023; Amevenku et al., 2019; Antwi, 2019; Rajeev & Bhandarkar, 2022). Small-scale fisheries (SSF) and aquaculture employ over 41 million people worldwide. Most of these numbers are in developing countries working in fish production. Specifically, SSF serves as a major source of employment (March & Failler, 2022). It serves as foreign exchange for developing countries with a third of fishery commodity production exported (Finegold, 2009). SSF supports close to 113 million workers in fishery value chain and accounts for about 40 percent of global fish catch. It is estimated that at least 45 million women are involved in SSF (IHH, 2021; Teh & Sumaila, 2013). The small-scale sector of fisheries makes up 85 percent of harvesters (FAO, 2020) and 47

percent of landed value in the region (Pauly & Zeller, 2016). These contribute to the food security of more than 200 million people in Africa (Sowman & Cardoso, 2010).

Sub-Saharan Africa (SSA) countries highlight the role of the fisheries subsector to GDP as it contributes significantly to national development. The contributions are related to employment, livelihood, foreign exchange earnings, food security and poverty reduction, (OECD, 2020; McGoodwin, 1995, 2001; Kent, 1997; Béné & Heck, 2005; FAO, 2005, 2015). Fisheries production in SSA is only 4 percent of total world production, with limited growth prospects in the next decade (OECD, 2020). Fisheries livelihoods are central to the socio-cultural identity of households in some coastal fishing communities. Countries such as Morocco, Nigeria and South Africa are the noted to be the top three producers of capture fisheries as the continent's domestic fish supply is dominated by capture fisheries (Cinner & Bodin, 2010; FAO, 2018).

Fisheries as a source of livelihoods contribute to the socioeconomic development of the Ghanaian economy (Adom et al., 2019; Crawford et al., 2016; Hasselberg et al., 2020; MoFAD, 2015). Ghana's fisheries subsector is estimated to employ about 10 percent of Ghana's population of 30.8 million (GSS, 2021). These people are engaged in various aspects of the industry from fishing, transporting from the shores to homes and processing sites, processing into dried, fried, smoked, storing, and transporting to wholesale and retail centres for consumption. The small scale fisheries (SSF) employed approximately 107,518 (primarily male) fishers and 1.9 million fish processors and traders (mainly female), accounting for about 80 percent of the total annual marine fish catch by volume in 2015 (MoFAD, 2016).

The fisheries sub-sector contributed 4.94 percent to the agricultural GDP in Ghana in 2020 (SRID, 2021), is estimated to contribute about 1.2 percent of Ghana's gross domestic product (GDP) and accounts for over 50 percent of earnings from non-traditional export (GSS, 2019). It is estimated that the sector directly employs over 135,000 fishermen in the marine capture sub-sector alone. About 92 percent of this number are artisanal fishers per records of the Artisanal Vessel Registry System of the Fisheries Commission. There has also been an increase in canoe from 12,700 in 2016 to over 14,700 canoes in 2018.

1.1.2 Youth dynamics in economic development

The youth stage is the period between adulthood and childhood in the life cycle of an individual (Curtain, 2001). The World Bank, (2006) deems it as a universally distinct developmental stage and a time of transition for everyone. It is also a stage where critical decisions are made by the individual or adolescent, affecting their future, households, and communities. The international development community acknowledges the contribution of youth in achieving and sustaining inclusive youth development. There is greater call for youth participation and meaningful opportunities and engagement in all aspects of development.

Different international institutions and countries have their own definition with variations in age brackets for the youth. Kenya and Tanzania have a similar youth age range as Ghana, from 15–35 years. Nigeria on the other hand has a youth age range from 12–30 years, while South Africa's youth age range is from 14–35 years (Mkandawire, 2000). Africa has between 20 and 36.8 percent of her population as the youth population and workforce, with 20 percent or more between the ages of 15 – 24 years. It is expected that by the year 2050, the composition is estimated to be 18.6

percent of the population in Central Africa, 18.5 percent in Eastern Africa, 18.8 percent in Western Africa, 15.6 percent in Southern Africa and 13.9 per cent in North Africa (AUC, 2015). The study operationalizes youth group as persons within the age bracket 18 – 35 years for the study.

The global youth population is expected to total 1.20 billion in 2020, 1.29 billion in 2030, and almost 1.34 billion in 2050, accounting for a gradually declining share of the overall population (15.5, 15.1 and 13.8 per cent, respectively) (United Nations, 2019). The World Youth Report (2020) estimates the youth cohort will continue to grow and will likely represent almost 30 per cent of the world's population by 2050 in sub-Saharan Africa. This is an increase of their population from 18 percent in 2020 and almost 22 percent in 2030. Specifically, Northern Africa and Western Asia are also likely to see their youth populations expand over the next 30 years (2050). Africa youth accounts for about a third of its total population. The continent has the world's youngest and fastest-growing population, with Western and Eastern Africa accounting for more than half of this population (AUC, 2015; Serajuddin et al., 2017). Agenda 2063 of the African Union (AU) development plan gives high priority to investing in youth as the driving force for achieving socio-economic development in Africa by the African Union Commission (AUC, 2015).

The UN reports a high growth rate of youth population for least developed countries, about 47 countries with 32 of them in SSA. This part of Africa has the youngest age distribution compared to other parts of the world. The organization further estimates that the SSA youth cohort grew 2.5 times faster than the total population of the rest of the world with an average growth of 2.3 per cent annually from 2015 to 2020 (UN, 2019). With the high population growth comes the need for more and better opportunities in terms of their livelihoods.

Ghana's development plans have incorporated programmes and policies (e.g. National Youth Policy) to mitigate the challenge posed by the growing youth population. The development of the national youth policy document in 2010 is to guide the identification and incorporation of youth in national development. The country has over 38 percent of its 31 million population as youth (GSS, 2021). Policies such as the National Youth Policy (NYP) have 19 thematic areas supporting youth empowerment. The policy highlights the importance of youth involvement in national development. As a major source of human capital for the nation, youth are at the forefront of the socio-cultural, economic and political development. Their intellectual abilities coupled with their productive acumen when properly harnessed underpin social progress. Assets, capabilities and agency are key for the contribution by youth to national development. In addition to these an enabling environment ensures positive contribution of the youth to national development.

Social protection strategies targeted at reducing vulnerabilities among the Ghanaian population are been implemented in the country. The National Social Protection Policy was developed in 2015 by the Ministry of Gender, Children and Social Protection (MOGCSP). This document also aligns with the shared Growth and Development Agenda (2014–2017). The strategy is to support the population inclusive of youth to be a knowledgeable, skilled, productive and healthy. The end goal is economic development and transformation through the reduction of income disparities and enhance access to social security for the vulnerable in society. These strategies align with Ghana's, Africa's and global to empower and inform communities and work to protect youth from extreme poverty, social exclusion and inequality (Commonwealth secretariat, 2021).

To ensure viable and sustainable livelihoods and contribute to social change and sustainable development, young persons must be equipped and empowered with education, skills and opportunities in their communities (WYR, 2020). These require access to and use of all assets (physical, social, economic, financial, and natural). Youth headed households (YHH) with access to and use of these assets can create better livelihoods. These are through access to and availability of productive resources, lower cost of living and livelihood opportunities. YHH face challenges such as limited skills and capabilities, the enabling environment coupled with challenges in fisheries which positively push them to diversify away from fisheries. Smith et al., (2005) points to the lack of differentiation and the failure to cater for the specific needs of fishing communities. As such, strategies to support youth headed households' diversification efforts to obtain higher income need to be based on thorough research. Research to understand challenges faced by YHH livelihood diversification and employment realities tend to mitigate the risk of not achieving adequate impact. Furthermore, increased investment is needed which research highlights for the appropriate and needed impact (Williams & Pompa, 2017).

Empirical evidence demonstrates the possibility of understanding "how different contexts such as geographic, economic, political or professional, impact young people" and their ability to access jobs (Philipps, 2014). There is a need for youth studies to capture the global youth (Philipps, 2018; Comaroff & Comaroff, 2005). Research on Ghanaian youth as part of Africa 's increasing population (Yahya, 2017) is a fruitful source of methodological and theoretical insights for policy formulation on youth.

There is rising youth population in Ghana and by extension youth headed households, Africa and globally. Underemployment and unemployment are one of the many challenges faced by the youth in coastal communities due to dwindling fish stocks. This makes it prudent for national, regional, and international policies to focus on the youth and make youth the center of planning for sustainable economic development in Ghana and Africa as a whole.

1.1.2.1 Defining youth

The United Nations (UN) indicates the youth period is a period of transition from the dependence of childhood to adulthood's independence. This period is characterized by sexual maturity, increasing economic and social independence from carers and parents (Arulingum et al., 2019; Leavy & Smith; White 2012; Pyburn et al., 2015). This stage is critical for the social integration of young people who find themselves in a complex social system, composed of tradition, history, social demands, hopes, and individual prospects, all of which must incorporate into a coherent picture to build a proper foundation for their personal life (Henze, 2015). For the purposes of this study, the youth definition is given as people between the age range of 18 – 35 years (NYP, 2010) which is consistent with the African Union Youth Charter definition. This definition considers the biological features that are socially constructed of the target group.

Youth is also defined based on several factors such as age, education, gender, legal status, marital status and sometimes timing of engagement in a particular labour market (Pyburn et al., 2015). Definition of youth varies by different institutions or organizations, different disciplines, features and these organizations consider some factors such as biological, physiological and social features. By literature, definitions of youth can be classified into; (i) chronological, (ii) psychological and

(iii) sociological points of view (Beşirli 2013). The easiest way to define the youth group is the chronological definition in terms of education and employment, because 'youth' refers to a person between the ages of leaving compulsory education and finding their first job.

The different stages of youth are: early adolescents within 11-14 years, middle adolescents within 15-17 years and late adolescents characterize this period, 17-21 years. Adolescence is determined to be the period of a person's life that individual is neither a child nor an adult, (Morris, 2002). Sociological definitions of youth are described according to the status attributed to individuals in social structure and expected situations of individuals in compliance with this status (Marshall, 1999). This definition does not consider the biological features of youth and is based on biological features that are socially constructed. It refers to the socio-cultural and socio-economic structure and culture, which is determinant of this structure. In sociological definition, young people's position in the social structure, their functions in social institutions, their role in the process of social change and their impacts evaluated etc. Sociological research shows that being a youth is more of a social than a biological stage, though this study's definition is based on age. The United Nations (UN) defines 'youth', as those persons between the ages of 15 and 24 years, without prejudice to other definitions by the Member States. (United Nations, 2010). Table 1.1 indicates the different youth definitions.

Table 1.1: Entities, countries and their definition of youth

Country/Organization	Age range	Reference / Source
UNICEF /The Convention on Rights of the Child	Child until 18	UNICEF
UNICEF/WHO/UNFPA	Adolescent: 10-19, Young People: 10-24, Youth: 15-24	UNFPA8
UN Secretariat/UNESCO/ILO	15-24	UN Instruments, Statistics, UNESCO, 2019
UN Habitat (Youth Fund)	15-32	Agenda 21
The Commonwealth	15- 29	The commonwealth 2018
The African Youth Charter	15-35	African Union, 2006
OECD	15-24	OECD
World Bank	12 - 24	World Bank,2006
Africa		
Egypt	18–30	Ministry of Youth (Sika 2016)
Nigeria	18–35	Second National Youth Policy 2009 (Federal Ministry of Youth Development, 2009)
Tanzania	18–35	National Youth Development Policy 2007 (Ministry of Labour, Employment and Youth Development, 2007)
Zambia	15–35	National Youth Policy 2015 (Ministry of Youth and Sport, 2015)
Asia – Pacific		
Bangladesh	18 - 35	National Youth Policy 2017 (Draft) (Ministry of Youth and Sports 2017)
Cambodia	15-30	National Policy on Youth Development 2011 (Ministry of Education, Youth and Sport 2011)
Myanmar	15 - 35	Youth Policy, the Republic of the Union of Myanmar 2017 (Ministry of Social Welfare, Relief and Resettlement 2017)
Solomon Islands	15 - 34	National Youth Policy 2017-2030 (Ministry of Women, Youth, Children and Family Affairs 2017)
Association of Southeast Asian Nations (ASEAN)	15 - 35	As defined by the ASEAN member countries, the overall youth age bracket is 15–35 years old (ASEAN and UNFPA 2017)

Source: World Bank 2006; UNICEF Pacific 2011; UNFPA 2014; UNESCO, 2019

1.1.3. Households in economic development

Small-scale farmers form between between 60 and 80 percent of agricultural population who are dependent on rain and basic resources for production to earn a livelihood for their households. Such households are dependent on agriculture for their income (Toledo & Barrera-Bassols, 2008). Agricultural households as defined by the Handbook of Household Surveys (UN, 1984) is one in which "at least one member of the household is operating a holding (farming household) or when the household head, reference person or main income earner is economically active mainly in agriculture". Another definition by Eurostat (1995), is one where the main income of the household reference person is from independent activity in agriculture. A broader definition is one where any member has some income from independent activity in agriculture.

A household is group of people who are related or unrelated, live together in the same housing unit, share same housekeeping and cooking arrangements, and are considered as a unit (Lowie, 1950; Bongaart, 2001). It is simply a social institution that fulfils a key socio-economic role in society (Becker, 1965; 1981)]. The UN (2012) and OECD (2003) define an agricultural household as a household where at least one member is engaged in agriculture (that is fisheries for the purpose of the study) as self-employed. Such members may not be related by blood or marriage and such a unit reflects the social structure. The composition reflects the social structure of the population and may consist of a man, his wife or wives and children. Relatives or non-relatives may live with such families. European countries and Northern America tend to have small average household sizes, of fewer than three persons per household. An average of 1.9 and 2.9 persons are found in households in Monaco and Serbia respectively, whilst the US has an average of 2.6 persons per household. These figures are slightly lower in some parts of Eastern Asia and the Caribbean. Japan

and Montserrat have 2.4 and 2.0 as the average number of persons per household respectively. Africa and the Middle East on the other hand, have large average household sizes. The average number per household is greater than five persons per household and the largest household sizes were found in Senegal and Oman, averaging 9.0 and 8.0 persons, respectively (UN, 2017). These figures show the higher number of household sizes for Africa and Asia.

The average household size, however, has been on the decline since 2000. Countries such as France, has seen a fall in average household size from 3.1 persons per household in 1968 to 2.3 in 2011. Kenya, in East Africa has seen a fall of the average household size from 5.3 persons per household in 1969 to 4.0 in 2014 (UN, 2017). The average household size is at the lowest level ever at 3.6 for Ghana. The estimated number of households in Ghana as of 2021 is 8.3 million with 14.8 million males and 15.2 million females as the population composition. This shows a growth in 2021 compared to 2019 of 7.3 million (GSS, 2021). Except in Africa and Asia, size of households in Europe and other parts of the world keep declining.

The term head of household is used for "the person considered responsible for the people in the house". This person may be appointed based on age (older), sex (generally, but not necessarily male), marital and non-marital status, war, conflict, migration, economic status (main provider) or some other reason (UN, 2017). Literature states three main groups of such household heads namely male-headed, female-headed, and households headed by children. Sex, is one key factor that determine access to the position of household leadership especially in societies where men are overwhelmingly present in positions of leadership and decision-making culturally and otherwise.

A youth headed household is a young person within the ages of 18 – 35 years who is responsible for the welfare of the people in the household. The responsibility is in terms of decision making and finance.

Household in which an adult male is the sole or main income producer and decision-maker is termed as a male headed household or lone-father households. These are quite rare with 2 to 4 per cent of such households with children in almost all regions except in Africa which has about 7 percent of such households with children (UN, 2017). Men are typically considered as household heads irrespective of their ages or economic situation or ability to make decisions on behalf of all or some members of the household. Ghana statistical service (GSS) (2019), reports the proportion of male-headed households are about 66.6 percent compared to females which is about 33.4 percent. Whilst per zone, rural savannah has the highest proportion of male-headed households with 79.7 percent and rural coastal has the least of about 60.3 percent. However, female headed households in rural coastal recorded the highest number of 39.7 percent whiles the lowest, 20.3 percent, is in rural savannah (GSS, 2019).

Household in which an adult female is the sole or main income producer and decision-maker is said to be female-headed household or lone-mother households. This type of household accounts for nearly a quarter of households with children in Africa, Northern America, and Latin America and the Caribbean. Such households are less common in Asia and Europe with 11 per cent and 18 percent of households with children respectively. Women are not usually considered as heads of households in some countries unless no adult male is living permanently in the household. The assumption that the head of a household is always an adult man, even if a woman's economic

contribution to the household's maintenance is the same or greater than that of a man, is a form of gender bias. In developing countries, there is a general trend of more and more women being the primary source of economic support for their families.

A child-headed household is a household where there is an absence of an adult care person and children found in the household live on their own. Mostly, one older child will care for siblings, cousins, nephews or nieces. This is common in areas affected by war or genocide and increasingly common in areas with high AIDS mortality. However, this kind of household is not prevalent in Ghana.

These definitions as based on the sex of household head has three main underlying assumptions and from relevant research on gender differences in access to resources. These assumptions affect access, utilization and disbursement. Firstly, the household head is responsible for the economic and financial wellbeing of the household. Secondly, men relative to women are advantaged in accessing a society's economic resources and opportunities. These assumptions do indicate that the means of ensuring economic well-being is not gender-neutral. However, the head of the household must ensure economic well-being and sustainability of the household.

The last assumption suggests that the gender of the head of household affects both how household resources are utilized and disbursed within the household. It also affects how households are networked for the exchange of resources with other households (Lloyd & Gage-Brandon, 1993; Haddad, 1990; Bruce, 1989). However, there are limitations to these three assumptions. One, there is no defined or clear association of the definition of household headship with economic

responsibility. In addition, the propensity for women to perceive or indicate their status as the household head, especially with the presence of an adult male in the household do vary across different cultures and is itself likely to be a function of the status of women in such cultures. Mostly, the household head is the one mainly responsible for the economic welfare of the household, which may or may not be true as a generalized assumption for an unknown proportion of household heads, whether they be male or female.

In terms of agricultural households, the final report of the National Agricultural Census in 2020 estimates agricultural households in Ghana to be slightly above 2.5 million. Ghanaians make up 99 percent of the population of agricultural households and foreigners make up 1 percent of the population in the country. The breakdown of the population in the agricultural households is 11.3 million persons of which 5.7 million (49.5 percent) are males. The rural agricultural households' population is 8.5 million (75.2 percent) of the 11.3 million people. In terms of gender, females make up 5.6 million which are slightly more than males. The agricultural population has 36 percent of its composition in the first two age groups of 0-14 years (4.0 million) and 15-35 years (4.1 million) demonstrating the youthfulness of the population (GSS, 2020). Young persons between the ages of 18 – 35 years form 38.2 percent of the over 30 million population of Ghana (GSS, 2021). The youth population in capture fisheries is estimated to be 3,657 out of 124,000 artisanal fishers (GSS, 2020). About 64 percent of this population are found in the 30 – 35 age brackets and those within 25-29 years make up a quarter of the population respectively. However, majority of the estimated population are over 24 years in the artisanal sector. It is also estimated that canoes are the most common vessels used and owned by the youth. About 98.1 percent (3,601) use canoes,

out of this number 92.9 percent are found in the rural areas. Males are the primary users of the canoes in the rural coastal areas and also for inland fishing activities (GSS, 2020).

Two schools of thought on household food security and its measurement in literature. There are those who favour intra-household perspective and those who are in favour of individual measurement. Assenso – Okyere et al., (1997) argue that production and consumption decisions take place at the household level and as such measurement of food security at that level is merited. Household as a unit is the main conduit for measuring hunger levels and poverty (De Weerdt et al., 2014). Also, it is costly to perform intra-household analysis (Haddad & Kanbur, 1990).

Whilst another school (Maxwell, 2001; Maxwell & Smith, 1992; Sen, 1984) think otherwise. As they indicate that measuring food security at the household level is an oversimplification. This tends to lead to a wrong prediction of the actual food security status of the household members. This is highlighted through tthe unequal distribution of decision-making powers within the household, which in this instance borders on food acquisition and allocation. Maxwell and Smith (1992), further demonstrated that that food price fluctuations generated different effects for male and female household members in terms of food consumption and as such intra-household analysis is the best approach for micro- level analysis of the welfare of the household (Sen, 1984). Maxwell and Smith (1992), proposed these basic assumptions: "(a) household members share a common set of preferences in resource allocation; (b) household income and food resources are pooled and allocated to maximize collective welfare and (c) households with similar endowments respond similarly but independently to price, income and other exogenous changes" (Maxwell & Smith, 1992). With all these highlights, the study with its objectives seek to employ the household and

therefore youth headed household (YHH) for measuring livelihood diversification and food security.

1.2 Problem statement

One third of all fish stocks are overfished globally as reported by FAO (2020). FAO (2020) further points out a decline in biodiversity and extinction of about 33 percent of marine mammals, sharks and other related species. The decline in fish stocks affects fish dependent households mainly due to overfishing and other factors. The decline has been attributed to poor management of industrial and artisanal fishing. Further exacerbating the situation is widespread illegal, unreported, and unregulated (IUU) fishing. In developing nations, IUU accounts for more than 30 percent of fish taken from their waters and is often a sign of weak governance that affects the food security and economic state of coastal communities that rely on fishing.

The SDGs that promote the right to food and nutritional security, zero hunger are the responsibility and focus of nations globally. The need to promote food security and economic growth for household's dependent on fisheries is enshrined in several international and regional conventions, agreements and protocols (Froehlich et al., 2018). Africa's New Partnership for Africa's Development's (NEPAD) has the promotion of food security as an integral part of the Comprehensive Africa Agriculture Development Programme (CAADP) framework. This is as a result of concerns on the subject on the continent. The expansion of both industrialized and artisanal fishing has further prompted fears of a worldwide crisis in fisheries (MacGoodwin, 1990; Crean, 1996) with resource depletion threatening livelihoods. Livelihoods are threatened this way through reduced per capita supply and the nutritional status of low-income households in developing countries per the World Humanities Action Trust (WHAT, 2000).

Increase in global population has affected the demand for fish as a food source (Porter, 2014). This has caused pressure on fish stocks with a gradual decline in global marine fish stocks. It is estimated the share of fish stocks within biologically sustainable levels decreased from 90 percent in 1974 to 68.6 percent in 2013 (Hilborn et al., 2003; Stobutzki et al., 2006; UNFAO, 2010; Watson et al., 2002; FAO, 2016). Over 1million tonnes of fish are lost per year due to overfishing and bad governance which accounts for one tenth of global annual losses (AfDB, 2012). It is expected that interventions such as better management regimes can improve the marine fish stocks or else production levels for marine capture fisheries are projected to stagnate or decline (Costello et al. 2016; World Bank 2013). Thus, coastal dwellers who are dependent on marine fisheries as source of livelihood are at risk (Porter, 2014). This increasingly undermines life below water as opposed to the objective of the Sustainable Development Goal (SDG) 14.

YHH constitute a majority of dwellers in coastal areas in Ghana and these households are dependent on especially the artisanal subsector. A decline in fish landing over the years has affected income and livelihoods of coastal folks who are involved in the fisheries subsector. The decline in fish landing is not only peculiar to Ghana but a global problem especially in coastal countries (Béné et al., 2010; 2016; Oliveira Júnior et al., 2016; Rahman et al., 2012; Scyphersa et al., 2019, Danquah et al., 2021). These problems are similar in other coastal countries as literature points out (Ofori-Danson et al. 2012; Asiedu & Nunoo 2013; Atta-Mills et al., 2004; Nunoo et al. 2014).

Ghana has experienced a varied fish output with the lowest recorded in 1976 of 246,601 metric tonnes (MT). There is a steady rise of this figure, peaking in 1999 of 420,000MT to a further decline in 202,000 metric tons in 2014 (FAO, 2016). The trend shows total fish landings for Ghana recorded in 2019 represented about 41 percent of the highest recorded landings compared to the year 1993 (Lazar et al., 2019). Further, commercial landings of small pelagic species, the most important in terms of landings and food security, decreased continuously from 250,000 metric tons in 1996 to 44,180 metric tons in 2014 (Lazar et al., 2017). The gap in the output is met by importation which in 2007 and 2013 were 328,888 MT and 347,408 MT, exceeding local fish catch (GoG, 2015; Asiedu et al., 2018). This trend stresses further the concern of overfished fish stocks.

Factors such as the open access nature of fishing, illegal fishing methods, overcapacity on the sea, obsolete fishing gear and climate change have contributed to the decline in fish stocks over the years. The rest include: ambiguous policies, weak institutions for compliance and poorly defined legal and institutional framework (Cobbina, 2018; Akpalu et al., 2018; Lazar et al.. 2018; Hasselberg et al., 2020; Adom et al., 2019). These factors have negatively affected the livelihoods of coastal folks and the annual income of artisanal fishers. The open access of the sea as a natural resource and dependence on it by coastal folks in developing countries contribute to long-term challenges such as poverty, marginalization, and resource degradation. Small-scale fisher folks are known to be "the poorest of the poor" or characterized as "the occupation of last resort" (Smith, 1979; Pauly, 1997). Fisheries policies outline solutions to make small scale fisheries economically efficient to long-term challenges such as resource degradation and poverty through diversification of their livelihoods. The policies employ other approaches to conserve fish stocks through a

combination of management practices to limit access and provide strategies for current actors in activities to leave the fishery.

The Fisheries Commission estimate that over 200 coastal villages have limited alternative sources of livelihood or employment with fisheries as the only source of income. Fisher folks from such communities face many challenges which make them vulnerable to situations such as climate and non-climate stressors. These stressors directly affect their fish catch and livelihoods (Bennett et al., 2015; Bunce et al., 2010). The Commission reports of canoe fishing as the largest artisanal fishing in Ghana. Canoe fishing is severally affected by severe storms, waves and winds, sea-level rise, increased sea surface temperature and ocean acidification (Wong et al., 2014). These factors are known as climate stressors. The non – climate stressors include apathy and neglect by governments (Dugan, 2005), competition with other resource users (Andrew et al., 2007) and overfishing (Sumaila et al., 2008).

Ghana is facing the effects of climate change with evidence of increased coastal erosion, changes in upwelling events, stronger waves and more frequent storms. These are the climate stressors affecting coastal dwellers (Freduah et al., 2017; Ankrah, 2018). A combination of the two stressors (climate and non – climate) is profound for the livelihood of coastal fishermen. The open nature and access to the sea poses risks in more treacherous waters for fisher folks to adapt and compensate for decreasing catches. The other factors are increasing fuel prices and competition from industrial trawlers (Freduah et al. 2017, 2019; Ankrah, 2018). The two stressors combined compound the many challenges faced by small-scale fishers. The two stressors go through dynamic processes which are influenced by biophysical, cultural, socioeconomic, and institutional

conditions across communities (Amaru & Chhetri, 2013). Further, these stressors are critical factors influencing vulnerability of coastal communities and households (Chen & Lopez-Carr, 2015; Wagner et al., 2014; Fussel & Klein, 2006).

Other challenges faced in fisheries are inadequate support and investments, often politically marginalized, with limited or low representation related to decision-making structures and limited allocation of government resources to the sector for development. The many challenges compound the fate of fisherfolks and their poverty levels. With thousands of fishery livelihoods who are at risk with over 60 percent of the numbers being women (Béné et al., 2010; Ellis & Freeman, 2005; Sumaila et al., 2008; Prado et al., 2015). Some of the solutions are to develop coherent policies and interventions to integrate across domains (that is economic, social, environmental, legal, and political), issues (that is health and nutrition, climate change adaptation, trade), and sectors (capture fisheries and aquaculture, agriculture) (Bennet et al., 2018). The solutions to some of such challenges have been the necessity to make small-scale fisheries efficient economically and at the same time finding means to conserve fish stocks and provision of incentives for current participants to leave the fishery.

The COVID-19 pandemic affected several countries, originating from China, to Asia and other continents. The African continent was expected to be the most affected however, it did not witness the severe impact like other continents (Antwi-Boasiako & Nyarko, 2021 Wang et al., 2020). The fisheries system was expected to be significantly impacted by the pandemic and will have dire consequences for fisher folk given the mode of transmission of the virus juxtaposed with the communal nature of activities in the artisanal fisheries sub-sector (Bennett et al., 2020; FAO, 2020; Okyere et al., 2020).

However, the pandemic and its aftermath has exacerbated the plight of fishing households and the challenges having a spillover effect on different facets of human life (Ozili & Arun, 2020). The dwindling fish catch resulted in a reduction in income of fisheries-dependent households in Ghana coupled with the pandemic as reported by the Coastal Resources Center (CRC) (2021). Though fisherfolks adapted to the global pandemic, COVID-19 highlighted the weak resilience of the subsector with existing challenges thereby causing a further decline in fishing sales, purchasing power, and capability to obtain sufficient food supplies for the family (Mangubhai et al., 2021; Truchet et al., 2021).

The highlighted factors within the sector constrain the youth in fisheries households in accessing land, finances, and other resources, and having a voice in decision-making. These make the youth to be associated with low social status with exploitative and discriminatory working conditions. Other challenges faced by the youth include possessing limited knowledge and experience. Though there has been significant economic growth over the years in Ghana, the country's fisheries players continue to experience increasing inequality. The uncertainties in fish availability and unsustainable management of the fisheries are challenging local food and nutrition security (Hasselberg et al., 2020) and these critical factors influence vulnerability states of the youth in such coastal communities (Chen & Lopez-Carr, 2015; Wagner et al., 2014; Fussel & Klein, 2006). These require interventions to provide diversified livelihoods to reduce their vulnerabilities of coastal fisherfolks to environmental and economic shocks. It is estimated about 19 percent of fisherfolks in coastal communities engaged in diversified livelihoods (USAID, 2022).

The African Union (2020) predicts that approximately 20 million jobs would be lost, and the impact would have a stronger negative impact on youth (15-24 years) compared to those above 24 years. The economic crisis experienced by many countries because of COVID-19 pandemic, has resulted in massive increases in unemployment and worker competition across different economies. The likely growth of digitalization, has resulted in a significant exodus of young workers from the labour market for some time (Blustein et al., 2020). Africa has the youngest population of 420 million (15 -35 years), which makes it prudent to focus on them as a target group for the continent's economic transformation (AfDB, 2018). Whilst tens of millions of youths join the labour market every year, only close to 3 million formal jobs are available making youth unemployment severe, pervasive, and multifaceted (AfDB, 2018).

Ghana needs to create 300,000 new jobs each year to absorb the increasing numbers of unemployed and underemployed youth (Buba & Reyes, 2019). Some of these jobs are in agriculture, that is on farm jobs, non-farm jobs, in the service and manufacturing sectors. The employment gap forces the rest of the youth into other activities located in the informal sector. Ghana is no different as it faces a significant youth unemployment problem with youth between the ages of 15–35 representing about 34 percent of the population (GSS, 2014). The country has a young population where 22 percent, roughly 6.9 million of the almost 31 million people are estimated to be adolescents. The age structure of Ghana is transitioning from one dominated by children (0-14 years) to one dominated by youth (15-35 years) as reported by Ghana Statistical Service (GSS). There is an increase of growth of young people 34.6 percent in 2000 to 38.2 percent (GSS, 2022). Youth consist of 36 percent of Ghana's population with 54 percent in urban areas; however, more (56.2 percent) females live in urban areas than (54.9 percent) males (GSS, 2018). Ghana's overall

unemployment rate is 8.4 percent; however, the unemployment rate has increased to 7.8 percent compared to 6.2 percent in 2019 on the continent (World Bank, 2020). For the youth within the 15- 35 years, the unemployment rate is 12.6 percent (GSS, 2019).

Factors that affect the youth contribution in development include adequate education and skills building to bridge the inequality gap in the formal and informal sectors especially in information and technology usage. The digital age supports innovative approaches for the youth. These group of people are attracted more into areas where the use of ICT is dominant. The youth dominate in entrepreneurship especially in the area of agribusiness due to higher capabilities & skills in modern technology usage and engagement of skills (Baulch et al., 2019; IFAD, 2019; Mabiso & Benfica, 2019; Sumberg & Hunt, 2019). As such diversifying their livelihoods through entrepreneurship is one pathway for their contribution to economic development.

A youthful generation who feel secure financially through different livelihood activities lead to improved well-being, food secured population and a stronger economy. Financial operators such as mobile network operators and microfinance institutions are some channels for which products and services friendly to the youth maybe harnessed to support the diversification activities of youth to ensure contribution to economic development. The engagement and involvement of youth reduce conflict, crime rates, promotes peace building active citizenships and become partners for active governance. These overall outcomes can be achieved through the diversifying of livelihoods for youth who have limited incomes and or are unemployed.

The youth and their place in development has been an emerging theme due to their increasing population over decades across the globe. There are recent interventions or policy targeted at these group as outlined by the United Nations in 2000. At the global level, there is the World Programme of Action for Youth in the Year 2000 which seeks to enhance their role in economic and social development. Thus their role and importance of sustaining small scale fisheries (SSF) remains crucial and important (Béné et al., 2016; Cohen et al., 2019) and with it the relevance of understanding and addressing their vulnerabilities. Social studies on SSF and the need to shift the paradigm in SSF management has also become paramount. The focus of shift from the existing challenges and the needed incentive to leave the fishery and or diversify to applying a socioecological approach are gaining attention in the last decades (Berkes, 2003; Castilla & Defeo, 2005; Gianelli et al., 2018; Waldmüller et al., 2019).

A number of literature focus on determinants of livelihood diversification and communities or households (Abera, et al., 2021; Biswas & Mallick, 2020; Brown et al., 2023; Emeru et al., 2022; Gordon, 2010; Kassegn & Abdinasir, 2023; Saba et al., 2022; Samuel & Sylvia, 2019; Yussuf, & Mohamed, 2022). Others focus on the degree, intensity or extend of diversification on rural households and its implications (Ayana et al., 2021; Alemu, 2023). Issues of effect of the environment and its impact on livelihoods have also been extensively discussed (Adzawla et al., 2021; Adzawla & Baumuller, 2020; Bhatta et al., 2015; Roy & Basu, 2020; Mondal et al., 2023). Income diversification, livelihoods and its implication on households have been covered by other studies on rural communities (Atuoye et at., 2019; Etea et al., 2019; Gebreyesus, 2016; LE & LE, 2020).

Other works exist on crops, livestock and income diversification for rural households (Alobo & Bignebat, 2017; Amfo et al., 2021; Antonelli et al., 2022; Adem & Tesafa, 2020; Djokoto, 2016). Other researchers also focused on livelihood diversification on fisheries households (Amevenku et al., 2019; Entee, 2015; Nunoo et al., 2015). There are studies that have focused on fisheries policies, thebbiological and economic dimensions to sustain dwindling fish stocks and protect the natural environment (Freduah et al., 2017; Ankrah, 2018). Further evidence exists on implication of livelihood diversification on household welfare or well-being (Adepoju & Obayelu, 2013; Asfaw et al., 2019; Gautem & Andersen, 2016; Mahama, & Nkegbe, 2021; Pace et al., 2022.) which have provided evidence for policy interventions. Abebe et al., (2021) and Torell et al., (2017) have also done some work specifically on livelihood diversification and household poverty.

Empirical evidence on cultural and social issues associated with fisheries (Adhuri et al., 2016; Allison, 2004; Stevens et al., 2014; Symes & Phillipson, 2009; Urquhart et al., 2011; Johny et al., 2017; Wakamatsu & Wakamatsu, 2017; Wuepper et al., 2018). Evidence of studies on fisheries, food security, diversification by households (Hanazaki et al., 2013; Zeleke & Zemedu, 2017; March & Failler, 2022), and on climatic conditions on rural households' food security (Gebretsadik & Tesfay.2023). However, there are fewer studies on fisheries, income diversification and age (Weller & Wenger, 2017) and on specific heads (male/ female) of households (Vimefall, & Levin, 2023; Rukmana et al., 2020). Recently, there has been studies on the impact of COVID-19 on coastal communities (Sopamena, 2021; Amoah et al, 2023) but very few studies on youth in coastal communities though there are studies on youth in other areas (Odoh & Eme, Okechukwu, 2014).

There is little or no evidence to show how young people in the fisheries supply chain in coastal areas address youth skills set, income diversification options and livelihood diversification's impact on food security. These have had implications for coastal fishing communities and have diverse effect on food production, supply, and availability when there are no strategies in place, as alternate livelihoods are not sought. These compounding challenges with limited interventions have caused a gap in knowledge to generate the empirical evidence for policy discourse, interventions, and initiatives to promote diversified livelihoods for youth in different sectors.

1.3 Thesis research questions

Based on the gap in knowledge and empirical evidence around policy discourse, interventions, and initiatives on promoting diversified livelihoods for youth in different sectors, this thesis asks the following questions:

1. What are the livelihood diversification strategies and relevant skills sets available for youth headed households in coastal fishing communities in Ghana?
2. What are the factors that determine the choice of livelihood diversification strategies for youth headed households in coastal fishing communities in Ghana?
3. What is the effect of livelihood diversification on food security among youth headed households in coastal fishing communities in Ghana?
4. What are the gender dimensions on fisheries and livelihood diversification of youth headed households in coastal fishing communities in Ghana?

1.4 Objectives of study

The main objective of the study is to assess the impact of livelihood diversification on food security status of youth headed households in coastal communities in Ghana. Specifically, the study seeks to achieve the following objectives:

1. To analyze the livelihood diversification strategies and relevant skills sets available for youth-headed households in coastal fishing communities in Ghana.
2. To estimate the factors that determine the choice of livelihood diversification strategies for youth-headed households in coastal fishing communities in Ghana.
3. To estimate the effect of livelihood diversification on food security among youth-headed households in coastal fishing communities in Ghana.
4. To characterize the gendered perspective on fisheries and livelihood diversification of youth-headed households in coastal fishing communities in Ghana.

1.5 Hypothesis of the study

The fishing communities in Ghana are noted to be underdeveloped with fishing viewed as an occupation for the "poorest of the poor". The decline in fish stocks and the instituted closed season by the Government is motivating coastal folks to seek additional or supplementary livelihood activities such as non-farm activities, non-agricultural wage activities and farm activities. Diversified livelihoods lead to reduced vulnerability, food insecurity, reduced poverty and reduced pressure on natural resources (Ellis, 2000; Haider et al., 2018) and fisheries management (FAO, 2015; SPC, 2015).

In line with the above, the main hypothesis of the thesis is that youth headed households in coastal fishing communities will diversify their livelihoods when they obtain the relevant skills which will lead to improved income, reduced vulnerability and improved food security.

Specifically, the study proposes the following hypotheses:

1. H_0 = There are no significant differences in the livelihood diversification strategies' income among YHH in coastal fishing communities in Ghana.
2. H_0: Socioeconomic and institutional characteristics do not influence the choice of livelihood diversification strategies of youth headed households (YHH) in coastal fishing communities in Ghana.
3. H_0 = Livelihood diversification does not improve food security status of youth headed households (YHH) in coastal fishing communities.

1.6 Justification of the study

The youth population is still growing with the highest proportion living in Africa and Asia. It is estimated that young people aged between 15-24 years represents the biggest cohort to transition to adulthood (Blum & Boyden, 2018). FAO, (2018) estimates the youth below 24 years forms over 60 percent of the continent's population (960 million) and 75 percent below 35 years (FAO, CTA & IFAD, 2014). Urbanization and the growing population are increasing the demand for diverse livelihoods globally and the study focus on these targeted group (18- 35 years) to come up with interventions for coastal community dwellers. Youth are across the rural-urban divide on the

African continent, with 55 percent found in rural areas (Stecklov & Menashe-Oren, 2019) as part of the youth bulge.

As the largest cohort, young people serve as an asset which can be harnessed if properly nurtured to become engines of social and economic growth (OECD, 2017). The youth bulge has increased the political will by national governments to develop comprehensive policy frameworks that better respond to young peoples' needs and aspirations (Mabiso & Benfica, 2019). Beyond Agriculture and fisheries, there are other strategies which may serve as a means of livelihood to create better livelihood conditions and absorb most of the youth labour force on the continent. Barriers such as access to land, capital, and other productive resources; poor markets; poor knowledge and entrepreneurial skills affect such interventions. Other factors are lack of interest in agriculture due to limited returns, migration, poor or lack of infrastructure and social services in rural areas are the common areas many policy interventions seek to address (Daum, 2019; Holden and Otsuka, 2014; Mwaura, 2017; Scoones et al., 2019; Sumberg et al., 2017).

Globally, policy makers come up with strategies to mitigate food insecurity, mostly focusing on agricultural production. However, there is a growing recognition that other food systems also contribute to the food security of populations (Godfray et al., 2010). Evidence of small-scale fisheries contribution to food security cannot be overlooked as evidence of its importance is highlighted by researchers, thus, the inclusion of fisheries into food security strategies (Allison, 2011; Béné et al., 2016; Béné, et al., 2015; Sowman, 2011).

Ghana boasts a significant growing youth population with 57 percent of this demographic under the age of 25 years (GSS, 2014). The growing number of youths, noted as the youth bulge is an untapped human resource that needs harnessing to enhance rural socioeconomic development (Bezu & Holden, 2014; FAO et al., 2014; Fares et al., 2006; Kumeh & Omulo, 2019; Sumberg & Hunt, 2019; Yeboah & Jayne, 2018). These have been the focus of development policy narratives. There are several assumptions associated with the youthful stage. First, the youthful stage is associated with higher capabilities and skills in using modern technology and engaging their skills in entrepreneurship. The youth dominate in entrepreneurship especially related to agribusiness (Baulch et al., 2019; IFAD, 2019; Mabiso & Benfica, 2019; Sumberg & Hunt, 2019). With all these attributes, however, agriculture policies and interventions targeted at the youth face limited success, and there is low capacity in small-scale agriculture to absorb youth unemployment whilst underemployment remains low (Magagula et al., 2020; White, 2012). Nevertheless, these assumptions are rarely based on the actual diverse and context – based interests, aspirations, experiences, and capabilities of the youth, which is critical for development (Daum, 2019; Djurfeldt et al., 2019).

The evolution of industrial fisheries in the last century has caused the focus of research and policy on large-scale fisheries. This tends to marginalize SSFs, or it is viewed as part of recreational activities in the developed world (Misund et al., 2002). Fisheries households and individuals in fishing communities have diverse income generating and employment activities; either directly or indirectly (Campbell & Townsley, 1995; Kleih, Greenhalgh & Oudwater, 2003; IMM, 2003). However, artisanal small-scale fishing communities are associated with poverty and underdevelopment in developing countries (Campbell & Townsley, 1995; FAO, 2004; FAO,

World Bank & WorldFish Centre, 2008). FAO (2004), at the same time highlights such communities in coastal areas as part of the most disadvantaged elements of rural society. The uncertainty of small-scale fisheries over the years has called for intense adaptation and diversification strategies as part of alternative livelihoods to mitigate the effect of unemployment and low income amongst the youth leading to high poverty levels.

The SSF sector has been overlooked by policy makers in policy formulation and implementation due to the lack of reliable data. There is limited support to coastal economic planning and coastal economic development because of no reliable data on its economic contribution (Béné et al., 2009; Weeratunge et al., 2014; De Graaf et al., 2015). Thus, the many existing challenges including the open-access nature of the fishery and lack of opportunities for livelihood diversification are contributing to growing pressure on marine resources and fish-based livelihoods. Thus, growing numbers of fishers' livelihoods find themselves in a vicious circle that signals an urgent need for livelihood diversification in fishing communities.

Gendered social constructions that control and affect how resources such as money and other resources are distributed are the root cause of many, if not most, of the dynamics that determine household and community behavior. It is recognized that many natural resources that are necessary for basic human survival are primarily used and potentially managed by women (Rio Declaration, 1992; Declaration on Global Food Security, 1996). For instance, in rural and coastal communities in Africa, women are responsible for 90 percent of the water security and 80 percent of the food security (Madonsela, 2002; Lidonde et al., 2003). Particularly in coastal areas, marine species feed billions of people and support hundreds of millions of jobs: 92 percent of the world's fisherfolk are

small-scale fishermen who support their families and local communities. In these communities around the world, men and women play diverse roles and contributes differently to their households' livelihoods. The dynamics between and among people are influenced by a complex interplay of social, cultural, and political influences at all levels, including households, communities, and countries. In coastal fishing communities around the world, these dynamics lead to variety within and between households and communities. These variations have significant effects on natural resource management, diet, and livelihood (Weeratunge, 2010).

Generally, youth involvement and contribution to agriculture is understudied (Sumberg et al. 2012; FAO, CTA and IFAD 2014; Pyburn et al. 2015) and in fisheries, there is very limited studies on this age (youth) bracket. Empirical evidence has focused on households, linking coastal / marine fisheries livelihoods to household food security, poverty, climate change, etc. (Fabinyi & Barclay, 2022; Sreya, et al., 2021; Koomson et al., 2020; Porter & Mbezi, 2010). Others have focused on either male or female/ women headed households, gendered construction, food security, seasonal variation (Amzi & Ragnhild, 2022; Amzi et al., 2021; Yoganandham & Sasintha, 2022; Porter, 2012; Williams et al., 2012) This study tends to bridge the gap by providing the necessary empirical evidence to craft specific policies targeted at youth as interventions.

1.7 Organization of the thesis

This thesis is organized into five chapters. Chapter one contains background information of the study, problem statement, hypothesis of the thesis, justification of study and concludes with organization of the thesis. Chapter two presents a review of the relevant empirical literature. Chapter three describes the methodology used for conducting the research. This chapter explains

the theoretical framework and the conceptual framework underpinning this research. This is followed by data collection, sample procedure, study area, methods of data analysis and scope and limitations of the study. Chapter four discusses the results of the analysis of data for the study. The last chapter presents the summary of the study, conclusion, and recommendations on the key findings of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents a review of the relevant empirical literature on youth livelihoods in coastal communities, fisheries sub- sector, determinants of livelihood diversification, Impact of livelihood diversification on food security, Empirical models applied in livelihood diversification studies and finally summary and gaps in literature.

2.2 Livelihoods in coastal communities

Many factors and levels such as household members, activities, scale, location and time make up livelihoods (DFID, 2001). Diversified livelihoods are a feature of household strategies, with members of households supporting with activities in different economic sectors to support household economic outcome (Yanda et al., 2023; Allison & Ellis, 2001). Due to the high percentage of employment by the rain - fed agricultural sector in sub- Sahara Africa, (Wani et al., 2009), most countries in the region are highly vulnerable to climate change (Brooks et al., 2005) and its effects. These and many other factors such as poverty cause the need to diversify. Dimova & Sen (2010) and Lay & Schuler (2008) explain the importance of diversification for rural households and highlights its positive outcomes such as accumulation for farm expansion and engagement in non-farm businesses. These are undertaken to cope with risks, shocks and improve the quality of life of rural households to mitigate poverty and food insecurity (Abebe et al., 2021). Diversifying away from agriculture to non-farm activities improve financial status, increase production, and cope with environmental stress and shock (Babatunde & Qaim, 2010; Bezu et al.,

2012; Hoang et al., 2014). Diversifying livelihoods is essential for rural households as a strategy to move into prosperity and away from poverty (Pingali & Rosegrant,1995).

Several factors push households into employing different strategies in agriculture which are categorized as "pull" (positive) or "push" (negative) factors as stipulated by Brugère et al. (2008), and Ellis (2000). Asravor (2017) goes on to explain that the pull factors are favorable factors or opportunity-led and leads to diversification of livelihood strategies. Whereas push factors are survival-led or harsh conditions. These forces households to diversify their income activities off their main income generating activity. Empirical studies (Cinner et al., 2010) stipulate household livelihoods in tropical coastal communities are not dependent on a single livelihood strategy but often a multiplicity of occupational sectors. Thus, rural households employ a variety of household responses for better economic outcome. These include the allocation of family labour in a time of need, or acceptance of income fluctuation and modification of consumption pattern.

Rural livelihood strategies can be on farm or non-farm, wage employment or self-employment (Bowen & De Master, 2011; Loison & Loison, 2016). Kassie (2017) also states another classification which has four broad areas: on-farm agricultural production, unskilled on-farm or off farm wage employment and non-farm earnings from trades, commerce and skilled employment. The fourth category is a mixture of all three strategies stated (Gebru & Beyene, 2012; Hilson, 2016; Sherren et al., 2016). Other group of researchers also have these categorizations that is agriculture, migration, mining, and tourism. These strategies are to meet and enhance livelihood outcomes in a sustainable manner (Davis et al., 2010; Jiao et al., 2017; Khatiwada et al., 2017; Pagnani et al., 2020; Uddin et al., 2018).

Further, some researchers indicate rural households in SSA diversify their livelihoods through nonfarm activities and migration (Barrett et al., 2001; Losch et al., 2012; Reardon, 1997). Scoones (1998) and McLeod (2001) point to the five capitals (Physical, Social, Financial, Human and Natural capitals) as critical for livelihoods diversification. Other research (Ellis, 1999, 2000; Gentle and Maraseni, 2012; Tesfaye et al., 2011; Ansoms and McKay 2010; Iiyama et al. 2008; Mutenje et al. 2010; Shanta et al. 2018) have demonstrated similar outcomes of the capitals as critical for livelihoods.

The socio-demographic characteristics of households influence the type and scope of diversification of their livelihoods. Losch et al., (2013) argue diversified livelihoods are facilitated by assets such as infrastructural development, emergence of rural towns and improving accessibility to urban areas. Other factors pointed out by Avila-Foucat & Rodríguez-Robayo, (2018) and Ellis & Freeman, (2004) include community cohesion, social networks and associations, environmental awareness, political and institutional facilities. Further, Biswas & Mallick (2020) highlight that these assets and capital strength of the household influence livelihood diversification. An asset approach study on wildlife tourism as a useful diversification strategy for coastal communities in Oaxaca, Mexico was conducted by Avila-Foucat & Rodríguez-Robayo (2018). The study highlighted that economic assets and capital only cannot help in the livelihood diversification process, but political and institutional facilitation is required. Similarly, Sobczak-Szelc & Fekih (2020) findings on research conducted in El Faouar, Tunisia, show the locals cope with uncertain crop production limiting their daily expenditure by selling livestock and other capital resources as a means of supplementing the household income.

Physical capital is one of the five capitals critical for sustainable livelihoods. It consists of the infrastructure and producer goods required, such as affordable transportation, adequate shelter and buildings. The rest are accessible water and sanitation, clean, affordable energy, and access to information (Farrington et al., 2002). Globally, infrastructure is the lifeblood of prosperity and economic confidence (Phillips & Roth, 2013) and improved infrastructure increases economic development and growth as highlighted by these studies (Démurger, 2001; Brenneman and Kerf, 2002; Fan and Zhang, 2004; Fedderke et al., 2006; Agénor, 2010; Vijil et al., 2011). Mensah et al. (2014), postulates the importance of access to community infrastructure as it is key for sustained and rapid socio-cultural, economic and political development for rural people. Bryceson and Bradbury (2008) discuss the importance access to rural public infrastructure play in rural livelihoods. Improved rural infrastructure allows diversification of livelihood strategies through the provision of positive outcomes such as expansion of markets, improvement of food security, social participation, job opportunities and many other benefits.

Foster and Briceño-Garmendia (2010), point infrastructure as responsible for more than half of Africa's recent improved growth performance. This also has the potential to contribute further to economic growth for the continent. Extensive research has been carried out on infrastructure and livelihoods of rural households (Baron 2010; Dubale 2010; Tirkaso 2011; Mogues 2011; Assefa, Bienen, and Ciuriak 2012; Deribe and Roda 2012; Kahssay and Mishra 2013; Demenge et al., 2014; Derso et al.2014; FAO 2014; Shiferaw et al., 2015; Nagesso et al., 2018). The studies show positive outcomes of infrastructure and livelihood outcomes. The availability of infrastructure eases the effort in diversification by households. Ghana views infrastructure as a key component of development which affects livelihoods. The annual infrastructure financing grew 208 percent

over the last 10 years per the Global Infrastructure Hub (GIH, 2021). Physical infrastructure consists of basic infrastructures such as water, sanitation, energy, transport and communications. The others are housing, goods, machines and tools, transportation, livestock, food and energy (FAO, 2014). In the coastal communities under study, there are considerable good roads, water supply and energy. The Ghana Energy Commission reports of 85 percent of the population with access to electricity, a 32 percent increase since 2010 (GEC, 2019). Close to 81 percent of the population has access to basic drinking water services in 2017, a 26 percent increase since 2000. Access to basic sanitation services has more than doubled since 2000, with 19 percent of the population having access by 2017 reported by the Joint Monitoring Programme (JMP, 2021).

Lin (2005) explains social capital as a concept and a theory. It represents investment in certain types of resource in each society as a concept. It describes the processes by which capital is captured and reproduced for returns as a theory. It is simply explained as the social relationship between people in a setting, either community, organizations, or institutions. Literature shows that livelihood diversification and social capitals are the main drivers for escaping poverty in rural areas (Ellis, 2000). It is inclusive of all social resources such as relationships of trust and reciprocity, membership of groups, support mechanisms, networks and access to wider institutions (e.g., diasporic networks). The others are shared cultural and religious values, language, and other markers of cultural identity. Evidence by Pokharel et al., (2021) in Nepal, Barrett, et al., (2001) in Cote d'Ivoire and Kenya, Block & Webb (2001) and Barr, & Mourato, (2011) in Tanzania shows positive correlation between social capital and livelihood diversification.

Tetteh, (2007) points out that Ghana's economy thrives on informal relations and mostly people who are part of traditional institutions do benefit from such capital. Members of self-help projects in the rural sector have information sharing networks and adoption of new technologies. These have enabled members to have access to credit (Sullivan, 2006) as part of their social capital. Further studies (Mohammed et al, 2013; Koomson & Enu-Kwesi, 2020), demonstrate that social capital increases access to financial services and serves as insurance for poor farmers in Ghana. Through it, many Ghanaians have been educated and employed, whilst supporting rural-urban migrants to settle in urban centres.

Financial resources include all financial means or accessible stocks of money (such as savings), regular cash inflows (such as remittances and income earnings), and accessible claims such as lines of credit through formal or informal lending providers (Carney, 1998; Azad & Pritchard (2022). Lax & Krug (2013) asserts that financial capital enables people to adapt to different livelihood strategies. It sets the precondition for the creation or improvement of other capitals. Research (Hoff et al., 2005; Hammill et al., 2008) showed a positive outcome on micro-finance as a catalyst for enhancing household adaptive capabilities for rural Bangladesh. Households can manage risks and smooth consumption when financial capital is available, deeper, and inclusive. Ghana's financial inclusion figures fare well compared to the Sub-Saharan Africa region. In absolute terms only, about forty one percent (41%) of adults have an account at formal financial institution (World Bank, 2016). The World Bank further states microfinance institutions (MFIs) have a wider reach (around 8 million clients) through over 3,000 outlets spread throughout the country compared to the universal banks.

Human capital includes health, knowledge, skills, information, labour resources in a household and the community. These include people of different genders, ages and generations, health status and ability, education, qualifications, and skills (Bajwa, 2015). Septanti (2023) highlights the need for this capital especially networks and connectedness, to obtain their outcomes, such as trust and cooperation. These are some of the main assets of the coastal folks. Existing literature on human population as part of human capital and rural livelihoods (Barrett et al., 2001; Boserup, 1965) shows the direct relationship between livelihood strategies and its impact (Barrett et al., 2001; Pender. 2004; Jansen, 2006). Human population has a negative correlation to livelihoods. Increase in population constrains resources leading to land fragmentation (Jansen, 2004), increased in fishing activities. On the other hand, it creates comparative advantages for certain types of occupations, for example by providing ready markets for products (Pender, 2004).

Natural assets serve as the basis on which other types of assets are constructed and supply the goods and services necessary for human wellbeing and development. It is of high importance to rural households who depend on natural resource-based jobs (De Haan, 2000). These include land, water, wildlife, biodiversity, property rights and environmental resources in the various communities. It is noted that marine and coastal ecosystems provide a range of critical 'ecosystem services', from biodiversity and culture to carbon storage and flood protection.

2.3 Youth livelihoods in coastal communities

Porter et al. (2008) reports of the African rural youth involvement in family businesses or own businesses in different areas of fisheries, agriculture and the other sectors of the economy to support their livelihoods. They may also serve as the bread winners or contribute to the basket of

income of households. The youth between 18 – 35 years (males and females) in coastal communities have a cultural and spiritual connection to the sea and its resources, and have a strong "sense of place" and a "social embeddedness" linked to their communities (Jones 1999; Eisenhauer et al. 2000; McCay 2000). This connection most times pull them towards activities related to the sea and fishing activities.

However, their livelihoods are threatened with the identified issues in the sector and increasing global populations (Blanco, 2007; Porter, 2014). FAO, CTA & IFAD (2014), group these challenges into six broad areas and these are i) limited access to land ii) limited access to markets iii) limited access to financial markets iv) limited access to knowledge, information and education v) difficulty in accessing green jobs and vi) limited involvement in policy dialogue on issues that affect the youth. These challenges further increase the food insecurity and poverty levels amongst the youth in low- and middle-income countries (Blanco, 2007; ILO, 2022). Regardless of these, youth demonstrate resilience by actively engaging in and navigating their social networks. Through these activities, they work to create opportunities for themselves and their households, thereby engaging in additional or supplementary livelihood activities.

About 19 percent of fisherfolks are involved in secondary livelihoods to reduce the negative economic hardship for coastal fishing communities (USAID, 2022) and a number of youths migrate to seek greener pastures. Migration to other communities to seek employment opportunities provide additional income to support their households through remittances, it weakens the human capital base of these coastal communities as pointed out by the Coastal Resource Centre (CRC, 2013). Studies conducted by other researchers (Anyidoho et al., 2012;

Ayele et al., 2017; White, 2012) outline youth as a huge contributor to human capital to national development. A certain level of capacity, knowledge and skills are needed to effectively engage the youth appropriately as part of national development. It is estimated that about 69.7 percent of the population in Ghana are from the informal sector (Mintah & Darkwah, 2017). These people depend on this sector for their livelihoods to support them and other members of the household. As youth enter the labour market, they may become dependent on the informal sector to gain employment or skills through the acquisition of knowledge or information. Knowledge as part of human capital is information acquired through sensory input: reading, watching, listening, touching and can be transferred (Guy, 2015). Skills, is the ability to apply knowledge to specific situations, is developed through practice and is a through a combination of sensory input and output. (Guy, 2015).

Literature (FAO et al., 2014; Sumberg, et al., 2012; Pyburn et al., 2015; Arulingam et al., 2019) points to limited studies on youth in this sector as part of agriculture and development. From the global point where lack of disaggregated data exists on this social group (FAO et al., 2014) to misleading data (Ayele et al., 2017). Tadele and Gella (2012) highlight the urge of youth to leave agriculture altogether whilst Filmer and Fox, (2014) indicate the discourse of discussions on food security and agricultural growth to creating employment opportunities for youth as part of the literature gap. These have led to simplistic policy interventions as this social group is viewed as a homogeneous group (Sumberg et al., 2012).

Existing literature though limited view the many challenges identified as affecting the youth as structural in nature and do not affect just the youth (Arulingam et al., 2019; Ripoll et al., 2017; Sumberg et al., 2012). The identified structural opportunities and constraints are noted to be at different levels i) Global or regional level - increasing and changing demand for food affecting food security, population growth, climate change and rising demand for biofuels and the resulting growing demand for agricultural land and resources (Arulingam et al., 2019; Sumberg et al. 2012).

Losch (2016) in his work urge for livelihood interventions to target beyond the youth. He speaks on interventions to be aligned to and be part of a broader approach to inclusive economic and social development. Ripoll et al. (2017) argue that any approach to youth involvement in agriculture should be placed in the context of structural and rural transformation for national level activities.

The second assumption for existing youth studies is that youth are viewed as a homogeneous group, regardless of their individual characteristics and circumstances to be engaged in the agricultural sector (Arulingam et al., 2019; Ripoll et al., 2017; Sumberg et al., 2012). It further simplifies the notion that all young people are entrepreneurial, more innovative and agile when compared to other social groups. A similar assumption is that all young people have equal ability and opportunity in accessing agricultural value chains (Ripoll et al. 2017).

Arulingam et al. (2019), challenges the notion of homogeneity of the youth but as a heterogeneous group with multiple and diverse abilities (ethnicity, gender, education and skills, class, disabilities, etc.) and the power dynamics (Huijsmans, 2014) in the households. They state the connection of

youth to their families and communities as part of social capital. Lee (2012) point also to the dual role of youth heads of households (YHH) should be recognized and with initiatives to build them up designed around economic strengthening and mentorship.

Arulingam et al. (2019) points to further research to have a better understanding of the diverse aspirations of youth in specific areas. These are broadly grouped in three namely (i) how their lives and livelihood choices intersect with the agriculture sector, (ii) their perceptions of the opportunities and challenges to engaging in the sector, and (iii) the factors that might make the sector attractive to youth as a choice of employment. Sumberg et al. (2012) adds to the areas by stating further research on how young people's interactions with agriculture and rural life change over time.

Anyidoho et al. (2012) and Te Lintelo (2012) points out the negative effect of the assumption and treatment of youth as a marginalized group. They indicate such classification do lead to the generalization of characteristics and needs of the social group. such treatment of youth as individuals without other intersectional identities, and with different forms of engagement in agriculture, SSF and aquaculture, risk policies assuming a monotonous intervention to meet the needs of the youth.

2.4 Fisheries Sub - sector

Food security is an outcome of a multitude of underlying factors and these are encompassed in four key dimensions (FAO, 2006). The four dimensions are availability, accessibility, utilization, and stability (FAO, 2006; Webb et al., 2006; CFS, 2009; Upton et al., 2016). Two new dimensions,

agency and sustainability have been added by the High-level Panel of Experts (HLPE) on Food Security and Nutrition (Clapp et. al., 2022).

Food availability describes the physical presence of food in sufficient quantities, supplied through domestic food production, import, stocks or aid (FAO, 2014; WFP, 2009). It is a key determinant of food security in agriculture as food may be available in dietary energy but not diversified enough to provide the macro and micronutrients essential for a healthy life. Another indicator of food availability is food adequacy, which is needed to provide information on the gap between food supply and average energy requirements.

Food accessibility describes the adequate distribution of available food to the population as and when needed (FAO, 2014). It should be available physically and economically to the population or there will be hunger. Income levels of household and social support access are determinants of food access to food and is determined by prices, income ability of households and individuals to access social support, and prices of food. The physical access to food is enhanced by the infrastructure available in the country such as good roads, boats, and rail lines.

Food utilization measures an individual's and household's ability to obtain sufficient nutritional intake and nutrition absorption during a given period. These include nutrient bioavailability, nutrition security, sanitation, feeding practices and food safety (FAO, 2006; Hauck & Youkhana, 2008; WFP, 2009). Poor meals are associated with a deficiency in various micronutrients such as iron leading to anaemia. This leads to child stunting and poor maternal nutritional status (Ruel, 2003; Savy et al., 2005; Ruel et al., 2010). To measure progress in food access and availability,

food handling preparation and storage are considered in addition to its usage. The stability of availability, access, and usage at all times of food with no risks is termed food stability. Mechanisms put in place to mitigate risks to ensure the availability, access, and usage determine food stability. Some of the risks identified include energy scarcity, extreme weather conditions, economic and social disruption, and adequate functioning global markets.

The two additional dimensions: Agency refers to the capacity of individuals and groups to exercise voice and make decisions about their food systems. Sustainability refers to the viability of the ecological and social bases of food systems (Clapp et al., 2022).

FAO indicate about 2.37 billion people, which is close to one- third of the world population faced food insecurity at the moderate or severe level in 2020. These numbers increased in 2014 and continuously climbed up in 2020 with COVID-19 pandemic (FAO et al., 2021). Food insecurity, may be triggered by shocks and stresses and there are two forms of food insecurity identified and these are 'transitory' and 'chronic or permanent' (Asenso-Okyere et al., 1997; Pinstrup-Andersen, 2009). Transitory occurs for a short period and can be induced by shortage in food supply and or "temporary loss of adequate effective purchasing power for food", the latter is "persistent and almost intractable" (Asenso-Okyere et al., 1997).

Rural households tend to cope in a "a stop-gap" response to shocks and stresses when faced with such conditions. These tend to disrupt the households' ability to obtain and secure enough income for a sustained livelihood (Niehof, 2004). Through these stress and challenges, households can develop their coping strategies. Coping mechanisms "are tactics for maintaining consumption

when confronted by disaster, such as drawing down on savings, using up food stocks, gifts from relatives, community transfers, sales of livestock, other asset sales, and so on" (Ellis, 2000).

The coping mechanisms vary from household to household, coastal community to coastal community and even coastal regions. It is also dependent on the kind of food insecurity they experience in their households and the resources available to the households. However, the most common and easier strategy is a "reduction in food intake or change in diet" (Corbett, 1988, Fleuret 1986, Rahmato, 1988, Young et al., 2001). Households resort to diet changes (reduce the number of times they eat or caloric intake.), engage in casual labour or remittance and support from family and friends when transitory food insecurity is experienced within the year. In terms of prolonged hunger for the household, either extreme or drastic measures are undertaken. Some of these strategic measures could be the sale of some household productive assets, loans and sometimes out-migrating to secure alternative livelihoods.

Studies by FAO (2020) estimate global fish production in 2018 to be 179 million tonnes, total first sale value of 401 billion US dollars and more than half of these, 250 billion US dollars (82 million tonnes) from aquaculture production. Humans consumed an estimated total of 156 million tonnes which is equivalent to an estimated annual supply of 20.5 kg per capita. Fish meal and fish oil were the non-food uses of the remaining 22 million tonnes. Global consumption in fish has increased at an annual rate of 3.1 percent from 1961 to 2017. This figure is double that of the world's population growth (1.6 percent) for the same period. This figure is also higher than 2.1 percent yearly growth of animal protein foods (meat, dairy, milk, etc.).

Fish production and consumption have increased globally in the last 2 decades (20 years) (FAO, 2020). Africa and Asia have doubled their fish production, with Europe as the exception showing a decreasing trend from 1980's but showing an increasing trend over the last few years. America on the other hand, has experienced fluctuations.

In terms of production, Asia is the continent with the highest fish production at 34 percent. This is followed by America with 14 percent; Europe, 10 percent; Africa, 7 percent and Oceania 1 percent. However, China as a country is the highest fish producer accounting for 35 percent of global fish production in 2018 (FAO, 2020). Fish consumption in developing countries increased significantly at an annual rate of 2.4 percent from 5.2 kg per capita in 1961 to 19.4 kg in 2017. That of the least developed countries (LDCs) had an annual average rate of 1.3 percent with an increase from 6.1 kg in 1961 to 12.6 kg in 2017. FAO reports that the increase is from the last 20 years with 2.9 percent per year, due to fish production and imports expansion by the players in the industry. Fish consumption for low-income food-deficit countries (LIFDCs), increased from 4.0 kg in 1961 to 9.3 kg in 2017, at a stable annual rate of about 1.5 percent. Fish consumption increased from 17.4 kg per capital in 1961 to peak at 26.4 kg per capita in 2007 for developed countries but reached 24.4kg in 2017 as a decline.

The yearly official estimate of per capita fish consumption in Ghana is higher than most African countries which is 28 kg (FAO online query, 2020). The country also increased consumption from 24.2 kg to 27.9 kg at a rate of 1.6 percent per annum (MoFAD, 2018). The figure is slightly lower for Nigeria with fish consumption at 13.3 kg/person/per year, a decrease by 2.33 percent less than in the previous year. In Senegal, the consumption is 25 kg per capita per year respectively. Ghana

and Senegal fish consumption are double the African average of 10 kg and above the global average of 20.5 kg. The Gambia and Mauritania have similar fish consumption of 10 kg to that of Nigeria (FAOstat, 2018). The marine fisheries contribution to the total output of the subsector in Ghana is estimated to be 326, 868 MT of the total 467,795MT in 2020 (SRID, 2022) indicating a major source of income and livelihood for most fisherfolks.

The Ghanaian diet largely consists of starchy staple foods of cassava, yams, bananas, and cereals (rice, maize) (Nti, 2008; FAO, 2010), with fish being central in the local cuisine serving as a complementary addition with its composition of other essential macro-and micronutrients (Kawarazuka & Béné, 2011; Weichselbaum et al., 2013). Studies (Milner-Gulland et al. 2003; Kawarazuka and Bene 2010) parallel the results of fish contribution to nutrients by highlighting it as a significant source of protein, calories, and micronutrients for households. Brashares et al. (2004) in his study shows the importance of fishery as a resource to meet minimum dietary requirements.

Fish species can be found in many different forms such as dried, fried and smoked for the small pelagic as part of food throughout the country. Whilst the larger species are mostly smoked, fermented, fried, or grilled (Adeyeye & Oyewole, 2016). Sumberg et al. (2016) report Ghanaians spend 61 percent of their expenditures on animal protein source foods on fish. Fish provides 70 percent of the total animal protein intake, suggesting that fish is largely a relatively affordable source of nutritious food. Low-income consumers purchase less expensive fish species; however, their expenditure on fish (25.7%) exceeds the national average of 22.4 percent, which emphasizes their stark dependence on fish in the diet (FAO, 2016). Income from fisheries serves as a major

means of livelihood for which is channeled into activities such as education, social events e.g., marriages, funerals, outdooring, group associations, etc. Therefore, a decline in the activities or outputs of fisheries and its related activities affect the income of fisherfolks and their ability to lead a sustainable and desired livelihood. The income from fish and its related activities are used to take care of the households from the fishing activities collectively especially the couples (Adusah-Karikari, 2015).

Food insecurity adverse effects are felt more in developing and least developed countries. The Asia region reported the highest number of people, 315.2 million, who were food insecure in 2017 (Meade & Thorne, 2017). SSA reported about 31.7 percent of the population suffered from food insecurities. This figure is estimated to be above 20 percent by 2027. The Asia region has the second largest food gap—10.8 million tons of grain in 2017. This is substantially below the 16.7 million tons for SSA. The "food gap" measures the amount of food necessary to allow all income groups to reach the caloric target. Africa reported about 257 million (20 percent) of the continent's population undernourished (Armstrong, 2022). Crop failure and drought in 2022, caused hunger for over 20 million people and at least 10 million children (UNICEF, 2022). Due to recurrent drought and low response capacity, East Africa lost about 2 million livestock in 2022 (Bloomberg, 2022).

Ghana have its northern savannah ecological zones as locations with the highest prevalence of food insecurity (Aniston, 2020). Food insecurity is a national issue in Ghana due to widespread poverty and is more about access and stability than availability. Food insecurity are more pronounced in rural areas as most livelihoods are agriculture dependent (Abubakari & Abubakari,

2015). Though the problem exists in both rural and urban areas. Ghana's food insecurity is heightened by irregularities in the seasons and production. The latter is highly dependent on rainfall, high food prices and low incomes at the household level. Whilst the seasons are due to climate change and variability. Coastal folks' livelihoods are tied to food resources and production from the ocean (Aniston, 2020). Thus, the decline in fish landing affects household's food security status. Artisanal fishing or small scale fishing is characterized using basic fishing methods such as dug out boats (canoe) often powered with outboard motors. This type of canoes is very common along the coastal communities in Ghana.

Belton et al., (2018) states fish as one of the most highly traded food commodities, with approximately 38 percent by value entering international trade thus serving as a main form of livelihood. They explain that aquatic products like shrimp, salmon, tuna, etc. are more expensive than those remaining in domestic markets (e.g., small pelagic fish, carps). Household needs are met by coastal fishers through the income earned from SSF. These needs are met and serve as safety nets among local small-scale fishers (Béné, 2006; Ngoma, 2010; Isaacs, 2012). Samey (2015) discusses the major coastal fishery resources are from Morocco, through Mauritania to Senegal and Guinea Bissau, and in the South, off Namibia and Angola. Senegal is an important supplier of fish and fish products, with Nigeria, Côte d'Ivoire, Benin, Ghana and Togo serving as important markets. The Gulf of Guinea are the major consuming countries. Processed fish products can and does play an important role in ensuring a better and more balanced supply of fish throughout the region, with important implications for food security.

Globally, fishing is often considered a male dominated activity and figures of 47 percent is recorded as women workforce that is 56 million jobs in the harvest and post-harvest sectors (World Bank, 2012). Small scale fisheries (SSFs) are engendered in coastal communities with specific roles played by the two sexes. Men engage in active fishing activities and the women are mostly noted for post-harvest fishing activities such as fish processing and mongering (Matsue et al., 2014). In the harvest sector only, women account for nearly 14 percent (8.3 million) of all people directly engaged in fisheries and aquaculture (FAO, 2018). The men hold the power to control overfishing inputs such as fishing gear and boats (physical assets) and decision-making while women take decisions on post-harvest activities (Torell et al., 2019). The role of women in fisheries is often overlooked and sometime unrecognized (Bennett, 2005; Di Ciommo & Schiavetti, 2012; Gustavsson & Riley, 2018; Harper et al., 2013; Zhao et al., 2013).

These roles however come with disparities and inequalities. Further, traditions and culture have contributed to the established gender relations and division of labor within this sector (Medard et al, 2002; Odotei, 2003; Demmke, 2006; Kurien, 2001). Current literature engages on discussions and approaches to deal with issues on the roles, participation, inequalities, poverty and vulnerability of women in the small-scale fisheries of Ghana (Appiah et al., 2020; Adusah-Karikari, 2015; Torell et al., 2019; Ameyaw et al., 2020). The vulnerable nature of women in fisheries is due to several factors stemming from culture and other responsibilities in society (Appiah et al., 2020). Some of the factors identified range from socio-demographic characteristics such as age, size of household; access to remittance to post-harvest losses; cultural norms; and constraints as a result of burdensome household responsibilities (Appiah et al., 2020; Torell et al.,

2019). The support from their partners show the ability to withstand and cope with shocks to their livelihoods.

The dynamics between and among coastal people are influenced by a complex interplay of social, cultural, and political influences at all levels, including households, communities, and countries. In coastal fishing communities around the world, these dynamics lead to variety within and between households and communities, and these variations have significant effects on natural resource management, diet, and livelihood (Weeratunge, 2010). Gendered social constructions that control and affect how resources such as money are distributed are the root cause of many, if not most, of the dynamics that determine household and community behavior. It is recognized that many natural resources that are necessary for basic human survival are primarily used and potentially managed by women (Rio Declaration, 1992; Declaration on Global Food Security, 1996). For instance, in rural and coastal communities in Africa, women are responsible for 90 percent of the water security and 80 percent of the food security (Madonsela, 2002; Meade & Thorne, 2006).

Fish capture, processing, marketing, and related services are important sources of income, not just in coastal regions but also in places near lakes and rivers. Income from fisheries contribute to the upkeep of the household. Without a doubt, fishing continues to be a significant economic driver in coastal Ghana. Men and women play a crucial role in ensuring food security in fishing communities. The youth are also involved in all aspects of fisheries, from fish capture for which the males dominate. The processing for which women dominate have a much older woman who

supervises the younger women. However, for the marketing end of the fisheries supply chain, there are equal number of youth and older women.

Women contribute along the entire value chain, including in the manufacture of fishing equipment, fish handling, fish sorting, and fish processing with cash as a means of capital or loans (Lambeth et al., 2002; Medard et al., 2002; Siason et al., 2002; Williams, 2002; Bennett, 2005). Most extractive procedures are typically dominated by men, and women are frequently in charge of post-harvest tasks like processing and trading, which frequently have a smaller profit margin than those performed by fish catchers (Béné & Merten, 2008). Women have an important part in the fishing industry since they process fresh fish to increase its value, distribute it to consumers far from the landing beach, and preserve it to maintain its availability long beyond the peak season (Britwum, 2009).

Nevertheless, while formulating policies, policymakers sometimes overlook these roles. Even though women predominate in the post-harvest sector (processing, marketing, and sale of the catch) and in funding fishing excursions, their contributions to the fisheries industry are sometimes disregarded or undervalued. Because most women still make up the bulk of the sector's marginalized population, they are frequently excluded from technical and capacity-building programs, community discussions, and decision-making processes related to fisheries management. Fisherfolks who do not possess fishing-related inputs, such as boats, motors, nets, and processing equipment, are the most marginalized segments in Ghana's artisanal fisheries sector. The fact that many of them are transient or permanent migrants without legal rights to land contributes to their marginalization.

Men and women alike frequently lack adequate access to savings accounts and microcredit to support their livelihood activities. This limits their ability to transition or diversify into other income generating activities. The lack of financial access when experienced during times when fishing is slow, may indirectly encourage the use of unsustainable fishing techniques to generate higher fish output. Men and women have different sets of options and different capacities for using these options, agency can vary amongst people (Boudet et al., 2013). In essence, gendered factors shape individual agency.

Men are frequently elevated to positions where they are more able than women to acquire and control productive assets (such as land, money, equipment, and technology) and natural resources (e.g. fish, land, and food) in various development situations (Meinzen-Dick et al., 2014). In terms of making claims on natural resources and deciding how to use resources in households and communities, women are typically less capable than men (Agarwal, 1997; Okali, 2006). The highlighted challenges coupled with a drop-in fish landing continue to be a global issue (Béné et al., 2010; 2016; Oliveira et al., 2016; Rahman et al., 2012; Scyphersa et al., 2019) and not just unique to Ghana (Ofori-Danson et al., 2012; Asiedu & Nunoo, 2013; Atta-Mills et al., 2004; Nunoo et al., 2014).

Women form an important part of the workforce and make significant contributions to the roles they play whether paid or unpaid. The fisheries sector has empowered women with opportunities to contribute to household food security and income through fish processing and trading (Welcomme et al., 2010; Hauzer et al., 2013; Lynch et al., 2017). A small number of women are in the catching sector, fish in smaller water bodies at the edges of lagoons and in estuaries, where

they collect oysters, crabs, and other fish species (Torell et al., 2015). There is a high degree of specialization or division of labour in this sector. In some Western African countries such as Benin, Gambia, Ghana and Niger, women are involved in unloading the day's catch to be carried to the beach or fish-smoking huts; drying and processing the fish and converting fish waste into useful products (Somy Kuriakose & Jayasankar, 2007; Weeratunge & Snyder, 2009; World Bank, 2012).

Fish production is mainly determined by the two seasons: major and minor upwelling as a result of the oceanography of the western Gulf of Guinea. The major upwelling from July to September has an abundance of fish with lower prices, whilst the minor upwelling occurs either December to January or February to March with lower catch leading to higher prices (Kwadjosse, 2009). This generally makes marine fish less accessible and a bit more expensive in the minor season (FAO, 2016). Seasonality in fish catches makes fisher folks migrate to other coastal communities in other countries such as Cote d'Ivoire, Benin, Liberia, etc. as a strategy to earn continuous income. This has been the practice for over decades (Marquette et al., 2002; Mensah & Antwi, 2002), however, challenges such as social and political situations in foreign countries hinder them from such activities to exclude them from their waters (Duffy-Tumasz, 2012). The migration and fishing activities characterize levels of fish catch for such fisher folks.

Institutions have come up with seasonal closures ("*closed season")* as a good management and conservation tool to allow fish to reproduce during the spawning season before harvesting (Bucaram et al., 2018; Lazar et al., 2016; Bennett and Dearden, 2014; Rola et al., 2018). Literature indicates it aims to reduce the fishing intensity and protect target stock from mortality at a specific life stage (Samy-Kamal, 2015). This effective conservation tool has been adopted in several

countries like Guinea Conakry, Mauritania, Morocco, Philippines, Senegal and Ghana to restore depleted marine fish stocks and improved marine sustainability (Lazar et al., 2016). The Ministry of Fisheries and Aquaculture Development (MoFAD) in consultation with other key players implemented a monthlong "closed season" as a policy. The closed season is implemented for the artisanal and semi-industrial fishers. This is to promote the sustainable harvest of marine resources.

The policy, which commenced in 2019, is in accordance with sections 76 (3) and 84 of the Fisheries Act, 2002 (Act 625) and the Fisheries Management Plan (2014–2019) of Ghana. Key stakeholders in the industry include the civil organization such as Ghana National Canoe Fisherman Council (GNCFC), National Fish Processors and Traders Association, (NAFPTA), NGOs such as Friends of the Nation (FoN) and Hen Mpoano (HM) and leaders of the various communities participated in the consultation. The "closed season" has been implemented for a total of three times before and after COVID -19 which happened in 2020; i) May 15 - June 15, 2019, iii) July 2021 3) July 2022. However, the July 22 "closed seasons" is for artisanal fisher folks and the month of August, 2022 for industrial fishers. The "closed fishing" season covers the entire 228,000 km^2 Exclusive Economic Zone (EEZ) of Ghana's coast, (Owusu et al., 2023). However, the closed season has witnessed opposition and mixed reactions in Ghana and Philippines from fisherfolks though it promotes conservation and has positive spill-over benefits (Owusu and Andriesse, 2020; Macusi et al., 2022).

The boundaries of fisheries in their aquatic habitats and ecosystems are not clearly defined and with changing seasons, their productivity changes. The changes are short, medium, or long term. Some of the factors that contribute to changes in productivity include climate change, the intensity

of fishing, overexploitation, breeding habitats of the fish species, cumulative impacts from near-shore and offshore developments, etc. Different fish species in the waters of Ghana include red snapper, chub mackerel, flat sardinella, large head skipjack, meagre fish, red Pandora, moonfish, round sardinella, hairtail, yellowfin, cassava fish and anchovy (Samey, 2015).

Pelagic fish species are characteristically mobile, migratory, and live in open waters of the sea. Some commercially important species include round sardinella, flat sardinella, skipjack, yellowfin, bumper, and chub mackerel. On the other hand, demersal fish species are commonly found near and just beneath the seabed. The major demersal fish species common in Ghanaian waters are the lujanidae (snappers), Serranidae (groupers), and polynemidae (threadfins) (Atikpo et al, 1992). All these species contribute as main sources to the livelihoods of the coastal communities. However, the type of fish species depends on the aquatic body, whether marine, fresh water or lakes. The marine waters of Ghana have about 392 species of organisms comprising 347 fish species belonging to 82 families as listed by Ofori - Adu (1988). The country has about 90 lagoons with several estuaries and rocky shore habitats exhibiting biological diversity (Ayensu et al., 1996). Ghana has five (5) Ramsar sites; the lagoons of Keta, Songor, Sakum, Densu Delta and Muni-Pomadze which are unprotected but only the Owabi Wildlife Sanctuary as a sixth site is a protected ecosystem (Okoree, 2008).

The country's freshwater fish fauna includes 28 families, 73 genera and 157 species (Okoree, 2008). Dankwa et al. (1999), lists about 121 species are recorded from the Volta system within Ghana, which drains more than a third of the entire country. About nine species viz. *Barbus subinensis* (Cyprinidae), *Irvinea voltae* (Schibeidae), *Chrysichthys walkeri* (Clarioteidae),

Synodontis arnoulti, S. macrophthalmus, S. velifer (Mochokidae), *Limbochromis robertsi, Steatocranus irvinea* (Cichilidae and Aethiomastac embeluspraensis (Mastacembelidae) are endemic to the freshwater system of Ghana (Dankwa et al, 1999). Freshwater fish has 81 species that are of food importance whilst about six species are of cultural importance. The major rivers are White Volta, Black Volta, Lower Volta, and Oti. Others are Pra, Tano, Ankobra, Bia and Todzie-Aka. Also included are other impoundments serving as drinking water sources and/or for irrigation. It is estimated conservatively that about 124 fish species from 62 families inhabit the major rivers.

Over the years, there has been keen interest and promising developments in the management and preservation of the blue economy, especially fisheries to mitigate the challenges affecting livelihoods. Stakeholders and development partners continue to demonstrate and invest in fisheries for development (World Bank 2004; DFID 2005; Cunningham et al. 2009; Leal 2010). However, these developments can happen only when there is policy reinforcement and regulation. Investment in technological innovation and cooperation among coastal nations is a must to comply with existing policy frameworks, international treaties, track and prevent illegal fishing. Further efforts are needed to improve compliance with existing rules; and international treaties aimed at building a stronger governance system.

Fish species travel across borders due to seasons and in search of food, changing their course in the process. These have an impact on both the management of the fish populations and the fleets that hunt them because their travels cross several national territories and the high seas (Loury et al., 2021). However, effective management can be implemented when the characteristics and

timing of fish life cycles and life histories are known. These are essentials to develop demographic models and establish effective harvest limits and other strategic management practices (Winemiller, 2005). It is imperative to have appropriate management practices that takes into consideration key factors such as age/size at sexual maturity, longevity and fecundity. These characteristics are important for defining species vulnerability, whilst knowledge of population structure is needed to define management units (Cadrin & Secor, 2009; Gavaris, 2009; Nielsen et al., 2009; Pita et al., 2016). This information can effectively support in limiting fishing pressure during the most vulnerable time periods, (Cooke et al., 2016). And seasonal fisheries closures that aim to minimize overharvest of critical life stages or reduce impacts during mass migrations (Baumgartner et al., 2019).

A combination of national laws and regulations and regional fisheries management organizations (RFMOs) establish the limits on who, how, when, and how much of these species can be caught. RFMOs are international organizations made up of governments that concur to coordinate management of fish stocks in a certain region and share a practical and/or financial interest in managing and maintaining fish stocks. These RFMOs have not been able to stop the flow of overfishing, with almost 50 percent of all stocks under their management being either overfished or overexploited. The objectives of national fisheries and aquaculture policies are frequently ambiguous and contradictory. They typically set goals for production increases and for resource conservation but not for development outcomes despite pledging support for the extensive declarations in the FAO Code of Conduct for Responsible Fisheries (FAO, 1995), (Allison, 2005; Bene et al., 2010; Sowman & Cardoso, 2010).

Several processes have created an enabling policy climate for a focus on these objectives with poverty reduction and food security a high priority of fisheries and aquaculture policy in developing nations. At the global level, international instruments provide useful policy guidance, national policy, legislation and institutional arrangements on fisheries and driven by the Paris Declaration on Aid effectiveness, there has been donor harmonization policies (OECD, 2005). However, the importance of fisheries sector to poverty reduction is not highlighted in national PRSPs and national food security policies and in government budget allocations (Thorpe et al., 2005; 2006; Sowman & Cardoso, 2010). Allison et al., (2011) points that the fisheries sub – sector is not adequately integrated in sectorial development policies such as health, education, climate change adaptability, and social protection policies. These leads to economic and social marginalization and vulnerability of fisher folks. Ghana is not part of the UN Fish Stocks Agreement signed 1995. The country is part of the UN Law of the Sea Convention and the FAO Compliance Agreement from 1993. The Fisheries Act 625 of 2002 regulate its activities.

The Fisheries Commission under the Ministry of Fisheries is mandated to manage the fisheries sector in Ghana. It coordinates fisheries policies and has the sole objective to regulate and manage the utilization of the fishery resources of Ghana. Fisheries policy in general has a compendium of issues from individual human rights, concerns for future local structures, of marine environment and sustainability of the economy. In terms of development, social issues such as employment, food security, protection of individual and community fishing rights and fair trade at its core in developing countries are part of fisheries policy. Over a period, the focus of political attention has shifted from the needs of the individuals in community to the viability of the broader coastal communities and the wishes of society.

2.5 Measurement of livelihood diversification in empirical studies

In the empirical measurements of livelihood diversification, it is clear from the literature reviewed that the use of the Simpson's Index of Diversity (SID) is the most popular way of measuring livelihood diversification. For example, it is used by Adem and Tesafa (2020), Alemu (2023), Ayana et al. (2022), Biswas and Mallick (2020), Djidi and Shiferaw (2018), Djokoto (2016), Etea et al. (2019), Johny et al. (2017), Khan et al. (2020), Kidan and Tafesse (2023) and Nguyen et al. (2019). The SID is an index which is applied under situations where households or people engage in more than one livelihood diversification strategy and considers the number of diversification strategies on one hand and the how these various diversification strategies are distributed (Adem & Tesafa, 2020). It is calculated using the formular:

$$SID = 1 - \sum_{i=1}^{n} P_i^2 \quad \text{.....(2.1)}$$

Where SID is the Simpson's Index of Diversity, i denotes the livelihood diversification strategies or options, n denotes the total number of diversification strategies or options and P denotes the proportion of income from the i^{th} strategy to the total household income. As an index, when the SID is constructed, its value ranges from 0 to 1. Zero implies that a household fully specializes in one activity (in the case of this study involved only in fisheries) and one (1) implies that a household has a perfect livelihood diversification (i.e., fully diversified).

Another popular measure of livelihood diversification in literature is the Herfindahl Index (HI) (see Vimefall & Levin, 2023; Adzawla & Baumuller, 2020). The formular for calculating the HI is specified as:

$$HI = \sum_{i=1}^{N} s_i^2 \quad \text{.....(2.2)}$$

Where HI denotes the Herfindahl index, N denotes the total number of diversification strategies or options and s denotes the income from the i^{th} diversification strategy or option. Like the SID, the HI also ranges from 0 to 1, which respectively denote complete specialization and complete diversification. Based on the HI, other studies (e.g., Patidar & Chothodi, 2021; Loison & Bignebat, 2017; Kassie, 2017) apply the Inverse Herfindahl Index (IHI) also referred to as the Herfindahl–Hirschman Diversity (IHHD) to measure livelihood diversification. As the name implies, it is specified as:

$$IHI = \frac{1}{HI} = \frac{1}{\sum_{i=1}^{N} s_i^2} \quad \text{.....(2.3)}$$

The IHI also ranges from 1 (i.e., complete specialization) to maximum possible livelihood diversification strategies.

Other index-based measurement of livelihood diversification used in the literature are Shannon (e.g., Etea et al., 2019), Margalef (e.g., Amfo et al., 2021) and Ogive (e.g., Biswas & Mallick, 2020). The Shannon diversity index, which is also called the Shannon–Wiener diversity index, is calculated using the formular:

$$SI = -\sum_{i=1}^{S} p_i ln\, p_i \quad \text{.....(2.4)}$$

Where S denotes the number of diversification strategies and p_i denotes the proportion of income gained from the i^{th} diversification strategy or option. It also ranges from 0 (i.e., complete specialization) and 1 (i.e., complete diversification). The Margalef index is specified as:

$$D_i = \frac{S_i - 1}{ln(N_i)} \quad \text{.....(2.5)}$$

Where S_i denotes the number of diversification strategies of the i^{th} household and N_i denotes the total number of diversification strategies of the sample under consideration. Amfo et al. (2021) argue that Margalef index has better statistical properties (such as goodness of fit) relative to the Simpson index, Herfindahl index and Shannon-diversity index. The Ogive index is specified as:

$$Ogive = \sum_{i=1}^{N} \frac{\left(S_i - {}^{1}/_{N}\right)^2}{{}^{1}/_{N}} \quad \text{..... (2.6)}$$

Where N denotes the number of diversification strategies engaged in by a household and S_i denotes share of income from the various diversification strategies.

Beyond the use of indices in measuring livelihood diversification, some studies (e.g., Saba et al., 2022; Kumari & Murthy, 2022; Khan et al., 2020; Patidar & Chothodi, 2021; Samuel et al., 2019; Vimefall & Levin, 2023; Zeleke et al., 2017) use discrete measures of diversification. One way of measuring of these measurements is diversification conceptualized as a binary variable (i.e., whether a household diversified away from primary economic activity into other economic activities or otherwise) (see Saba et al., 2022; Kumari & Murthy, 2022). Another way is for an

index to be classified into a binary outcome (see Khan et al., 2020; Patidar & Chothodi, 2021; Samuel et al., 2019; Vimefall & Levin, 2023). Some other studies (e.g., Abera et al., 2021; Amevenku et al., 2019; Ayana et al., 2022; Dadi et al., 2022) conceptualize livelihood diversification as polychotomous outcome, implying that there are more than two categories of livelihood diversification strategies.

2.6 Determinants of Livelihood Diversification

The livelihood diversification literature is diverse on the determinants of livelihood diversification. The determinants span demographic characteristics, socioeconomic characteristics, institutional characteristics, infrastructural characteristics and geographic characteristics. On the demographic characteristics, the main determinants identified in the literature include age, gender and household size. The influence of age on livelihood diversification is mixed. This implies that, while some studies report that age is a negative determinant of livelihood diversification (e.g., Abera et al., 2021; Alemu, 2023; Kidan & Tafesse, 2023; Kumari & Murthy, 2022; Samuel et al., 2019; Yussuf & Mohamed, 2022; Maniriho & Nilsson, 2018; Toyin & Abbyssiania, 2017; Demissie & Legesse, 2013; Shaga et al., 2021; Mezgebo, 2014), other studies report a positive influence of age on livelihood diversification (e.g., Asfaw et al., 2019; Dadi et al., 2022; Emeru et al., 2022; Adem et al, 2018; Debele & Desta, 2016).

The studies that report the negative influence of age imply that as people advance in age, they become less likely to diversify their livelihood. For instance, Abera et al. (2021) observed that older farmers in Ethiopia are less likely to engage in a combined livelihood diversification strategy of agriculture and non-farm, agriculture and off-farm, and agriculture and non-farm and off-farm

relative to agriculture only. This implies that increasing age increases the likelihood of farmers not diversifying away from their primary agricultural work. Further, Kidan and Tafesse (2023) observed that the likelihood of smallholder farmers in southern Ethiopia to diversify their income sources reduces by 0.6 percent with an additional year of the farmer.

The likely reason for this behaviour may be because livelihood diversification is strenuous and demanding as people must allocate their time to several economic activities. Thus, older people tend to struggle to allocate their time over several activities as they may not have the physical strength to commit to these activities. Another reason attributable to the negative influence of age is risk. It is observed that older people have lower propensity for risk taking (i.e., more risk averse) relative to younger people (Fryt et al., 2022). On the other hand, the studies that report a positive influence of age on livelihood diversification imply that as people advance in age, they become more likely to diversify their livelihood. For example, Dadi et al. (2022) report that advancing age increases the probability of people diversifying from only farm engagements into engaging in both farm and unskilled income activities in Ethiopia. Also, Emeru et al. (2022) found that an additional year of a person increases the likelihood of diversification into off-farm and non-farm activities by 0.7 percent in Ethiopia, explaining that older people are more educated and relatively have access to technology that propel their ability to diversify than younger farmers. Though there are mixed results of the influence of age on livelihood diversification, but on the balance of the evidence, age seems to reduce livelihood diversification more than it promotes it.

For gender, the balance of the evidence shows that males are more likely to diversify than females (e.g., Adem & Tesafa, 2020; Ellis, 1999; Olale et al., 2010; Demissie & Legesse, 2013; Yishak, 2017; Alemu, 2023; Emeru et al., 2022; Matsuura et al., 2023; Yussuf & Mohamed, 2022). Only few studies (e.g., Abera et al., 2021; Asfaw et al., 2019; Kassegn & Abdinasir, 2023) report contrary evidence. Adem and Tesafa (2020) found that in Ethiopia, men are 4.28 percent more likely to engage in livelihood diversification than women, explaining that women take up more unpaid care activities at home, thus limiting them from participating in diverse economic activities. The overwhelming evidence of males more likely than females to engage in livelihood diversification is generally attributable to pertinent constraints that women face such as disparity in ownership and access to productive resources, culturally defined roles, social mobility limitations and low educational levels (Adem & Tefasa, 2020; Demissie & Legesse, 2013).

Overwhelmingly, household size is a positive determinant of livelihood diversification. Almost of all the studies in the diversification literature (e.g., Abera et al., 2021; Adem & Tesafa, 2020; Demissie & Legesse, 2013; Teshome & Edriss, 2013; Zerai & Gebreegziabher, 2011; Adepoju & Obayelu, 2013; Amevenku et al., 2019; Asravor, 2017; Asfaw et al., 2019; Emeru et al., 2022; Etea et al., 2019; Khan et al., 2020; Loison & Bignebat, 2017; Matsuura et al., 2023; Patidar & Chothodi, 2021; Saba et al., 2022; Samuel et al., 2019; Bird et al., 2022) report that larger households (i.e., households with more members) engage in livelihood diversification than households with few members. Amevenku et al. (2019) observed that additional member of fishing households in the Volta basin of Ghana have 0.8 percent probability of diversifying from only fishing into both fishing and farming. Abera et al. (2021) observed that an additional member of a

household increases the likelihood of diversifying away from only agriculture to agriculture and non-farm, agriculture and off-farm, and agriculture and non-farm and off-farm in Ethiopia.

The general explanation supporting the positive influence of household size is that larger households can raise sufficient labour over and above the labour requirement of their primary activities. Thus, the surplus labour provides households with the capacity to allocate the surplus to diverse economic activities. A few studies (e.g., Kidan & Tafesse, 2023; Kumari & Murthy 2022; Gebru et al., 2018) report a negative effect of household size on livelihood diversification, explaining that larger households may not necessarily imply more endowment of productive labour supply.

Socioeconomic characteristics that are generally identified in the literature are education, income, wealth, landholding, livestock holding, shocks and risk and remittance. Human capital, proxied by education qualifications of people, has been generally observed to positively stimulate livelihood diversification (e.g., Adem & Tesafa, 2020; Ahmed, 2016; Yishak, 2017; Alemu, 2023; Asfaw et al., 2019; Ayana et al., 2022; Khatun & Roy, 2012; Adugna, 2012; Agyeman et al., 2014; Nghiem' 2010; Ambachew & Ermiyas, 2016; Emeru et al., 2022; Etea et al., 2019; Kassegn & Abdinasir, 2023; Khan et al., 2020; Kumari & Murthy, 2022; Le & Le, 2020; Musumba et al., 2020; Patidar & Chothodi, 2021; Saba et al., 2022; Samuel et al., 2019). Thus, people with more formal education qualifications have higher likelihood of diversifying their livelihoods.

Etea et al. (2019) explained that diversification demands the understanding of job environment such as identification of opportunities, analysis of risk and forecasting future trends. Therefore, literate people have the capacity to undertake these situational analyses than less educated people.

Despite this explanation some studies (e.g., Abera et al., 2021; Oluwatayo, 2009; Demissie & Legesse, 2013; Asfaw et al., 2019) have found that more educated people have lower probabilities of diversifying livelihood. However, the balance of the evidence shows that the effect of education on diversification is positive. The stimulating role of education on livelihood diversification is confirmed by the several studies (e.g., Adem & Tesafa, 2020; Zerai & Gebreegziabher, 2011; Emeru et al., 2022) that report that people with special endowment of skills have higher diversification potential.

Household income is another key determinant of livelihood diversification. Weighing the various studies that estimate the influence of income, the evidence shows that more studies find that income increases the likelihood of households to diversity their livelihoods (e.g., Abera et al., 2021; Adem & Tesafa, 2020; Yishak, 2017; Adepoju & Obayelu, 2013; Dadi et al., 2022; Etea et al., 2019; Kassegn & Abdinasir, 2023). For example, Abera et al. (2021) observed that farmers with more annual income are more likely to engage in agriculture and non-farm strategies relative to agriculture only in Ethiopia. The main explanation to the positive effect of income is that households with more income have the financial capacity to invest in alternative livelihoods. In addition, they can use their income to meet the underlying costs of searching for and engaging in other economic activities. The positive effect of income is consistent with other studies (e.g., Asfaw et al., 2019; Matsuura et al., 2023) that report a positive effect of wealth on livelihood diversification. It is also consistent with studies (e.g., Amevenku et al., 2019; Dinku, 2018; Kassegn & Abdinasir, 2023) that observe that remittances boost livelihood diversification.

There is no consensus on the influence of landholding or endowment on livelihood diversification. While some studies (e.g., Alemu, 2023; Khan et al., 2020; Matsuura et al., 2023; Musumba et al., 2020; Patidar & Chothodi, 2021) report a positive effect of landholding (or farm size) on livelihood diversification, other studies (e.g., Abera et al., 2021; Asfaw et al., 2019; Kumari & Murthy, 2022; Musumba et al., 2020; Saba et al., 2022) report a negative influence. It is argued that households with more landholdings are more likely to diversify because they can allocate their land to other economic activities such as forestry, gardening and livestock.

However, those studies finding a negative effect explain that households with more landholdings are less likely to diversify because they can engage in agricultural extensification to increase farm output and income. In other words, more land endowment encourages households to stay in agriculture. Further, it is generally found that households with more endowment of livestock have higher probabilities of diversification (Alemu, 2023; Dinku, 2018; Loison & Bignebat, 2017; Patidar & Chothodi, 2021; Yussuf & Mohamed, 2022). Dinku (2018) explains that pastoralist in Ethiopia diversify away from keeping livestock to other non-farm activities by disposing some livestock to raise the needed capital to diversify. Therefore, households with more livestock endowment are simply shifting their portfolio in livestock to other activities.

Another key determinant that seems to have consensus in terms of the direction of influence on livelihood diversification is exposure to shocks and risk, where it is shown that farm households who are exposed to shocks (reported in various forms such as climate shocks, rainfall shocks, crop failure, perceived weather risk and drought shocks) are generally more likely to engage in livelihood diversification (e.g., Antonelli et al., 2022; Asfaw et al., 2019; Chuang, 2018; Etea et

al., 2019; Khan et al., 2020; Matsuura et al., 2023). For example, Chuang (2018) found that farm households that were exposed to rainfall shocks reallocated their labour away from agriculture to non-farm economic activities in India. Especially for farm households, climate shocks constrain agricultural production and thus, farmers seek alternative livelihoods to cushion them from the effects of these shocks. For example, amid crop failures from these shocks, farm households need to have the appropriate response to enhance their survival. Therefore, livelihood diversification serves as the coping mechanism.

Key institutional characteristics that influence livelihood diversification are credit and extension. More studies (e.g., Adem & Tesafa, 2020; Babatunde & Qaim, 2009; Zerai & Gebreegziabher, 2011; Amevenku et al., 2019; Amfo et al., 2021; Amfo & Ali, 2020; Ayana et al., 2022; Emeru et al., 2022; Etea et al., 2019; Khan et al., 2020; Musumba et al., 2020) find that farmers or farm households who have access to credit are more likely to engage in livelihood diversification than those who find that credit reduces the likelihood of diversification (e.g., Abera et al., 2021; Amfo et al., 2021; Dinku, 2018; Kidan & Tafesse, 2023; Loison & Bignebat, 2017; Yussuf & Mohamed, 2022). Thus, on the balance of the empirical evidence, credit is a positive determinant of livelihood diversification. Just like the explanation for the positive effect of income on diversification, credit reduces liquidity constraints of households so that they can invest in diversifying their livelihoods. Overwhelmingly, access to extension is a positive determinant of livelihood diversification as most studies (e.g., Alemu, 2023; Asfaw et al., 2019; Dinku, 2018; Emeru et al., 2022; Matsuura et al., 2023; Amevenku et al., 2019; Asravor, 2017) estimate a positive effect. Amevenku et al. (2019) explained that for fishing households in Ghana, extension access provided the means of training, skills and knowledge to diversify their livelihoods.

Infrastructure is also identified as a key determinant of livelihood diversification. The infrastructural variables generally represented in the literature include distance to market, electricity, and a composite infrastructure index. Distance to market has been generally estimated as a negative determinant of livelihood diversification (e.g., Abera et al., 2021; Adem & Tesafa, 2020; Oluwatayo, 2009; Demissie & Legesse, 2013; Teshome & Edriss, 2013; Fufa, 2015; Ergicho & Markos, 2015; Yishak, 2017; Alemu, 2023; Amevenku et al., 2019; Asfaw et al., 2019; Emeru et al., 2022; Etea et al., 2019; Khan et al., 2020; Yussuf & Mohamed, 2022). The implication of the negative effect of distance to market is that households that are far from market tend to diversify less. Therefore, access to markets stimulates diversification. Other studies (e.g., Alemu, 2023; Le & Le, 2020) use access to infrastructure (such as roads, markets, communication, and electricity) and find that households that have access to infrastructure have higher likelihood of diversifying their livelihoods. This is explained by the fact that infrastructure access reduces the cost of obtaining information, transportation costs and transaction costs (Le & Le, 2020; Reardon et al., 2007). Alemu (2023) observed that access to infrastructure stimulates employment opportunities and help people to diversify in Ethiopia. Thus, the studies that estimate a positive influence of access to electricity (e.g., Adem & Tesafa, 2020; Zerai & Gebreegziabher, 2011) and access to irrigation (e.g., Ayana et al., 2022; Matsuura et al., 2023) on livelihood diversification confirm the influence of infrastructure on diversification.

Related to the influence of infrastructure on livelihood diversification is geographic or locational characteristics. Several studies (e.g., Amfo et al., 2021; Amfo & Ali, 2020; Dagunga et al., 2020) have reported that households who live far from district capitals have lower probabilities of engaging in livelihood diversification. This observation is consistent with the finding of Dadi et

al. (2022) who report that people in Ethiopia who live in urban areas are more likely to diversify their livelihoods. Since district capitals are urban and more developed places, this observation implies households living far off are more constrained in accessing economic opportunities in these urban centres. For example, households that are not closing face higher transaction costs in accessing employment opportunities in urban centres. Further, Amfo and Ali (2020) explain that cocoa farm households in Ghana who are closer to district capitals are more likely to access information on employment opportunities than those living far off.

2.7 Impact of Livelihood Diversification on Food Security

While a number of empirical studies on livelihood diversification examine the underlying factors that determine diversification, there are other studies that assess the impact of livelihood diversification on some outcomes. These impact studies measure the causal effect of diversification on these outcomes. The outcomes that are mainly assessed are poverty (e.g., Adepoju & Obayelu, 2013; Abebe et al., 2021; Adefris and Woldeyohannes, 2021), income (e.g., Asfaw et al., 2019; Gebreyesus, 2016), consumption expenditure (e.g., Alemu, 2023; Khan & Morrissey, 2023; Amfo et al., 2021; Matsuura et al., 2023; Mahama & Nkegbe, 2021; Antonelli et al., 2022; Pace et al., 2022), efficiency (e.g., Djokoto, 2016), climate vulnerability (e.g., Adzawla & Baumuller, 2020) and food security (e.g., Matsuura et al., 2023; Atuoye et al., 2019; Zeleke et al., 2013).

Based on the evidence from the empirical studies reviewed on the impact of livelihood diversification on consumption expenditure, all the studies except Khan and Morrissey (2023) estimated a positive impact. Therefore, in general, livelihood diversification exerts a positive

impact on consumption expenditures. In Ethiopia and Ghana, Alemu (2023), and Mahama and Nkegbe (2021), respectively, found that livelihood diversification has a positive impact on household per adult equivalent consumption expenditure. Mahama and Nkegbe (2021), for example, estimate that an increase in an index of diversification increases household real per adult equivalent daily consumption expenditure by 26.0 percent. They explained that diversification provides a conduit for meeting household consumption needs and that diversification may not imply that households fear losing their primary livelihoods but as a means of augmenting incomes to meet their needs.

Amfo et al. (2021) and Matsuura et al. (2023) respectively estimate positive impact of livelihood diversification on consumption expenditure and per capita food consumption expenditure. Further, Antonelli et al. (2022) report that a medium crop diversification strategy increases average per capita real expenditure and the average per capita real food expenditure by 45 and 39 percentage points, respectively. In addition, a combination of crop and income diversification strategies improves average per capita expenditure by 60 percent and 27 percent, respectively for medium and high levels of crop diversification. Pace et al. (2022) report that opportunity-led diversification increases food and non-food consumption. However, Khan and Morrissey (2023) estimate a negative impact of livelihood diversification on per adult equivalent consumption expenditure, explaining that the observation may be due diversification being survival-led (i.e., participating in diversification to enhance survival due distress and vulnerability to shocks) than opportunity-led.

Abebe et al. (2021), Adefris & Woldeyohannes (2021), and Adepoju & Obayelu (2013) unanimously find that livelihood diversification reduces poverty. From a propensity score matching analysis, Abebe et al. (2021) estimate that household engagement in livelihood diversification reduces poverty by 9 percent in Ethiopia. In Nigeria, Adepoju & Obayelu (2013) report that income from non-farm activities and from both farm and non-farm activities reduces poverty by 41.1 percent and 3.6 percent, respectively. The ability of livelihood diversification to reduce poverty is supported by the evidence on the positive effect of livelihood diversification on household income (e.g., Asfaw et al., 2019; Gebreyesus, 2016). These studies demonstrate that livelihood diversification improves household income. Asfaw et al. (2019) show that income diversification increases household income in Malawi, Zambia, and Niger, with the impact higher for the poorest households. Therefore, livelihood diversification reduces poverty through the transmission mechanism of boosting incomes. By extension, the generally positive impact of diversification on consumption expenditures is also a transmission channel.

In terms of the impact of livelihood diversification on food security, Matsuura et al. (2023) estimated a positive impact of diversification on household dietary diversity in Bangladesh. This implies that households that are highly income diversified consume more food groups and thus have better food security. They explained that diversification improves food security by improving the availability of food. Also, the boost in food security can be explained by the studies on the positive impact of diversification on food consumption expenditure and income. Thus, when households increase incomes from diversification, they can increase food consumption through purchases of food.

Zeleke et al. (2017) confirms the positive impact of diversification on food security by reporting that livelihood diversification increases the amount of caloric intake of households in Nigeria by 587.19 kcal. However, Atuoye et al. (2019) found contrary evidence that indicates that households that are highly income diversified have higher probabilities of experiencing severe food insecurity in the Upper West region of Ghana. A further disaggregated analysis showed that poorer households are more affected by severe food insecurity. They explained that the diversification of income that is not necessarily accompanied by income guarantee and stability does not improve food security.

In further studies, it is found that livelihood diversification reduces technical efficiency of farmers in Ghana (Djokoto, 2016), reduces climate vulnerability in northern Ghana (Adzawla & Baumuller, 2020) and improves sustainable land management practices in Ethiopia (Kassie, 2017).

2.8 Empirical models applied in livelihood diversification studies

Livelihood diversification literature applies numerous statistical and econometric models to provide evidence on determinants and impacts of livelihood diversification. A review of the studies in this work shows that the most popular econometric models applied are binary logit model (e.g., Khan et al., 2020; Patidar & Chothodi, 2021; Saba et al., 2022; Zeleke et al., 2017), binary probit model (e.g., Kumari & Murthy, 2022; Samuel et al., 2019; Vimefall & Levin, 2023), multinomial logit model (e.g., Abera et al., 2021; Amevenku et al., 2019; Ayana et al., 2022; Dadi et al., 2022; Dinku, 2018; Emeru et al., 2022; Vimefall & Levin, 2023; Weller & Wenger, 2017; Yussuf & Mohamed, 2022), Tobit model (e.g., Alemu, 2023; Kassie, 2017; Kidan & Tafesse, 2023; Le & Le, 2020; Loison & Bignebat, 2017; Samuel et al., 2019) and ordinary least squares (e.g., Alemu,

2023; Etea et al., 2019; Le & Le, 2020; Matsuura et al., 2023) and Poisson model (e.g., Biswas & Mallick, 2020; Matsuura et al., 2023; Vimefall & Levin, 2023). It is important to note that the type of model applied is primarily based on the way livelihood diversification is measured or conceptualized.

The studies that apply binary logit or probit models conceptualize livelihood diversification as a binary or dichotomous discrete variable. That is whether a person decides to diversify away from his or her primary occupation into other economic ventures or not. There are different conceptualizations that yield the binary outcome. For example, Khan et al. (2020) applied the Simpson's Index of Diversification (SID) to various incomes sources to calculate an index of diversification. Based on the index, a categorization was applied. Households whose index ranged from 0 to 0.50 were assigned a value of 0 and those whose index ranged from greater than 0.50 to 1.0 were assigned a value of 1.

Similarly, Patidar and Chothodi (2021) applied the Inverse Herfindahl-Harschman Diversity Index (IHHDI) to construct an index of diversification and assigned a value of 0 to households whose IHHDI was below 1.338 and a value of 1 assigned to those households whose IHHDI was above 1.338 to arrive at a binary variable for diversification. Samuel et al. (2019), Vimefall and Levin (2023), and Zeleke et al. (2017) used similar approaches. However, Saba et al. (2022) and Kumari and Murthy (2022) used direct binary variable to measure diversification. For example, Kumari and Murthy (2022) used the response of a direction question: if any member of the household is engaged in non-farm enterprises to classify response into a dummy variable. If a respondent responded yes, a value of 1 is assigned and 0 otherwise.

Studies that apply the multinomial logit model conceptualize livelihood diversification as a polytomous outcome. That is, each respondent or household is faced with numerous diversification strategies and participates in one of the various strategies. Instead of a 0 and 1 classification or categories, there are more than two categories. Thus, the many strategies or outcomes as opposed to the dichotomous outcome differentiates the binary logit and probit models from the multinomial logit model.

For example, Abera et al. (2021) considered the following categories of livelihood diversification strategies: (1) agriculture only; (2) agriculture and non-farm; (3) agriculture and off-farm; and (4) agriculture, non-farm and off-farm. In addition, Amevenku et al. (2019) classified diversification strategies into: (1) fishery only; (2) fishery and farming; (3) fishery and non-farm; and (4) fishery, non-farming and farming. In these studies, the multinomial logit model estimates the determinants of diversification for all the identified categories except one, which is used as a base category with which all the estimated categories would be compared. The multinomial logit model is the most widely applied model in the livelihood diversification literature. This is probably because livelihood diversification strategies are numerous, and households decide from among the numerous strategies which best suits them.

The Tobit regression model is applied by studies that conceptualize livelihood diversification based on an index that has defined boundaries (i.e., has a lower limit and/or upper limit). Departing from the studies that derive an index of diversification and then classify the index into binary variable, these studies use the index as the dependent variable (i.e., the measure of diversification).

Technically, Tobit models are applied when a variable is censored. That is, when it is bounded between some values. For example, Alemu (2023) and Kidan and Tafesse (2023) applied the Tobit model to diversification measured by the SID, which ranges from 0 to 1. Kassie (2017), and Loison and Bignebat (2017) applied the Tobit to diversification measured by the IHHDI, which ranges from 1 to 3. Applying conventional ordinary least squares the censored dependent variable yields inconsistent and biased estimates (Kassie, 2017; Greene, 2012; Maddala, 1992). Ordinary least squares (OLS) are generally applied in diversification studies in the context under which the Tobit model is applied. For example, Le and Le (2020) applied both the Tobit and OLS to an index of diversification. Also, Matsuura et al., (2023) and Etea et al., (2019), applied the OLS to diversification measured by the SID.

In a slight difference to the application of the multinomial logit model, the Poisson model is applied to diversification measured as a count variable. That is, the underlying issue in the application of the Poisson model is to view diversification as the number of diversification strategies a respondent or household engages in. For example, in the application of the Poisson model by Biswas and Mallick (2020), eight economic activities are identified including (1) cultivation of crops, (2) cultivation of fish, (3) catching fish, (4) business (both small and large scale), (5) collecting resources form Sundarbans, (6) wage earners, (7) formal employee and (8) other income sources (like tutor, mechanic, smith, tailor, driving). Thus, respondents indicate the number of activities they engage in, and the dependent variable is the number each respondent identifies.

Empirical studies that measure the impact of livelihood diversification on outcomes basically use propensity score matching (PSM) (e.g., Abebe et al., 2021; Zeleke et al., 2017), instrumental

variable approaches (e.g., Asfaw et al., 2019; Matsuura et al., 2023; Amfo et al., 2021; Gebreyesus, 2016). PSM classifies respondents into two groups: those who engage in diversification and those who do not engage in diversification. Then it matches comparable respondents in both groups to form the basis to estimate the impact of diversification status on the desired outcome. Instrumental variable approaches applied are two-stage least squares (2SLS) (Gebreyesus, 2016) and three-stage least squares (3SLS) (Amfo et al., 2021). Other approaches that are rarely used are multinomial endogenous switching regression (e.g., Antonelli et al., 2022) and seemingly unrelated regression (e.g., Asfaw et al., 2019).

2.9 Summary and gaps in literature

Empirical evidence (Alemu, 2023; Asfaw et al., 2019; Dinku, 2018; Emeru et al., 2022; Matsuura et al., 2023; Amevenku et al., 2019; Asravor, 2017) indicates several works in the areas of coastal communities fishing and their means of livelihood. Research on livelihoods and food security is also extensive for coastal communities in Ghana. Other empirical works have also covered aquaculture in Ghana as part of fisheries. However, specific research done in the areas of youth and youth headed households in coastal communities as a niche and correlation between their livelihoods and food security is very limited.

Agenda 2063 of the development plan of the African Union places a high priority on investing in youth as the driving force for achieving socio-economic development in Africa (African Union Commission, 2015). Recent studies suggest that, unless proposed solutions are based on a thorough understanding of youth livelihood and employment realities, they are at risk of not achieving adequate impact and scale (Williams & Pompa, 2017). The youth population in SSA is heterogeneous with varying economic, physical, and social characteristics (Chulani & Gordon,

2014; Dawes et al., 2014; Kilford et al., 2016). These characteristics thus influence youth's ability to access food through qualitatively different ways than older adults and among subgroups of youth (Belachew et al., 2012; Smith et al., 2017).

There is limited evidence of food insecurity to adverse youth outcomes in sub-Saharan Africa (SSA). A few conducted researches include youth food insecurity in Ethiopia (Belachew et al., 2012; Hadley et al., 2009; Hadley et al., 2016). There is however limited research about predictors of youth food insecurity, highlighting gaps in a region where youth are more likely than adults to lack access to adequate food (Amarnani et al., 2017).

Several factors are attributed to these gaps in knowledge in SSA, which include the lack of suitable data with validated measures of food access and the link between food insecurity and limited economic or financial resources may be axiomatic (Rainier et al., 2020). Empirical evidence shows economic and financial variables, most notably income to be constantly associated with food access (Baer et al., 2015; Pereira et al., 2017; Smith et al., 2017) though this indicator may not be the only contributor of youth food insecurity. Previous research shows an association between food insecurity and non-economic factors such as health conditions, social networks and capital, and gender (Dean & Sharkey, 2011; Hadley et al., 2008; Smith et al., 2017; Tsai et al., 2012). Human capital, one of the five (5) assets of sustainable livelihoods is derived from the discourse of economics (Damoah, 2020) which indicates that capital is a vital factor of production, and this is part of the conceptual framework of the study.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter describes the theoretical framework underpinning the study. Data for the study which include sampling procedure, data sources and collection are discussed. The conceptual framework underlying the study follows next. The section is then followed by the theoretical framework. The methods of data analysis are captured next and finally, limitations of the study

3.2 Data

Ghana is situated on the west coast of Africa with a total area of 23,884,245 hectares (MoFA, 2015) and a coastal line of 550 km. The country is tropical and shares borders with Burkina Faso to the north, Togo to the east and Côte d'Ivoire to the West. Ghana had 10 administrative districts which was further divided into 16 regions in 2019. There are four coastal regions out of the 16 administrative regions: Greater Accra, Central, Western and Volta regions. Central and Greater Accra regions, are purposefully the focus of the study. These are selected based on their high fish output compared to the other coastal regions (GSS, 2018). The map of Ghana (figure 3.1) with the shaded parts shows the regions and communities selected for the study.

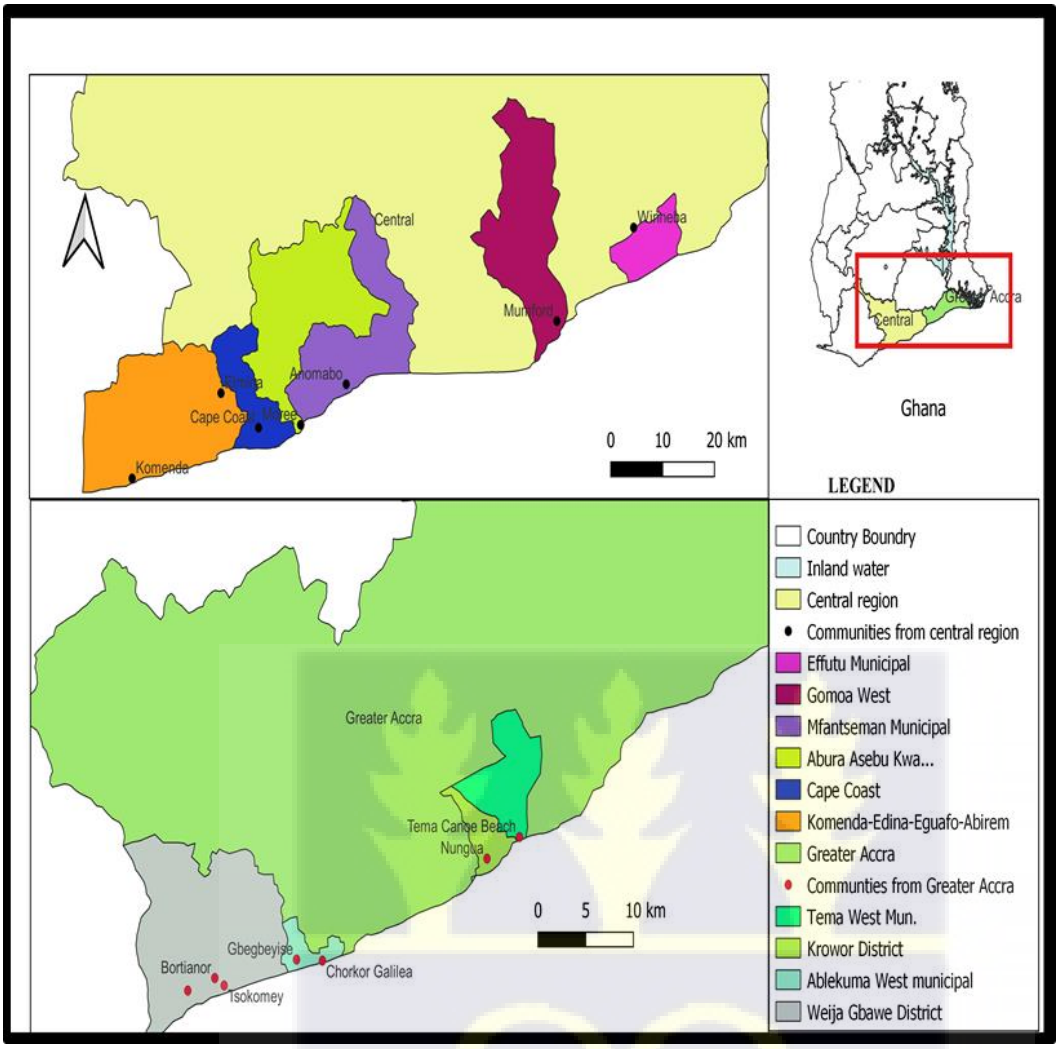

Figure 3.1: Map of study area with sampled districts.

Source: Produced by the Remote Sensing/GIS Laboratory, Department of Geography, University of Ghana, 2022.

The multistage sampling technique is used to select a representative sample of 424 households for the study. To derive a representative sample, this study used data from the Ghana Statistical Service (2019) that indicates that the population of youth (age 15-35 years) in the Greater Accra and Central regions were 1.6 million and 845,683 respectively as estimates.

This gives a total youth population of 2,489,329 in both regions. The Yamane (1967) formula for calculating sample size was applied and specified as:

$$n = \frac{N}{1+N(e^2)} \quad (3.1)$$

Where n is the sample size to estimate, N is the population of interest (in this case the youth population in the Greater Accra and Central regions), and e is the level of precision. Assuming the level of precision to be 0.05 and using the youth population of 2,489,329 in both regions, a total sample of 400 was obtained. However, to provide for exigencies and missing observations, this sample was oversampled by 5 percent to arrive at a final sample of 420 respondents. However, 4 more respondents were added during the data collection. Therefore, a total of 424 is used as the final sample of this study. The sample is shared on a 50:50 basis despite the capital region Greater Accra youth population being double the number in the Central region.

The first stage of the multistage sampling procedure involved the purposive selection of two coastal regions, Greater Accra and Central from the four coastal regions in Ghana. These regions were selected based on their fish contribution to the economy of Ghana. The second stage involved the purposive sampling of six and five districts in the Greater Accra and Central regions respectively. Thirdly, seven communities were randomly sampled from the districts in the two regions. It is estimated that there are 200 coastal villages within the four coastal regions (GSS, 2018). The youth heads in fisheries communities were then randomly sampled from the communities (Table 3.2). The sampling techniques have been used by other researchers to conduct research in fisheries livelihoods and coastal development in the Global South (Owusu et al., 2023;

Owusu & Adjei, 2021; Penney et al., 2017; Adjei & Overå, 2019; Marquette et al., 2002). Figure 3.2 depicts the stages of sampling procedure. Table 3.2 presents the sampled districts, communities, and their respective sample sizes.

Primary data is used for the study. The data is obtained through the administering of questionnaires i.e., focus group discussions (FGD), key informant interviews (KII), etc.). Three different focus groups; male headed, female headed, and youth headed households are conducted. A total of 424 questionnaires are administered in fourteen (14) communities in the two coastal regions of Ghana. The data was collected in the month of May 2022.

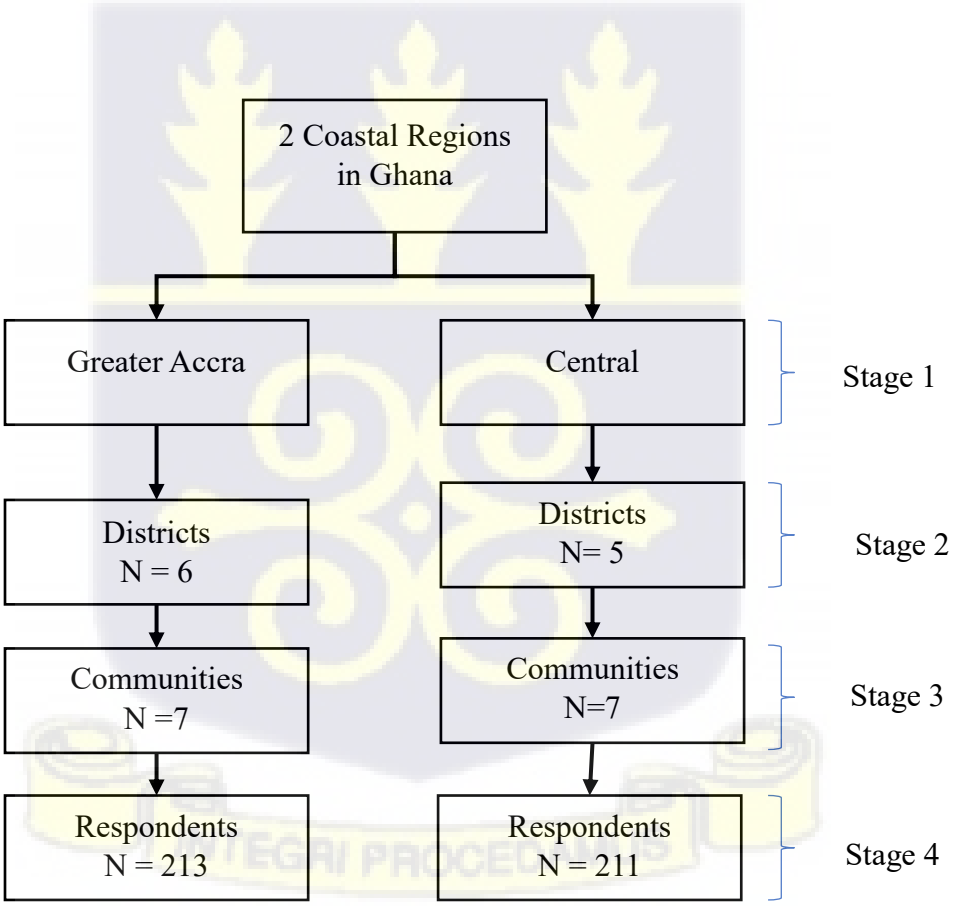

Figure 3.2: Stages of sampling procedure

Stage 1 is about the selection of the two regions from the four regions. Stage 2 deals with the selection of coastal districts six (6) from Greater Accra and five (5) from Central in the two regions. Stage 3 considers the selection of the 14 coastal communities from the selected districts. Stage 4 deals with the selection of the 424 respondents from the communities.

Table 3.1: Sampled districts, communities, and respondents

Central region				Greater Accra region			
District	Community	Respondents	*FGD	District	Community	Respondents	*FGD
Mfantsiman	Anomabo	36	2	Accra	Chorkor-Galilea	28	2
Abura Asebu Kwamankese	Moree	31	2	Tema	Tema Canoe Beach	30	2
Komenda	Elmina	45	0	Ga	Kokrobite	29	0
Edina Eguafo Abirim	Komenda	32	2	South	Tsokomey	29	2
Cape Coast	Cape Coast	29	2		Bortianor	38	2
Effutu	Winneba	14	0	Gbegbeyise	Gbebgeyise	29	2
Gomoa West	Mumford	24	2	Krowor	Nungua	30	0
Total		**211**	**10**			**213**	**10**

** 2 different focus groups engaged (1 male group, 1 female group from YHH) with an average of 9 members in each group.*

3.3 Conceptual Framework

3.3.1 Livelihoods Framework

The sustainable livelihood framework (SLF) is adapted as the general concept for this study. The framework is developed by Department of International Development (DFID) (1999) and used in several studies investigating households' poverty and livelihood changes (Weldegiorgis & Jayamohan, 2011; Radeny et al., 2012; Bhandari, 2013). The sustainable livelihoods framework is

used to show the various assets of individuals, households, and communities available to them. It further demonstrates how the various components of assets and activities interact within an institutional and vulnerability context leading to various outcomes. The sustainable livelihood approach (SLA) (Scoones 1998; DFID 1999) help assess livelihood vulnerability by highlighting how climate variability and change affect the vulnerability context, the asset base, policies, institutions, and processes (Adatoh & Meinzen-Dick 2002; Elasha et al. 2005; Badjeck et al., 2010). One highlight of the livelihood approach (Reardon & Vosti, 1995; Carney, 1998; Bebbington, 1999; Ellis, 2000) is the emphasis on the capabilities of the rural poor. The approach recognizes the wealth of the poorest households within the five capitals.

The sustainable livelihoods framework is represented in several ways (Carney, 1998; Scoones, 1998, Ellis, 2000). This approach is applied as a means of intervention to the poor and assisting them achieve long-term positive results in their livelihoods. There have been modifications to the original framework with the addition of new assets: institutional knowledge, institutional/political capital, and cultural/traditional assets (McLeod, 2001; Cochrane, 2006; Odero, 2008). Lowe & Schilderman (2001) highlights the importance of knowledge, information, and skills as part of the human assets that are of high importance in every livelihood. The conceptual framework is constructed based on the sustainable livelihood's framework by DFID (2000). This is due to SLF's general nature and the need to modify it to suit this study. Figure 3.3 presents the version for the study.

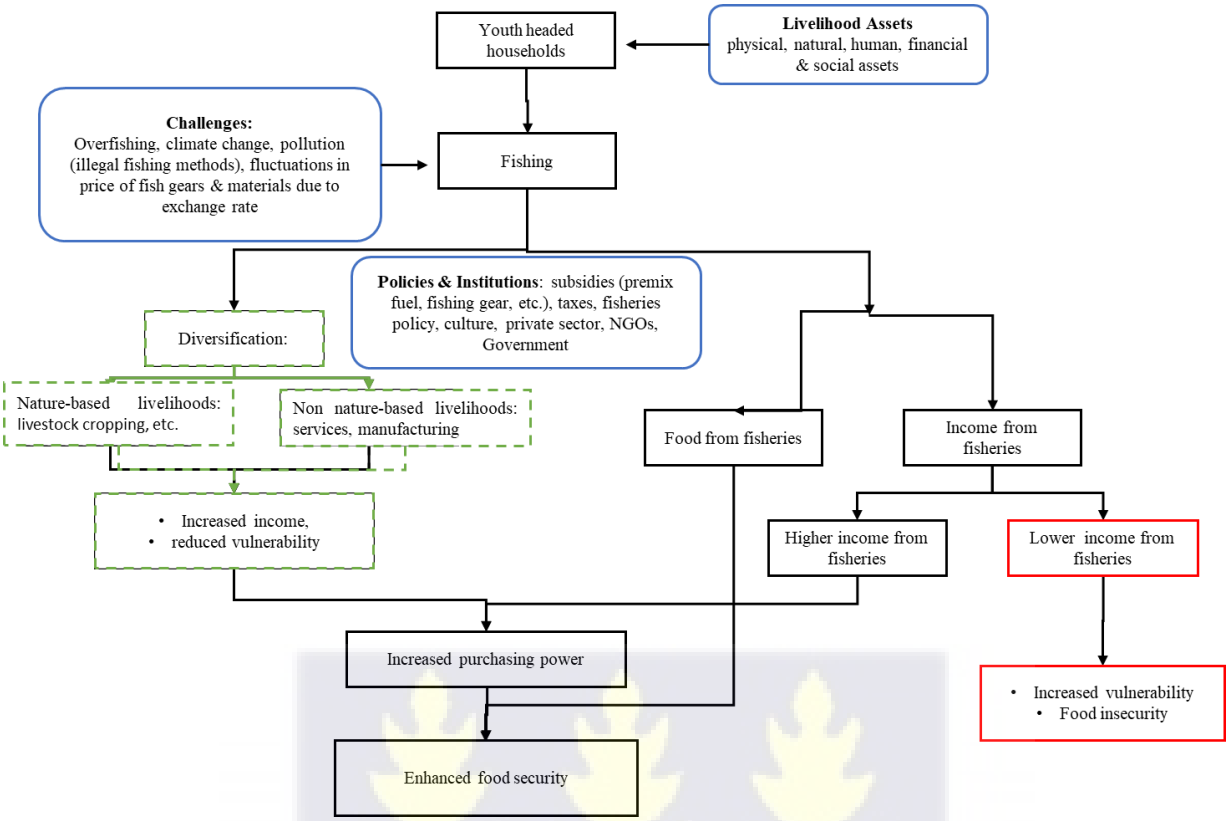

Figure 3.3: Conceptual framework of the study

Source: Author's construction based on the sustainable livelihoods' framework by DFID, (2000).

Every coastal household has a set of livelihood activities to choose from. These activities of livelihood strategies lead to different adaptation pathways. For such households, adaptation strategies are grouped into marine-and non-marine-based livelihoods. The non - fisheries based adaptation strategies for households include farming, small businesses, migration (intra and external migration) and tourism activities, etc. (Castells-Quintana et al., 2018).

Youth headed household in fishing communities determine to diversify or not with fisheries as the main occupation. To diversify, the youth make use of the five capitals available to them. These capitals are financial (regular remittances, savings, supplies of credit), human (knowledge, skills,

health, information, ability to labour), natural (environment, land, water, wildlife, biodiversity), social (membership of groups, networks, relationships of trust, access to wider institutions) and physical assets (communications, energy, water, sanitation, transport) (DFID, 2000).

As part of social capital, families support each other to have better gains in outputs in coastal communities in Ghana (Adusah-Karikari, 2015). Intangibles such as trust and respect amongst families, groups and members lead to credence for individuals in society. The build of these values over the years lead to advocacy for active participation in activities in these households and communities. Thereby stimulating and strengthening networks to increase trust, maintain network structure and allow for sharing of resources such as knowledge, information and ideas (Cinner et al., 2015).

Financial capital is leveraged on by YHH to facilitate their livelihood activities through the various transactions they engage in. It is common to find informal lending schemes in such communities that support their activities. These schemes, for example the village savings and loans (VSL) scheme, provide financial and business support services (Nunoo & Asiedu, 2015). Human capital is leveraged on by families to achieve their livelihood outcomes through labour support, knowledge, skills, etc. The physical capital such as good roads, hospitals, and communication facilitate the movement of youth for their day-to-day activities. The access to such good assets enhances better communication, enhance market access and access to information, etc.

As part of activities to increase fish output and earn higher income, intensification of fisheries activities is employed when a YHH does not diversify as a strategy. Intensification activities may

include changing fishing gear, spending longer hours on the seas, traveling longer distances, fishing in the coastal waters of neighboring countries, and changing the boat size or outboard motor capacity, fishing nets or using illegal fishing methods (Perry & Sumaila, 2007; Wallner-Hahn et al., 2016; Afoakwah et al., 2018; Freduah et al., 2019). The outcome is higher fish output and increased income. When intensity is not increased, there is lower income due to the decreased fish landing which leads to increased vulnerability of the YHH.

The vulnerable state can be external or internal. The internal side of their vulnerability is caused by lack of ability and means to cope with losses by the households. The external vulnerability are the risks, shocks, and stresses associated with the environment and community (Serrat, 2013). In the decision of YHH to diversify, the youth go into nature-based resources livelihood activities such as livestock, cropping, extractive to supplement their incomes. Alternatively, the youth could decide to go into non-nature-based resources such manufacturing, trading, wage employment, etc. The decision to go into any of these livelihoods is also influenced by the access to the structures, processes, and policies available in the communities.

There are structures that govern the coastal communities dictating who and when to fish (Ostrom, 1990; Symes, 1998). Such structures could be of a professional, formal, informal, and religious nature including government agencies, fisher groups and associations. The structures and institutions could be the local government e.g. Youth Employment Agency (YEA), and private sector engagement (NGOs, microfinance institutions, etc.) in providing information, trainings or skills, tools/ equipment, to build youth skills in such areas. For instance, community committees, apex associations such as National Fisheries Association of Ghana (NAFAG), National Fish

processors and Traders association (NAFTA) regulate some fisheries activities in the communities. There are "chief fisherman" and "Queen fishmonger" in most coastal communities who are responsible for and govern all fishing activities including the welfare of fisherfolks informally (Lenselink, 2002; Torell et al., 2015).

Processes embrace the laws, regulations, policies, operational arrangements, agreements, societal norms, and practices that, in turn, determine the way in which structures operate in any community. Coastal fishing communities have unique cultural characteristics and socio-economic dynamics with their ethnic groups. The culture, norms and traditional practices of the dominant ethnic group dictates the societal settings of the community (Odotei, 1999; Kraan, 2009). Moreover, differences in the political and administrative regions of coastal communities have some implications on local institutions (formal and informal) (Okyere et al., 2020). Gadgil & Vartak (1976) note that African communities have taboos or norms which are connected with particular habitats, for example smaller or larger ecosystems reserved for religious purposes. These are also common in other places like Europe and Asia and not just Africa per studies (Colding & Folke, 1997; Frazer, 1992).

For example, there are off-fishing days for coastal communities (Acheampong, 2010) to mitigate major challenges in natural resource management (Altieri, 2004). On this day, fisher folks do not go to sea (mostly on Tuesdays) as part of traditional laws and regulations to i) let the fisherfolks take a rest from their daunting fishing activities and mend their fishing equipment such as nets, boats, etc. ii) the day is set aside for the sea (sea god) to rest, and it is a crucial component of the laws regarding fishing. Douglas (1966) shares a taboo of the Lele tribe of Congo, which forbids the return of fishing equipment to the village after use rather it should be hung on trees close to

the water bodies. These traditional controls are further meant to protect and promote communal wellbeing, rather than individual interests (Diawuo & Issifu, 2015).

Policies in place include “closed season” for all fishing activities as a measure to regulate fishing activities. Seasonal closures are an effective conservation tool in fisheries management to allow fish to reproduce during the spawning season before harvesting (Bucaram et al., 2018; Lazar et al., 2016; Bennett & Dearden, 2014; Rola et al., 2018). It aims to reduce the fishing intensity and protect target stock from mortality at a specific life stage (Samy-Kamal, 2015). The implementation has been met with resistance and mixed perceptions as it disrupts the normal flow of livelihood activities over a period though it has its positive outcomes (Owusu & Andriesse, 2020; Macusi et al., 2022).

Households in coastal communities’ experience shocks such as human health shocks (COVID - 19, sickness, death) natural shocks (flooding or droughts, etc.) economic shocks (inflation, etc.), conflict and crop/livestock health shocks. Seasonality of prices in resources, of production, of health and of employment opportunities do affect several of the livelihood activities of households in the coastal communities. These factors, coupled with variance in access to assets, institutions and processes could affect their context of vulnerability, adaptive capacity and their capacity to self-organize.

The vulnerability context has two parts: internal or external. These explain the environment in which households in the coastal communities exist and operate to affect their livelihoods. Seasonality, critical trends, and shocks affect such livelihoods, which the households have limited

or no control over. Some trends in the economy include population (e.g. increase in births in the coastal communities), availability of resources (e.g. wood/canoe, nets, pre-mix fuel, etc.), national/international economic trends (the performance of the economy reflecting in the lives of the people). The rest are trends in governance (change in government and priority assigned to such coastal communities, policies that affect the coastal communities directly or indirectly, etc.) and finally, technological trends (new methods of fishing, farming, smoking of fish, etc.).

The households, individuals or communities must have a buffer capacity to deal with the vulnerabilities they experience. Buffer capacity is the degree to which social actors or systems can absorb shocks while preserving their original identity, structure and functionality (Carpenter et al., 2001). "Buffering" shocks on livelihoods requires sufficient amounts of what households or individuals deem critical to the functioning of their livelihoods. These requirements, which are mainly tangible and intangible assets range from social, natural, human, financial, and physical assets dubbed as "livelihood capitals" (Ding et al., 2018).

3.3.2 Importance and limitations of the sustainable livelihoods' framework

The sustainable livelihoods framework (SLF) approach provides a systematic view of factors that lead to food insecurity and poverty. However, the SLF is criticized for downplaying issues such as politics and power, engagement with processes of changing economic situation globally. Other structural constraints are issues of environmental sustainability, and shifts in rural economies (De Haan, 2007; Scoones, 2009). There is limited consideration for individual capabilities in areas of gender, wellbeing, and generational power relation within households as the household is mostly

the unit of focus. Little research has been done where the framework has been used to analyze youth livelihoods or access to assets (Van Blerk et al., 2008).

3.4 Theoretical framework

This thesis on livelihood diversification and food security status of youth headed households in coastal communities in Ghana is intended to provide the necessary empirical evidence for interventions in coastal communities for enhanced livelihood. The framework attempts to provide recommendations based on hypotheses tested and outcomes. The outcomes of the hypotheses are diversifying livelihoods by YHH in coastal communities which tend to ensure higher income and improve their food security status. The study is based on two theories: the rational choice theory (Friedman, 1953) and perception theory (Langton, 1970).

3.4.1 The rational choice theory

This theory is a context for understanding and modeling social and economic behavior (Blume & Easly, 2008). The "rationality" is explained in a specific and narrower definition to be "an individual act as if balancing costs against benefits to arrive at an action that maximizes personal advantage" (Friedman, 1953). Elster (1989) stated the essence of rational decision-making as selecting from among possible choices based on facts and reason through a systematic approach. Through these processes, different options by an individual are assessed in a series of steps to review relevant facts, observations, and possible outcomes before choosing a particular course of action. This theory was developed using empirical methods as part of the behavioral revolution in the 1950s – 1960s and was to investigate how individuals behaved (Ogu, 2013).

Oliveira (2007) indicates that in rational decision-making models, decision makers or household units evaluate several possible economic options from different possible situations before selecting a specific livelihood strategy.These possible situations or scenarios are weighed by probabilities. Then, the household can determine the expected result for each livelihood strategy. Further, the final choice that the decision maker makes would be the one offering the probability with the highest outcome.

The rational choice theory stipulates that cumulative social behavior results from the behavior of individual actors or household as a unit, each of whom makes individual decisions (Blume & Easly, 2008; Sen, 2008). The proposed theory focuses on the determinants of individual choices. Rational choice theory then supposes that an individual has preferences among the available choice alternatives that allow them to state which possibility they prefer (Blume & Easly, 2008; Sen 2008). It is noted that households may be 'poor but rational' (Schultz 1964) and the rationality may well be 'bounded' (Simon, 1990; Kabeer, 2000). Choices and trade-offs are much influenced by race, age, gender, marital status, etc. as determinants for households or individuals.

Criticisms of the rational choice theory assumes the selfish motivations or interests of the individual or household. However, rationality of an individual or household is consistent with selfishness (Elster, 1989). The theory is also criticized (Boudon, 1998) as it ignores social interactions and is the exact opposite of the game theory which handles three very important interdependencies. These are (a) the welfare of each depends on the decisions of all; (b) the welfare of each depends on the welfare of all; and (c) the decision of each depends on the decisions of all. Elster (1989) in this instance stipulates the assumption of the theory that human beings behave like

powerful computers and are culturally biased. In the case of powerful computers, it compares to its instant work out of the most complex ramifications of all conceivable options. In principle, rational choice theory can incorporate cognitive constraints comparable with physical or financial constraints. People are instrumentally rational because they adopt the principle of least effort. Also, individuals know that acting on false beliefs undermines the pursuit of their ends. Such individuals want to use cognitive procedures that reduce the risk of getting it wrong when getting it right matters. These individuals often fail to adopt the right procedures and does not undermine the normative ideal.

3.4.2 The perception theory

The perception theory states that an individual or household will make decisions based on information gathered from the community or society they live in (Langton, 1970). This information could be from personal experience or that gathered from the community. Households who have information or perceive some different livelihoods in addition to what they are currently involved in will provide extra income and tend to diversify. Also, the neighbourhood effect comes into effect here. As households in communities' livelihoods improve through extra activities which is normally evident in their social interactions and networks, other households will tend to choose a similar path. These decisions are also based on the availability of resources to and capability of such households.

3.5 Methods of data analysis

3.5.1 Livelihood diversification strategies and relevant skills sets

The fourteen selected communities from the two regions along the coast of Ghana have fishing as a major occupation and generational means of livelihood for most households. Other means of

livelihood include agriculture labour on the various farms they cultivate, other farm-based activities, non- agricultural wage and self-employment. Some households have families who migrate to other communities or to urban centres to find work during lean season. The communities have different ethnic groups, but some ethnic groups are dominant. In the Greater Accra region, the seven (7) communities are dominated by the Ga - Adangbe ethnic group, while the majority of those in the Central region are Fantes (Adjei & Sika-Bright, 2019).

In classifying the various livelihood strategies, two different approaches are applied: the asset-based approach and income-based approach. The asset-based approach classifies livelihood strategies from the perspective of input according to asset allocation across different activities (Brown et al., 2006) or asset portfolios. However, it is hard for the asset-based approach to capture non-productive income-generating activities which do not involve asset inputs or difficult to measure. Some of the asset inputs are investment, retirement fund or income, transfer payment, etc.

The income-based approach classifies livelihood strategies from the perspective of output according to income from a certain source, for example, nonfarm income (Readon et al., 1997; Fang et al., 2014), cash transfer income (Dou et al, 2017), or income from several sources (Wu et al., 2017).

The study focuses on these skills, capabilities, resources, and opportunities for pursuing and achieving their individual and household economic goals or income generation. The livelihood

skills include but not limited to technical and vocational abilities (carpentry, sewing, computer programming, etc.), business management, entrepreneurial, and money management skills.

Descriptive statistics involving frequencies and graphs are employed for the livelihood diversification strategies and relevant skills set of households. In addition, chi-square analysis is employed to assess inherent differences in livelihood diversification strategies and skills set based on some characteristics such as gender, education, and marital status. Chi-square analysis is used to analyze gender disparities in various livelihood activities. It is used to examine whether there exists significant difference in livelihoods diversification among youth headed households.

The chi-square formula is applied. Stata version 18 statistical software package is used for the analysis.

$$\chi 2 = \frac{(O_i - E_i)^2}{E_i} \qquad (3.2)$$

Where $\chi 2$ is the chi-squared statistic, O_i is the observed frequency and E_i is the expected frequency. Similar studies (Nasa et al., 2010; Ushie et al., 2010; Jayaweera, 2008; Oyesola & Ademola, 2012) used the chi-square analysis to analyze livelihood activities in Nigeria. F-distribution or test was used to test the hypothesis that:

H0 = There are no significant differences in the diversification strategies for YHH in coastal fishing communities in Ghana.

The multivariate analysis of variance method (MANOVA) is then used to analyze the difference in the mean incomes of YHH. The mean income is categorized by the type of secondary livelihood activity they are engaged in. MANOVA is a statistical technique for comparing the means of two or more variables (Zerzucha et al., 2012). When examining if there are variations in each variable's mean across various levels of one or more independent variables, this technique is especially helpful. It enables researchers to consider the intercorrelations between the dependent variables and analyze the total differences between groups (Eid & Asutay, 2019).

The hypothesis statements to be tested are as stated below:

H0: There is no significant difference between the mean average net income from fishing between diversified YHH and non-diversified YHH.

The decision rule is to reject the null hypothesis if the Prob>F is greater than the critical value. Four different tests of hypothesis for the statistical significance in observed difference in means of the different categories of farmers were adopted. These are Wilks' lambda, Pillai's trace, Lawley-Hotelling trace and Roy's largest root. For all these tests, the decision rule is to reject the null hypothesis if the test statistic is greater than the critical value of the F-test (Prob>F).

3.5.2 Determinants of choices of livelihood diversification strategies

A Probit model is employed to estimate the determinants of livelihood diversification strategies for youth headed households in coastal fishing communities. In this study, livelihood diversification is measured as a dummy variable – that is, either a youth headed fishing household diversifies into other economic activities, or the household does not diversify.

The probability that an income diversification strategy is chosen depends on the expected utility from that strategy. Assume that a respondent from a fisheries household in a coastal community i's utility from choosing income diversification, strategy j is given as:

$$U_{ij} = V_{ij} + \varepsilon_{ij} \quad (3.3)$$

Where: U_{ij} is youth's i's utility from choosing alternative j, V_{ij} is the deterministic (observable) component of total utility and ε_{ij} is a stochastic element that represents unobservable influences on the youth's choice.

Following equation 3.3, an individual will choose an alternative j to other alternatives (k) if:

$$U_{ij} > V_{ik}, j \neq k \quad (3.4)$$

The probability that any respondent prefers option j in the choice set to any alternative option k is expressed as the probability that the utility associated with option j exceeds that associated with the other options and is indicated as:

$$P_{ij} = Prob\{V_{ij} + \varepsilon_{ij} > (V_{ik} + \varepsilon_{ik}; \forall\, k \in C \backslash \{j\})\} \quad (3.5)$$

Where: C is the set of all possible alternatives.

In this conceptualization – a household that diversify is given a value of 1 and a household that do not diversify is given a value of 0. The binary logit or probit models econometric procedures for estimating the factors that influences the choice of a household is widely used. The main difference between these models is basically in their distributional assumptions regarding the error term. The probit model assumes a normal distribution whiles the logit model assumes a logistic distribution.

However, these models basically produce similar results (Greene, 2002). This study therefore applies the probit model over the logit model because it assumes normal distribution.

Assume a latent variable, LD_i^*, is defined as:

$$LD_i^* = X_i\beta + \varepsilon_i \quad (3.6)$$

Where ε_i is the error term that has a standard normal distribution. The decision of a household to diversify or not to diversify, denoted as LD_i, is related to the latent variable as:

$$LD_i = \begin{cases} 1 \ \ if \ LD_i^* \geq 0 \\ 0, \ \ otherwise \end{cases} \quad (3.7)$$

The probability that a youth headed fishing household diversifies into other economic activities is specified as:

$$Prob(LD_i = 1|X_i) = \Phi(X_i\beta) \quad (3.8)$$

Where X_i is a vector of explanatory variables that are hypothesized to influence livelihood diversification. β is a vector of parameters to be estimated, and Φ is the normal cumulative density function. The empirical model based on eq (3.8) is specified as in eq (3.9):

$$LD_i = \beta_0 + \beta_1 GEN_i + \beta_2 AGE_i + \beta_3 EDU_i + \beta_4 MS_i + \beta_5 HHS_i + \beta_6 LOC_i + \beta_7 TRAINP_i + \beta_8 TRAINCS_i + \beta_9 TRS_i + \beta_{10} FBO_i + \beta_{11} LOAN_i + \beta_{12} AHI_i + \beta_{13} PHONE_i + \beta_{14} RADIO_i + \beta_{15} TV_i + \beta_{16} MOTO_i + + \beta_{17} INCR_i + \beta_{18} PF_i + \beta_{19} YOUTH_i + \epsilon_i \quad (3.9)$$

Table 3.2 presents the definition and measurement of variables used and the a-priori expectations.

Table 3.2: Description, measurement and a-priori expectation of variables

Variable	Description	*A-priori* expectation
Livelihood diversification (LD)	Dummy: 1 = if diversified; 0 otherwise	
Gender (GEN)	Dummy: 1 = Female-headed, 0 otherwise	+ / -
Age (AGE)	Number of years of youth head	+ / -
Education (EDU)	Dummies:	
	Primary (1 = if yes; 0 otherwise)	+
	JHS (1 = if yes; 0 otherwise)	
	Secondary (1 = if yes; 0 otherwise)	
	Tertiary (1 = if yes; 0 otherwise)	
Marital status (MS)	Dummy: 1 = if married, 0 otherwise	+
Household size (HHS)	Number of persons in household	+
Location (LOC)	Dummy: 1 = Central region, 0 = Greater Accra	+
Training in previous livelihood activities (TRAINP)	Dummy: 1 = if yes; 0 otherwise	+
Training in current livelihood activities (TRAINC)	Dummy: 1 = if yes; 0 otherwise	+
Training in relevant skills (TRS)	Dummy: 1 = if yes; 0 otherwise	+
Member in community group (FBO)	Dummy: 1 = if yes; 0 otherwise	+
Access to loan (LOAN)	Dummy: 1 = if yes, 0 otherwise	+
Access to health insurance (AHI)	Dummy: 1 = if yes, 0 otherwise	+
Ownership of mobile phone (PHONE)	Dummy: 1 = if yes, 0 otherwise	+
Ownership of radio (RADIO)	Dummy: 1 = if yes, 0 otherwise	+
Ownership of TV (TV)	Dummy: 1 = if yes, 0 otherwise	+
Ownership of motorbike (MOTO)	Dummy: 1 = if yes, 0 otherwise	+
Income reason (INCR)	Dummy: 1 = income as main reason for livelihood; 0 otherwise	
Primary occupation in fishery (PF)	Dummy: 1 = if yes, 0 otherwise	+ / -

Hypothesis tested is:

H_0: Socioeconomic and institutional characteristics do not influence the choice of livelihood diversification strategies of youth headed households (YHH) in coastal fishing communities in Ghana.

3.5.2.1 Description of a- priori expectations

A YHH is classified as **diversified (LD1) or not diversified (LD0)** when they are engaged in other activities other than the fisheries supply. It is expected that a diversified YHH has a positive probability a-priori expectation by YHH in fisheries.

Gender (GEN) is dummy and represents the sex of the decision maker in the youth household. It takes the value of 1, if the youth is female and 0 for males. The expectation for gender is bidirectional. Most studies indicate that both sexes tend to diversify and will have a bidirectional effect on livelihood diversification. **Age** is a continuous variable and represents the number of years of the responding youth in fisheries. Age is expected to be bidirectional for YHH. The age of the youth decision maker may have an influence on the choice of livelihood strategy as different levels provide access to different capitals in coastal communities. **Education** is a dummy for the level of education i.e. no education, basic, SHS/ Tech/ Voc, tertiary of youth in fisheries. Education is a proxy for human capital, which influences youth comprehension on capacity training and skills for diversification. The variable, "No education" is the reference point. Education is expected to have a positive influence on diversification by the youth.

Marital status (MS) is a dummy, where 1 is married and 0 is otherwise. Marital status has a positive probability a-priori expectation on livelihood diversification of youth from fisheries household. A youth been married will have a positive influence on where a youth will diversify as the head will have additional responsibilities such as taking care of the welfare of the spouse.

Household size (HHS) is a continuous variable and represents the number of members within the household of the youth in fisheries. The larger the household size the higher the decision to diversify by the youth. This is because the bigger the size, the more mouths to feed and take care of, thus, household size has a positive probability a-priori expectation on livelihood diversification of youth from fisheries household. **Location (LOC)** The differences in resource endowments between the two study regions, Greater Accra and Central can influence diversification by a YHH. Central region is less endowed compared to Greater Accra which is the capital of the country. Therefore, the Central Region is assigned 1 and Greater Accra 0 to be able to estimate and compare the two outcomes respectively.

Training in previous livelihood activities (TRAINP) is a dummy where 1 is the value of youth trained in previous livelihood activity and 0 is for otherwise. It is expected to have a positive coefficient as training in previous livelihood activities can motivate a youth to diversify. Previous knowledge and skills acquired may make a YHH to diversify to support the livelihood. **Training in current livelihood activities (TRAINC) is a dummy**, where 1 is the value of youth trained in current livelihood activities and 0 is for otherwise. The coefficient is expected to be positive as exposure to capacity building, new skills and knowledge is an incentive to pursue new livelihood activity. Thus, a positive impact on livelihood diversification. **Training in relevant skills (TRS)** is a dummy with a value of 1 for youth who have had some form of capacity building to acquire skills relevant to their livelihood activities. Whilst 0 is for otherwise. It is expected to have a positive coefficient, implying the positive impact it will have on the decision to diversify by the youth. These trainings in the form of extension are all expected to have a positive influence on diversification.

Membership in community group (FBO) is a dummy with a value of 1 for respondents who are members of any group and otherwise for youth respondents who are not members of any group or association. The coefficient FBO has a positive probability a-priori expectation on livelihood diversification of youth from fisheries household. A YHH builds the social capital, networks and information through the engagements as a member of a community group. This in turn motivate them to either diversify or not.

Access to loan (LOAN) is a dummy for YHH, with 1 for those who have had access to any form of financial support for their livelihood activities and 0 for otherwise. It is expected that the variable will have positive coefficient as the impact of loans to youth respondent's livelihood will be positive. **Access to health insurance (AHI)** is a dummy with 1 for having access by a YHH respondent and 0 for otherwise. The expectation is a positive coefficient for the sign of this variable because having access to health insurance will spur the need to diversify as youth respondents will dedicate much time to livelihood activities as they believe any failure in health will be duly covered by the health insurance. **Ownership of mobile phone (PHONE)** is a dummy with 1 for having access to mobile phone and 0 for otherwise. Access to mobile phone influences ease of communication and thus it is expected to influence information received by the youth with a positive impact on their ability to diversify their livelihoods. As such the coefficient is expected to be positive.

Ownership of radio (RADIO) is a dummy and is 1 for an owner of a radio whilst 0 for otherwise. The coefficient of the sign is expected to be positive as owning a radio will impact positively on

the decision to diversify. **Ownership of TV (TV)** is a dummy is a dummy with ownership 1 and otherwise 0. It is expected the coefficient of ownership of radio will be positive as owning a TV creates room for more TV programs which leads to increase in information thus positive impact on the decision to diversify. **Ownership of Motorbike (MOTO)** is a dummy with 1 as ownership and 0 otherwise. The variable will be is expected to be positive as a coefficient. Owning a motorbike is expected to increase mobility thus influencing the decision to diversify by a youth in a coastal community. **Income reason (INCR)** is a dummy variable. Where 1 is yes, income is a main reason for livelihood diversification and 0 is for otherwise. It is expected that as income from fisheries increases, the less likelihood a YHH will diversify.

The maximum likelihood estimation procedure is used to estimate the parameters of equation (3.9). Therefore, a log-likelihood function emanates from equation (3.9) and is specified as:

$$lnL = \sum_{i=1}^{n} LD_i \, ln\Phi(X_i\beta) + (1 - LD_i) ln\{1 - \Phi(X_i\beta)\} \quad (3.10)$$

However, the magnitudes of the parameters (i.e., the βs) cannot be interpreted as the effect of the explanatory variables on the probability of a household to diversify. To derive the effect of each variable on the probability of diversification, marginal effects are estimated as:

$$\frac{\delta E(LD_i|X_i)}{\delta X_i} = \frac{d\Phi(X_i\beta)}{d(X_i\beta)}\beta = \phi(X_i\beta)\beta \quad (3.11)$$

Where ϕ is the normal density function.

3.5.3 Impact of livelihood diversification on food security

In this study, the household dietary diversity score (HDDS) and the household food insecurity access scale (HFIAS) are the two food security outcomes used to measure food security. Dietary diversity refers to a qualitative measure of food consumption that reflects household access to a variety of foods and is a proxy for nutrient adequacy of the diet of individuals (Kennedy et al., 2011). HDD is measured using the number of food groups consumed by a household over the past 24 hours of the assessment time (Carletto et al., 2013; Hussein et al., 2018). This study uses 12 food groups consumed and these are i) cereals; ii) roots and tubers, iii) legumes, pulses and nuts, iv) vegetables, v) fruits, vi) meat, vii) fish and seafood, viii) eggs, ix) milk and dairy products, ix) oil and fat, xi) sugar and sweet, xii) condiments and spices (FAO, 2010; Moroda et al., 2018).

The consumption of each food group is measured as a count, 1 representing a household consuming the food group and 0 otherwise. From these various counts of the food groups, the HDDS is calculated as a count of the number of food groups each household consumes. Therefore, it ranges from 0 to 12, where 0 implies that a household does not consume any of the food groups and 12 implies a household consuming all the food groups. All these are measured within a time frame. Due to the seasonality of SSF, the measurement is done within a season.

The HFIAS, on the other hand, is developed from several (9 questions) questions relating to the availability, access, and consumption of food in a household. Based on the data collected, several scores are obtained that range from 0 to 9. These scores are used to group household's food security status into the four classes. The four classes of HFIAS are; (i) severely food insecure, (ii) moderately food insecure, (iii) mildly food insecure and, (iv) food secure. Therefore, whilst the

HDDS is measured as a continuous variable (a number ranging from 0-12), the HFIAS is measured as an ordered variable.

To measure the impact of livelihood diversification on these two outcomes of food security, we specify the following generic model:

$$FS_{ij} = \alpha_{0j} + \alpha_{1j} LD_i + \alpha_{2j} X_i + \epsilon_{ij} \quad (3.12)$$

Where FS is food security of household i, j indexes the food security measure used (i.e., HDDS and HFIAS, thus $j = 2$), LD is livelihood diversification, X is a vector of control variables (see Table 3.1), ϵ is the error term and $\alpha's$ are parameters to be estimated. The parameter of interest measuring the impact of livelihood diversification on food security is α_1.

Given that HDDS is measured as a continuous variable, equation 3.12 can be estimated with ordinary least squares or estimated with ordered probit in the case of HFIAS. However, the use of these respective models would yield biased and inconsistent estimates due to endogeneity concerns. Diversification is potentially endogenous to food security. Reverse causality is the first cause of endogeneity. While more diversified households are likely to be food secured (a hypothesis this study aims to test), more food secured households may also be more diversified. In addition, unobserved characteristics may jointly affect diversification and food security, making the latter endogenous. Therefore, OLS and ordered probit are not applied in this study.This study applies the inverse probability weighting regression adjustment (IPWRA) estimation procedure for the HDDS measure of food security. This method uses weighted coefficients to estimate

averages of treatment-level predicted outcomes in which the weights are the calculated inverse probabilities of treatment. One key advantage of the use of the IPWRA estimator is its doubly robust property (Okyere & Ahene-Codjoe, 2021; Tambo & Mockshell, 2018; StataCorp, 2021). The model departs from implementing a one-stage estimation like equation 3.10 and rather implements two models – one equation (i.e., livelihood diversification, and another for the outcome equation (i.e., HDDS). In the implementation of these two models, the doubly robust property implies that for deriving consistent estimates, only one of the two models must be correctly specified. There are three steps the IPWRA uses to derive unbiased and consistent treatment effects. These are:

1. It fits the parameters of a treatment model and estimates inverse-probability weights. Specifically, in this study, the treatment model is specified as:

$$LD_i = \gamma_0 + X_i'\gamma_1 + \varepsilon_i \quad (3.13)$$

Where all the variables are as defined before (see Table 3.1) and $\gamma's$ are the parameters to be estimated.

2. Relying on the computed inverse-probability weights, the model estimates a weighted regression model of the outcome (i.e., HDDS) following each treatment category (i.e., for diversified and non-diversified households) to derive treatment-based predicted outcomes for each household.

3. The model then estimates means of the treatment-based predicted outcomes to generate average treatment effect (ATE) and average treatment effect on the treated (ATT) specifically specified as:

$$ATT = E\{HDDS_1 - HDDS_0 | LD_i = 1\} = E(HDDS_1 | LD_i = 1) - E(HDDS_0 | LD_i = 1) \quad (3.14)$$

$$ATE = E(HDDS_1 | LD_i = 1) - E(HDDS_0 | LD_i = 0) \quad (3.15)$$

where $HDDS_1$ is the household dietary diversity of households who have diversified their livelihood and $HDDS_0$ is the household dietary diversity of households who have not diversified their livelihood, LD is as defined before (dummy variable; 1 for households who are diversified and 0 for households who are not diversified).

The study applies the extended ordered probit for estimating the impact on HFIAS since the IPWRA cannot be applied in this case because HFIAS is an ordered outcome. The extended ordered probit model extends the ordered probit by allowing a separate model of livelihood diversification to be specified as estimated jointly with the food security model. Therefore, the extended regression specifies the joint estimation of:

$$HFIAS_i = \delta_0 + \delta_1 LD_i + \delta_2 X_i + \epsilon_i \quad (3.16)$$

$$LD_i = \gamma_0 + \gamma_1 X_i + \gamma_2 Z_i + \varepsilon_i \quad (3.17)$$

Where Z in equation 3.17 is a vector of instruments. The simultaneous modelling framework with the vector of instruments provides the capacity to deal with endogeneity and selectivity bias. Therefore, the model is a type of instrumental variable (IV) approach. This implies that at least

one valid instrument must be identified. This study used two instruments – recent training in livelihood activities (TRAINC) and proportion of households in each community who diversified their livelihood. Training in recent or current livelihood activities is expected to stimulate households' interest in diversifying their livelihoods as they receive the necessary information and skills. However, any effect of training on food security is through diversification, implying that training does not directly influence food security.

The second vector of instrument is constructed following literature (e.g., Strauss, 1986; Mwabu, 2009). We argue that this community-level variable is exogenous because each household does not control the proportion of households in their respective communities who diversified their livelihoods. However, this variable will be correlated with livelihood diversification. The expected correlation of this instrument and livelihood diversification is motivated by previous studies that explain the importance of neighborhood effects on household-level outcomes (example, Magnan et al., 2015; Andersson et al., 2015). This instrument is specifically constructed by summing the number of households who diversified their livelihoods divided by the total number of households in the community.After estimating the parameters of equation (3.16) and equation (3.17), the model provides the platform to estimate treatment effects. These effects estimate the specific impact of diversification on food security. For each of the food security measure models, this study estimates alternative models to provide robustness of the baseline estimates. For the HDDS case the alternative model is the use of the extended linear regression while the control function ordered probit model is used in the case of the HFIAS.

3.5.4 Gendered perspective on fisheries and livelihood diversification: A mixed methods approach

This objective provides a mixed methods approach of the gendered roles, responsibilities, and dynamics of youth in coastal communities (Wolcott, 2009). Focus group discussions and key informant interviews are used for the qualitative method. The required minimum of four (4) participants (Churchill & Iacobucci, 2005) are achieved as each focus group discussion had between eight (8) - ten (10) participants per group. The analysis is undertaken with initial data organization from the focus group discussions and the notes are typed and reviewed (Kvale & Brinkmann, 2009). The notes are coded to make it easy for narration, for example role of men and women dynamics on fisheries, effect of the decline of fish landings on their livelihoods and determinants for diversifying, etc. The rest are the diversification and food security and general changes in the social and economic context. The coded themes are linked together into a cohesive overarching theme to fit into the study objective. A final review is undertaken to ensure the themes fit into the topic under focus.

3.6 Limitations of Study

The multi-dimensional nature of food security has been difficult to measure comprehensively, given the one-dimensional focus of existing indicators. The food security measures; i) Food consumption score (FCS); ii. Household dietary diversity score (HDDS) measure food and undernourishment. On the other hand, consumption behaviours are measured by these for food security i. Coping strategy index (CSI); ii. Reduced coping strategy index (rCSI); iii. Household food insecurity and access scale (HFIAS); iv. The household hunger scale (HHS); v) Self-assessed

measure of food security (SAFS). These measures the different food security dimensions at any particular time.

Existing studies have used more than one of the indicators to measure the complexity of food security (FAO, 2013; Cafiero, 2012) to get a comprehensive understanding of the different dimensions (Maxwell et al., 2013; Maxwell et al., 2014; Ike et al., 2015; Leroy et al., 2015; Ike et al., 2017). The HDDS and HFIAS are the tools used in this study. The socio-economic level of the household through the HDDS which measures the access to the 12 dietary food groups (Swindale & Bilinsky, 2006) and the HFIAS captures household behaviours signifying insufficient quality and quantity. It also captures the uncertainty over household insecure access or food supply, insufficient quality (includes variety and preferences of the type of food and insufficient food intake and its physical consequences). Given the limited – dimensional focus of these indicators which primarily focus on access and availability, the other dimensions such as utilization and stability are not measured. Further studies on the other indicators of food security affordability, stability, utilization and agency can be undertaken.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents and discusses the results of the study. The first section contains the socio-economic profile of the respondent youth from fisheries household. The next section covers the livelihood diversification strategies and relevant skills sets available for youth headed households in the study area. This is then followed by the results of the determinants of choices of livelihood diversification strategies of youth headed households. The next section is on the impact of livelihood diversification on food security among youth headed households. The final section contains the gendered perspective in fisheries in the study area.

4.2 Background of respondents

The socio-economic features such as age, gender, education, and marital status of the youth from the fisheries household in the coastal communities of the study area are discussed. The other characteristics include status of respondent as head, household size and marital status, the role played in fisheries, number of years in fisheries, access to fisheries resources such as nets, canoes, and outboard motors. The rest are access to financial resources, information access and capacity building opportunities. The descriptive statistics of respondents are in Table 4.1.

The respondents are youth from the selected coastal areas within the ages of 18 – 35 years as per the working definition for the study. The mean age is 29 years for the respondents. The age count has 45 (11%) respondents within the 32-age bracket forming the highest number of the population sampled, and only 2 (0.5%) people within the 19 years of age. Most households are males with

63.7 percent with 36.3 percent as females. Married respondents form 44.6 percent of the sample size, 19.81 percent are separated, 13.21 percent are single or never married and 6.84 percent divorced.

A total of 33.5 percent has attained Junior High/Middle school, followed by primary education, with 27.6 percent, 23.1 percent with no formal education, 12. 5 percent with secondary education and 3.3 percent have attained tertiary education. The statistics further reveal that 52.6 percent have acquired previous livelihood training while 47.4 percent of the respondents have not acquired previous livelihood training. A total of 45.3 percent has attained current livelihood training whilst 54.7 percent have not. However, most respondents representing 60.6 percent have received training in relevant skills and 39.4 percent have not.

Table 4.1: Descriptive statistics of respondents

Variable	Mean (n = 424)	SD	Min.	Max.
Diversified (1 = yes)	0.472	0.500	0	1
Gender of respondents (1 = female)	0.363	0.481	0	1
Age of respondents (number)	28.54	4.531	18	35
Education:				
No formal education (1 = yes)	0.231	0.422	0	1
Primary (1 = yes)	0.276	0.448	0	1
JHS (1 = yes)	0.335	0.473	0	1
Secondary (1 = yes)	0.125	0.331	0	1
Tertiary (1 = yes)	0.033	0.179	0	1
Marital status (1 = married)	0.446	0.498	0	1
Household size (number)	4.491	1.882	1	13
Location (1 = Central region)	0.502	0.501	0	1
Training in previous livelihood activities (1 = yes)	0.526	0.500	0	1
Training in current livelihood activities (1 = yes)	0.453	0.498	0	1
Training in relevant skills (1 = yes)	0.606	0.489	0	1
Membership in community group (1 = yes)	0.415	0.493	0	1

Access to loan (1 = yes)	0.443	0.497	0	1
Access to health insurance (1 = yes)	0.630	0.483	0	1
Ownership of mobile phone (1 = yes)	0.882	0.323	0	1
Ownership of radio (1 = yes)	0.455	0.499	0	1
Ownership of TV (1 = yes)	0.630	0.483	0	1
Ownership of motorbike (1 = yes)	0.017	0.128	0	1
Income reason (1 = yes)	0.800	0.401	0	1

Source: Field survey, 2022

In terms of group membership, the analyses show that 41.5 percent of the sample are active members of community groups or association. As part of these community groups, the members discuss pertaining issues and identify appropriate interventions. These groups bring together different stakeholders to engage the members and facilitate the accumulation of social capital for interventions (Katungi et al., 2007; Musyoki et al., 2013; Aladegoroye et al., 2021). About 44.3 percent of the sample applied for and accessed loans from financial institutions. Studies points to the positive impact of credit, as it enhances productivity growth in livelihood activities (Misra et al., 2016; Lawal et al., 2009; Duong & Izumida, 2002). Thus, YHH accessing credit are able to enhance their businesses and livelihood activities through investment of finance.

4.2.1 Household dietary access

Youth headed households (YHH) have access to the diverse food groups in varying capacity indicating the required nutrients for their wellbeing. The 201 YHH who have diversified have HDD mean of 5.9. Whilst the 219 non-diversified have HDD mean of is 5.6. These results highlight the positive influence diversification have on access to the different food groups by household. Overall, YHH who have diversified are able to have 0.3 units more of the 12 food groups as the

dietary requirements for their wellbeing. Figure 4.1. depicts the distribution of access to the 12 food groups by the YHH.

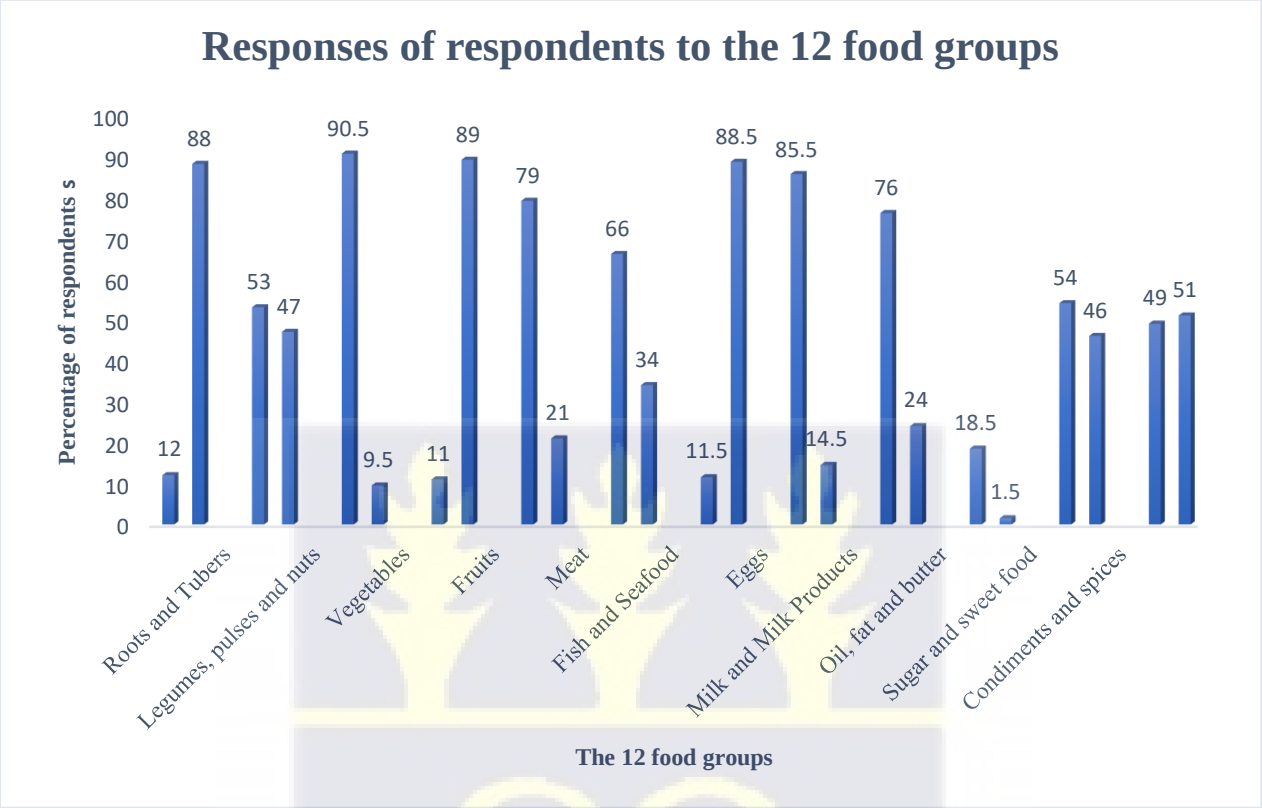

Figure 4.1: Responses of YHH to the 12 food Groups

The test of difference in household dietary diversity between diversified (5.94) and non-diversified (5.625) YHH indicate that there is a statistically significant difference in dietary diversity. Diversified households statistically consume 0.315 units more diverse diets than undiversified households. The results show that the number of food groups consumed by YHH who have diversified is significantly higher than those consumed by non – diversified YHH. This implies that diversified YHH are able to meet their daily nutrient requirements. The more food groups YHH include in their daily diet, the greater the likelihood of meeting nutrient requirements of the

body and overall wellbeing. This is because all nutrients cannot be found within a single food item (FAO, 2011; Labadarios et al., 2011). Table 4.2 tests the significant differences in access to food groups between diversified and non- diversified YHH (control group).

Overall, our descriptive results suggest that diversified YHH are more food secure and consume a more diverse diet than non-diversified YHH. This points to a positive relationship between livelihood diversification and YHH food security. These results align with Tambo et al., (2021) and Nigatu et al., (2018) and Mekuria et al., (2017) on the positive significance of household dietary diversity and food security.

Table 4. 2: Test of Difference in HDD between diversified and non-diversified YHH

Group	Obs	Mean	St. Err	Std. dev	95% Conf. interval	
No	224	5.63	.115	1.72	5.39	5.85
Yes	200	5.94	.120	1.70	5.70	6.17
Combined	424	5.77	.084	1.72	5.60	5.93
diff		.315	.167	.643	.013	

Note: diff = mean (No) – mean (Yes); t = -1.8830; H0: diff = 0; Degrees of freedom = 422; Ha: diff < 0; Ha: diff != 0; Ha: diff > 0; Pr(T < t) = 0.0302; Pr(|T| > |t|) = 0.0604; Pr(T > t) = 0.9698. Source: Field survey, 2022

4.3 Livelihood diversification strategies and relevant skills sets available

4.3.1 Livelihood strategies available to youth in communities.

Fisheries is the main occupation of the respondents in the study area. Distribution of respondents along the fisheries supply chain is as follows: respondents involved in processing (smoking, drying, frying) are the highest with 41 percent of the sample. The rest is as follows: fishermen make up 24 percent, 26 percent of respondents are in sale of fisheries, 6 percent as oyster pickers and 3 percent as porters (individuals who carry fish from the shore to other places for the customers

/ people who run errands at the shore related to fisheries) at the beaches and seashore. This is depicted in figure 4.2. Men are mostly into fishing whilst majority of women are into processing and marketing of fisheries. More of the processors are also into the bulk sale of fisheries to their customers who come from other communities and regions of the country. The results depict earlier works on the distribution of gender and roles along the fisheries supply chain (Bennett, 2005; Béné & Merten, 2008; Medard et al, 2002; Odotei, 2003; Demmke, 2006; Kurien, 2001).

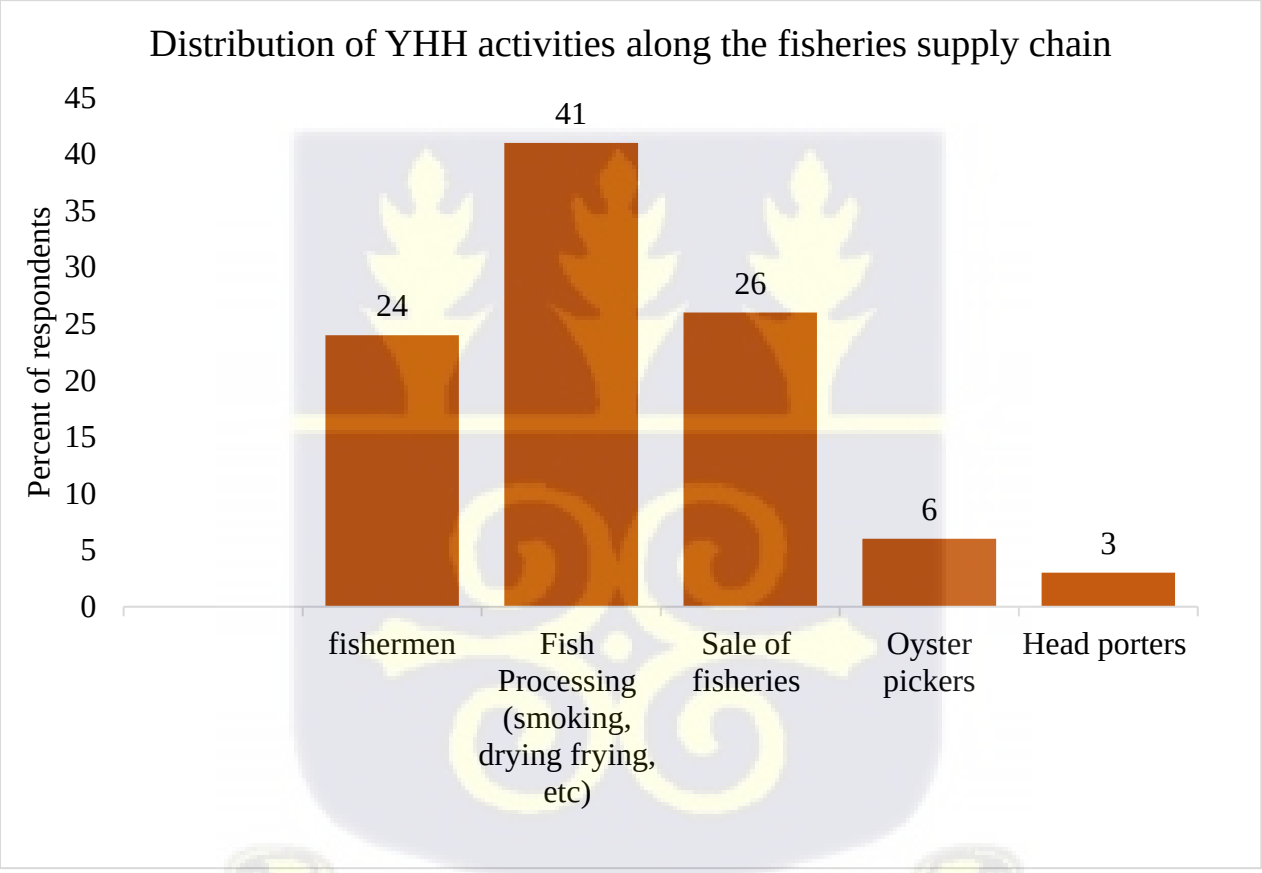

Figure 4:2 Distribution of respondents' activities along the fisheries supply chain

4.3.1.1 Secondary livelihoods of YHH

The study categorized YHH who are engaged in multiple activities to earn an income as households who have diversified. YHH who are into fisheries as the only occupation are classified as households who have not diversified. The study categorized the principal economic secondary livelihoods of YHH into three (3) and these are 1) Non-agricultural wage (labour on other people's farms, masonry, etc.); (2) Farm-based livelihoods (such as crop farming, livestock, labour etc.) (Melketo et al., 2020) and 3) Self-employed (such as trading, dressmaking, tailoring, hairdressing and driving).

Table 4.3: Secondary livelihoods of fisherfolk and average net incomes for a season

Livelihood diversification types	Count of diverse type	Percentage (%)	Average net fishery income based on diversification types (GHS)
Fishery only	219	51.65	241.91
Non-Agricultural Wage	4	0.94	932.50
Farm Based	4	0.94	173.25
Self Employed	197	46.46	290.42
Total	**424**	**100**	

Source: Field Survey 2022. The net incomes are calculated for a season during the data collection period in May, 2022.

From Table 4.3, a total of 219 YHH are engaged in fisheries only and this group make up the majority of the sample interviewed (52%). This category has an average net fishing income of GHS 241.91. About 197 (46.5 %) of the sample interviewed are self-employed as an alternate livelihood choice and this category has an average net fishing income of GHS 290.42. An equal number of respondents, 4 each (0.94%) are engaged in non- agricultural wage activities with an income of GHS 932.50 and farm-based activities with an income of 173.25 respectively. The results show that YHH who diversify into non- agricultural activities earn a higher income in

addition to fisheries, whilst those involved in farm-based activities earn the least with GHS173.25 in addition to fisheries. This implies YHH will earn higher income when they combine fisheries with non-agricultural activities. These activities align with Ellis' (1999) study of 30 – 50 percent diversified rural households in Africa and that of Mensah, (2014) who also reported of about 50 percent of households diversifying in Ghana. The findings also align with study of Roy & Basu, (2020) on the growing contribution of non-farm sectors in the income basket of rural households.

4.3.1.2 Net fishing income of categories of secondary livelihoods identified

The multivariate analysis of variance method (MANOVA) is then used to analyze the difference in the mean incomes of YHH categorized by the type of secondary livelihood activity they are engaged in. The results of the tests conducted using the Stata® software are as shown in table 4.4.

Table 4.4: Results of Tests for the Difference in Mean Net Fishing Income

Test	Statistic	df1	df2	F	Prob>F
Wilks' lambda	0.9829	3	420	2.44	0.0641*
Pillai's trace	0.0171	3	420	2.44	0.0641*
Lawley-Hotelling trace	0.0174	3	420	2.44	0.0641*
Roy's largest root	0.0174	3	420	2.44	0.0641*

Source: Field Survey 2022

From the results shown in Table 4.4, the probability value calculated in all 4 tests is 0.0641, which is less than the critical value of 0.05. Therefore, we reject the null hypothesis and conclude that mean incomes statistically differ with the types of diversification fisherfolks engaged in. Diversification into non -agricultural wage with fisheries provide the highest income for YHH in

coastal fishing communities. This implies that the choice of secondary livelihood affects the average net fishing income for the previous fishing season of 2022 for fisherfolks.

4.3.2 Relevant skills set available for youth headed households

Respondents were asked whether they have had any form of training or skills before they engaged in either their primary or secondary livelihood activities. The responses are reported in table 4.5.

Table 4.5: Relevant skill sets

Skills	Frequency	Percent
Individual skills:		
Business management and development	24	7
Technical and vocational training	239	72
Financial management training	29	9
*More than one training	38	12
Total	**330**	**100**
**More than one training /combination of skills*:		
Business & technical training	11	29
Business & financial training	2	5
Technical & financial training	16	42
Business, technical & financial	9	24
Total	**38**	**100**

Note: *A total of 330 (78%) out of 424 respondents have had some form of capacity building in one or more of these areas. Source: Field Survey 2022

The livelihood skills captured in this study include but are not limited to technical and vocational abilities (carpentry, sewing, computer programming, etc.), business management, entrepreneurial, and money management skills. The respondents indicated they benefitted from such trainings from NGOs such as the Development Action Association (DAA), Central and Western Fishmongers Improvement Association (CEWEFIA) and other fisheries related organizations. These

organizations provide trainings ranging from technical to financial to support their livelihoods. They are able to apply the skills learnt to their various livelihood activities.

The results show a total of 330 (78 percent) of the 424 respondents have had some form of skill training either for the main or secondary livelihood strategy. Of the 330 who responded ***yes*** to skill training, 72 percent have had some form of technical and vocational training. The least is 7 percent, these are respondents who have had some form of business management and development training. Nine (9) percent of respondents have acquired some skills through financial management training. About 3 percent of the youth engaged (frequency of 9 persons in total (330)) have skills in all areas (Business, technical and financial) to effectively engage in diversification.

4.3.3 Test of statistical significance of socioeconomic characteristics

The test of statistical significance (Table 4.6) demonstrates the relationship between gender and diversification and shows a p-value of 0.497. This implies that the relationship is not statistically significant and implies that there is no evidence of an association between gender and livelihood diversification. That is, there are no statistical differences in livelihood diversification between males and females of youth headed households in coastal communities.

With respect to the association between age and livelihood diversification, the results show that there is a statistically significant relationship between these two variables, as the p-value is 0.014. This implies that there is a qualitative association between age and livelihood diversification. The relationship between livelihood diversification and marital status indicates a p-value of 0.451. This is statistically insignificant and implies there is no evidence of an association between marital

status and livelihood diversification, meaning there are no statistically significant differences in livelihood diversification of married and unmarried youth in coastal communities. The association between education and livelihood diversification has results that show that there is a statistically significant relationship between these two variables, as the p-value is 0.061. This implies that there is an association between educated and uneducated youth headed households and livelihood diversification in coastal communities.

Table 4.6: Test of statistical significance of socioeconomic characteristics

	Livelihood diversification		
Variable	**Not diversified**	**Diversified**	***p-value***
Gender			0.497
Female	146	124	
Male	78	76	
Age			0.014
18	3	1	
19	2	0	
20	7	7	
21	3	10	
22	6	11	
23	14	8	
24	12	12	
25	22	10	
26	13	6	
27	13	10	
28	16	7	
29	6	18	
30	12	21	
31	19	11	
32	27	18	
33	21	19	
34	9	11	
35	19	20	
Marital status			0.451
Not married	128	107	
Married	96	93	
Education			0.061
No Formal schooling	52	46	
Primary	73	44	
Junior Secondary	70	72	
Senior Secondary	25	28	
Tertiary	4	10	
Region			0.918
Greater Accra	112	99	
Central	112	101	

Variable	Livelihood diversification		*p-value*
	Not diversified	**Diversified**	
Training in relevant Skills			0.019
Trained	100	67	
Not trained	124	133	
Training in previous Livelihood activities			0.086
No	115	86	
Yes	109	114	
Training in current Livelihood activities			0.000
No	141	91	
Yes	83	109	
Household size			0.888
1	6	5	
2	24	23	
3	46	35	
4	50	39	
5	38	44	
6	31	22	
7	17	19	
8	8	7	
9	2	2	
10	2	2	
11	0	1	
13	0	1	
Access to loan			0.043
No	135	101	
Yes	89	99	
Access to health insurance			0.072
No	74	83	
Yes	150	117	
Membership in community group			0.003
No	146	102	
Yes	78	98	
Ownership of a radio			0.002
No	138	93	
Yes	86	107	
Ownership of TV			0.679
No	85	72	
Yes	139	128	
Ownership of Motorbike			0.039
No	223	194	
Yes	1	6	
Ownership of Mobile Phone			0.092
No	32	18	
Yes	192	182	

Source: Field Survey 2022

The relationship between location of youth in coastal communities and livelihood diversification indicates a p- value of 0.918. The relationship is not statistically significant and implies there is no evidence of an association between location and livelihood diversification of YHH in coastal communities. With the relationship between current livelihood trainings and livelihood diversification, the p- value is 0.000. The results show that there is a statistically significant relationship between these two variables, as the p-value is 0.000. This implies that current livelihood trainings positively influence livelihood diversification of youth headed households in coastal communities.

The relationship between access to loan and diversification shows a p-value of 0.043. This implies that the relationship is statistically significant and implies that there is evidence of an association between access to credit (loan) and livelihood diversification. That is access to credit positively influence livelihood diversification for youth headed households in coastal communities. These results align with earlier studies (Amevenku et al., 2019; Amfo & Ali, 2020; Ayana et al., 2022; Etea et al., 2019; Khan et al., 2020; Musumba et al., 2020).

The relationship between members of community group and livelihood diversification shows a p-value of 0.003. The p- value shows a statistically significant relationship between these two variables. This implies a positive influence of association between members of community groups/associations on livelihood diversification of youth headed households in coastal fishing communities.

With respect to the association between access to radio and livelihood diversification, the results show that there is a statistically significant relationship between these two variables, as the p-value is 0.002. This implies that there is association between access to radio and livelihood diversification of youth headed households in coastal fishing communities.

The relationship between access to motorbike and livelihood diversification has a p- value of 0.039. The p-value show that there is a statistically significant relationship between these two variables. There is a qualitative association between access to motorbike and livelihood diversification of youth headed households in coastal fishing communities. The relationship between ownership of mobile phones and livelihood diversification shows a p- value of 0.092. The results show that there is a statistically significant relationship between these two variables. This implies that there is association between ownership of mobile phones and livelihood diversification of youth headed households in coastal communities.

4.4 Determinants of choices of livelihood diversification strategies of youth headed households

It is estimated that certain factors drive youth headed households to diversify their livelihoods and as such tests were run to determine these factors for the coastal communities. The results of the determinants of livelihood diversification of fishing households are reported in Table 4.7.

Table 4.7: Determinants of choices of livelihood diversification strategies

Variable	Coefficient	Marginal effect
Gender	-0.185	-0.073
	(0.155)	(0.611)
Age	-0.001	-0.001
	(0.008)	(0.002)
Household size	0.043	0.017
	(0.039)	(0.015)
Marital status	-0.083	-0.033
	(0.151)	(0.601)
Primary	-0.314*	-0.124
	(0.183)	(0.070)
Junior Secondary School education	0.003	0.001
	(0.184)	(0.073)
Senior Secondary School education	0.085	0.034
	(0.251)	(0.100)
Tertiary education	0.633	0.242
	(0.409)	(0.142)
Access to loan	0.211	0.084
	(0.141)	(0.056)
Access to health insurance	-0.234*	-0.093
	(0.140)	(0.055)
Location	-0.046	-0.018
	(0.137)	(0.055)
Training in relevant skills	-0.455	-0.179
	(0.325)	(0.126)
Membership in community group	0.371***	0.147
	(0.137)	(0.054)
Income reason	-0.038	-0.015
	(0.163)	(0.065)
Primary occupation in fishery	0.007	0.003
	(0.147)	(0.058)
Ownership of radio	0.407***	0.161
	(0.152)	(0.059)
Ownership of TV	-0.295*	-0.117
	(0.161)	(0.064)
Ownership of motorbike	1.150*	0.391
	(0.675)	(0.155)
Ownership of mobile phone	0.106	0.042
	(0.204)	(0.080)
Training in previous livelihood activities	0.180	0.072
	(0.248)	(0.098)
Training in current livelihood activities	0.630***	0.247
	(0.206)	(0.078)
Constant	-0.328	
	(0.377)	
Observations	424	
Wald chi-square	47.748***	
Pseudo R-square	0.086	
Log pseudolikelihood	-268.096	

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; Standard errors in parentheses; Source: Produced by author using Primary Data 2022.

The Wald Chi-square is statistically significant at 1 percent meaning that the overall model is good. This implies a good fit of the model given the data. The results show these variables as significant determinants of livelihood diversification for the study. These are ownership of assets, social grouping and institutional characteristics. Except primary education which influence diversification positively, HH characteristics are not significant, implying similar traits of YHH. Ownership of assets are significant and influence diversification positively except TV. Social grouping (group membership) and institutional characteristics (training in current livelihood activities) positively influence diversification.

Education is a key source of human capital and it creates opportunities for engaging in different livelihood activities (Reardon *et al*., 2006; Yunez-Naude and Taylor, 2001) and lack of education restricts access to entry of different livelihood activities. Respondents who have received primary education as an aspect of human capital are more likely to diversify relative to YHH who have not received primary education. Specifically, YHH who received primary education are 12. 4 percent more likely to engage in livelihood diversification. This meets the a-priori expectation of education opening up YHH to different diversification strategies in coastal communities. It is in line with similar studies on positive influence of education on diversification (Alemu, 2023; Khatun & Roy, 2012; Adugna, 2012; Agyeman et al., 2014; Nghiem' 2010; Emeru et al., 2022; Khan et al., 2020; Kumari & Murthy, 2022; Musumba et al., 2020; Patidar & Chothodi, 2021; Saba et al., 2022). Diversification with fisheries requires the understanding of the environment to be able to identify opportunities, risk analysis and future trend forecast (Etea et al., 2019). for YHH.

Other household characteristics such as gender, age, marital status. household size and location are all not significant for the study. These outcomes of the characteristics do not meet the a- priori expectation. Gender and age were expected to bi-directional in terms of the influence on diversification. Evidence shows males are more likely to diversify (Adem & Tesafa, 2020; Ellis, 1999; Olale et al., 2010; Yishak, 2017; Yussuf & Mohamed, 2022) with a few studies (Asfaw et al., 2019; Kassegn & Abdinasir, 2023) indicating otherwise. Age mainly has positive influence on diversification (Adem et al, 2018; Dadi et al., 2022; Emeru et al., 2022) and negative influence of livelihood diversification (Alemu, 2023; Kidan & Tafesse, 2023; Samuel et al., 2019; Maniriho & Nilsson, 2018; Toyin & Abbyssiania, 2017; Shaga et al., 2021).

Marital status and household size do not influence diversification for the study. However, studies (Demissie & Legesse, 2013; Teshome & Edriss, 2013; Zerai & Gebreegziabher, 2011; Adepoju & Obayelu, 2013; Amevenku et al., 2019; Asravor, 2017; Asfaw et al., 2019; Alobo Loison & Bignebat, 2017; Bird et al., 2022) report households with more members are involved in diversification and such household members. These households use other members to engage in non-farm activities to increase and stabilize their household income.

Social grouping (group membership / association) positively influence diversification for youth headed households. Respondents who belong to community groups or associations are 14.7 percent more likely to engage in livelihood diversification relative to respondents who are not in any group in the community. This evidence may be pointing to access to information and group influence in engaging in livelihood diversification. Community groups and associations may provide information and knowledge on alternative economic activities that stimulate the interest

of members to diversify their livelihoods. Some of the knowledge shared in the groups are technical, financial, and basic managerial skills to ensure the start-up, sustainability, and growth of enterprises. Respondents who have diversified their activities either benefitted from such trainings directly or the knowledge are passed down in the family (Bishar & Abduselem, 2022; Robeyns, 2005; Berner & Phillips, 2005; Graig & Mayo, 1995). The results align with Couto & Guthrie, (1999); Sterwart, (2005); Robeyns, (2005); Berner & Phillips, (2005); Graig & Mayo, (1995) who indicates group membership influences low cost access to information, input supply, savings and credit, informal insurance, organizing market access (Mknelly & Kevane, 2002; Weinberger & Jüting, 2000; Narayan & Prichett, 2000).

Ownership of assets (radio, motobike and mobile phones) all have positive influence on diversification. On the other hand, ownership of TV influence diversification negatively. YHH are more likely to diversify when own a radio. In specific terms, radio owners are 16.1 percent more likely to diversify than those who do not own a radio. This observation is explained by access to information. Owners of radio are spurred to engage in livelihood activities through the information they receive. For example, advertising of various businesses from radio may stimulate interests in venturing into similar businesses. This supports empirical evidence by Tetteh (2007) on women's activities in the Ghanaian fishery sector. Her research indicated that fishmongers who are more connected in terms of access to information are able to market their fish faster compared to their counterparts who are less connected. This is because they obtain information about market opportunities from different channels. This result meets a priori expectations and supports existing literature

Households that have access to motorbikes are 39.1 more likely to diversify compared to households who do not have motorbikes. Access to motorbike in such communities is higher, faster and more affordable thus making it easier for YHH to diversify into other economic ventures.

However, households are less likely to diversify when they have access to TV. YHH who have access to TV are 11.7 percent less likely to diversify compared to those who do not have TV. Though the TV is a channel for information dissemination, it can be explained that households who have TV do not have enough time to watch it as they go about their businesses. Thus, TV generally does not serve as a means of motivation for diversification in these coastal communities.

Overwhelmingly, access to extension (training in current livelihood) is a positive determinant of livelihood diversification. Training in current livelihood has a positive coefficient and implies that respondents who have received training in current livelihood activities are more likely to engage in livelihood diversification. Specifically, respondents who received training are 24.7 percent more likely to diversify relative to respondents who have not received training in their current livelihood.

This observation meets expectation as capacity building in livelihood activities provides the technical capacity and appropriate skills for people to engage in alternative economic activities, especially in line with the area of training. For example, fisherfolks who have benefited from soap making training programmes can make soap and thus substitute time from fishery activities into soap making and marketing. There is a switch back to fisheries during the bumper season as the alternate activity does not take their full time. This meets a priori expectation and supports previous studies (e.g., Alemu, 2023; Asfaw et al., 2019; Dinku, 2018; Emeru et al., 2022; Matsuura

et al., 2023; Amevenku et al., 2019; Asravor, 2017). Extension access provided the means of training, skills and knowledge to diversify their livelihoods (Amevenku et al., 2019).

4.5 Impact of livelihood diversification on Food Security

Two indicators, the household dietary diversity (HDDS) and the household food insecurity access scale (HFIAS) that measure availability and access of food security are employed to measure impact of livelihood diversification on food security of youth headed households.

4.5.1 Test for endogeneity of instruments

To test for the endogeneity in the equations, two instrumental variables, Training in current livelihood activities and average number of people diversifying in communities (Table 4.8) are selected as the instruments. The instrumental variables are used to test for exogeneity of the two variables, livelihood diversification on food security status. Based on the test, which is an OLS estimation, both instrumental variables are not statistically significant. This implies there is no endogeneity and thus the primary model can be run. This simply means though these two instruments motivate diversification, it does not directly influence food security. But diversification has a direct association with food security.

Table 4.8: Exogeneity of instruments

Variable	HDDS	HFIAS
Training in current livelihood activities	0.418	0.014
	(0.741)	(0.204)
Average no. of people diversifying in community	0.211	2.134*
	(1.482)	(1.161)
Gender	-0.080	-0.322**
	(0.196)	(0.161)
Age	0.007	0.022***
	(0.010)	(0.008)

Variable	HDDS	HFIAS
Household size	-0.163***	-0.077*
	(0.050)	(0.040)
Marital status	0.339*	-0.188
	(0.194)	(0.155)
Primary education	0.300	0.190
	(0.234)	(0.195)
Junior Secondary School education	-0.044	0.313
	(0.237)	(0.196)
Senior Secondary School education	0.255	0.645**
	(0.320)	(0.251)
Tertiary education	0.199	1.400***
	(0.520)	(0.383)
Access to loan	0.136	-0.172
	(0.178)	(0.142)
Access to health insurance	0.164	0.047
	(0.176)	(0.141)
Training in relevant skills	-0.841**	-0.022
	(0.397)	(0.320)
Membership in community group	0.201	-0.238*
	(0.175)	(0.140)
Income reason	-0.030	-0.222
	(0.207)	(0.159)
Primary occupation in fishery	0.143	0.019
	(0.193)	(0.155)
Ownership of radio	0.417**	0.090
	(0.188)	(0.148)
Ownership of TV	0.262	0.487***
	(0.199)	(0.165)
Ownership of motorbike	0.479	0.194
	(0.652)	(0.459)
Ownership of mobile phone	-0.079	0.660***
	(0.261)	(0.250)
Training in previous livelihood activities	0.582*	0.116
	(0.307)	(0.248)
Regional dummy	0.697***	0.201
	(0.172)	(0.136)
Constant	4.946***	
	(0.786)	
Cut1		2.825***
		(0.646)
Cut2		3.307***
		(0.649)
Cut3		3.581***
		(0.651)
Observations	424	424
F-statistics/LR Chi-square	2.907***	73.807***
R-squared	0.138	

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; Standard errors in parentheses; HDDS is household dietary diversity; HFIAS is household food insecurity access scale; Source: Produced by the author using Primary Data 2022.

4.5.2 Impact of Livelihood Diversification on Food Security

After testing for the exogeneity of the instruments used in estimating the HFIAS model (Table 4.8), the results of the impact of livelihood diversification on the two measures of food security (i.e., HDDS and HFIAS) are reported in Table 4.9 and Table 4.10. As described in the methods, the HDDS model is estimated using the inverse probability weighted regression adjustment (IPWRA) model. The two treatments, average treatment effects on the treated (ATT) and average treatment effect (ATE) are estimated. On the other hand, the HFIAS model is estimated using the extended ordered probit model, where the generic impact of livelihood diversification on HFIAS is estimated before treatments are generated (see Table 4.11).

From Table 4.9, the livelihood diversification outcome is significant at 1 percent with a positive coefficient of 2.043 for the HDD of the ATE. The result is quite similar for the HDD of the ATT which has a 1 percent significant level with a positive coefficient of 1.921. This indicates that YHH who diversify their livelihoods consume 2.043 more of the 12 different food groups for their diets. The implication is that such YHH are more food secured compared to YHH that are not diversified. For the HFIAS, the livelihood diversification is significant at 1 percent with a positive coefficient of 1.426 (Table 4.10). This indicates YHH who diversify are more likely to be food secured compared to their counterparts who do not diversify. Thus, this evidence shows that diversified YHH has better food security outcomes than YHH that are not diversified.

Table 4.9: Impact of livelihood diversification on household dietary diversity (HDD)

	HDDS (ATE)			HDDS (ATT)		
Variable	**HDDS0**	**HDDS1**	**LD1**	**HDDS0**	**HDDS1**	**LD1**
Livelihood diversification		2.043***			1.921***	
		(0.074)			(0.085)	
Gender	-0.440	0.490*	-0.179	-0.415	0.469*	-0.179
	(0.270)	(0.271)	(0.156)	(0.317)	(0.271)	(0.156)
Age	0.020*	-0.013	-0.004	0.019*	-0.007	-0.004
	(0.011)	(0.014)	(0.008)	(0.011)	(0.013)	(0.008)
Household size	-0.271***	-0.032	0.046	-0.253***	-0.019	0.046
	(0.068)	(0.065)	(0.039)	(0.077)	(0.060)	(0.039)
Marital status	0.389	0.254	-0.067	0.184	0.251	-0.067
	(0.271)	(0.267)	(0.152)	(0.334)	(0.264)	(0.152)
Primary education	0.088	0.006	-0.334*	-0.069	0.322	-0.334*
	(0.282)	(0.343)	(0.184)	(0.311)	(0.352)	(0.184)
Junior Secondary School education	-0.034	-0.360	-0.002	-0.107	-0.080	-0.002
	(0.292)	(0.317)	(0.184)	(0.303)	(0.314)	(0.184)
Senior Secondary School education	0.111	0.109	0.059	0.019	0.275	0.059
	(0.398)	(0.407)	(0.251)	(0.431)	(0.407)	(0.251)
Tertiary education	-0.558	0.462	0.460	-0.719	0.576	0.460
	(0.485)	(0.564)	(0.421)	(0.446)	(0.546)	(0.421)
Access to loan	0.001	0.191	0.222	0.044	0.347	0.222
	(0.242)	(0.237)	(0.142)	(0.258)	(0.240)	(0.142)
Access to health insurance	-0.154	0.252	-0.234*	-0.251	0.195	-0.234*
	(0.245)	(0.255)	(0.141)	(0.271)	(0.253)	(0.141)
Training in relevant skills	-0.102	-0.531	-0.416	-0.115	-0.775**	-0.416
	(0.427)	(0.397)	(0.324)	(0.480)	(0.386)	(0.324)
Membership in community group	0.380*	0.212	0.375***	0.556**	0.034	0.375***
	(0.228)	(0.259)	(0.137)	(0.253)	(0.254)	(0.137)
Income reason	-0.326	0.455**	-0.038	-0.279	0.437*	-0.038
	(0.292)	(0.221)	(0.163)	(0.343)	(0.233)	(0.163)
Primary occupation in fishery	0.221	0.074	-0.080	0.148	0.010	-0.080
	(0.267)	(0.302)	(0.152)	(0.306)	(0.288)	(0.152)
Ownership of radio	0.474*	-0.026	0.408***	0.467	0.122	0.408***
	(0.254)	(0.275)	(0.153)	(0.297)	(0.285)	(0.153)
Ownership of TV	0.525**	0.348	-0.302*	0.660**	0.192	-0.302*
	(0.250)	(0.299)	(0.161)	(0.283)	(0.295)	(0.161)
Ownership of motorbike	2.267***	-0.425	1.237*	2.280***	-0.188	1.237*
	(0.409)	(0.595)	(0.650)	(0.458)	(0.576)	(0.650)

Variable	HDDS (ATE)			HDDS (ATT)		
	HDDS0	**HDDS1**	**LD1**	**HDDS0**	**HDDS1**	**LD1**
Ownership of mobile phone	0.032	0.032	0.077	0.042	-0.033	0.077
	(0.352)	(0.428)	(0.205)	(0.403)	(0.433)	(0.205)
Training in previous livelihood activities	0.618	0.336	0.131	0.813	0.536	0.131
	(0.432)	(0.381)	(0.249)	(0.495)	(0.359)	(0.249)
Regional dummy	0.439*	0.854***	0.061	0.352	0.860***	0.061
	(0.224)	(0.232)	(0.138)	(0.259)	(0.236)	(0.138)
Training in current livelihood activities			0.608***			0.608***
			(0.206)			(0.206)
Average no. of people diversifying in community			2.414**			2.414**
			(1.191)			(1.191)
Constant	5.263***	5.065***	-1.385**	5.211***	4.863***	-1.385**
	(0.645)	(0.614)	(0.615)	(0.699)	(0.615)	(0.615)
Potential outcomes mean (LivDiv = 0)	5.740***			5.879***		
	(0.113)			(0.136)		
Observations	424					

Note: * p < 0.1, ** p < 0.05, *** p < 0.01; Standard errors in parentheses; HDDS is household dietary diversity; LD is livelihood diversification; HDDS estimated using inverse-probability-weighted regression adjustment (ipwra); HDDS1 is HDDS of YHH who are diversified; HDDS0 is HDDS of YHH who are non-diversified. Source: Produced by the author using Primary Data 2022.

Table 4.10: Impact of livelihood diversification on household food insecurity access scale (HFIAS)

Variable	HFIAS	LD
Livelihood diversification	1.426***	
	(0.224)	
Gender	-0.173	-0.201
	(0.152)	(0.154)
Age	0.018**	-0.002
	(0.007)	(0.008)
Household size	-0.081**	0.043
	(0.038)	(0.039)
Marital status	-0.116	-0.030
	(0.139)	(0.146)
Primary	0.326*	-0.340*
	(0.174)	(0.176)
Junior Secondary School/Middle School	0.219	0.045
	(0.174)	(0.182)
Senior Secondary School/Technical/Vocational	0.453*	0.128
	(0.239)	(0.254)
Tertiary	0.884**	0.332
	(0.389)	(0.418)
Access to loan	-0.228*	0.148
	(0.130)	(0.147)
Access to health insurance	0.151	-0.260*
	(0.132)	(0.139)
Training in relevant skills	-0.105	-0.225
	(0.216)	(0.307)
Membership in community group	-0.373***	0.315**
	(0.130)	(0.143)
Income reason	-0.171	-0.017
	(0.151)	(0.165)
Primary occupation in fishery	0.065	-0.122
	(0.126)	(0.143)
Ownership of radio	-0.141	0.390***
	(0.143)	(0.146)
Ownership of TV	0.519***	-0.296*
	(0.142)	(0.155)
Ownership of motorbike	-0.398	1.275**
	(0.451)	(0.537)
Ownership of mobile phone	0.467**	0.102
	(0.203)	(0.195)
Training in previous livelihood activities	0.097	0.053
	(0.222)	(0.243)
Regional dummy	0.139	0.077
	(0.124)	(0.133)
Training in current livelihood activities		0.467**
		(0.183)
Average no. of people diversifying		3.012***
		(0.908)
Constant		-1.704***
		(0.533)
Cut1	1.944***	
	(0.383)	
Cut2	2.307***	
	(0.405)	
Cut3	2.515***	
	(0.412)	
Corr(e.livdiv and e.hfias)		-0.852***
		(0.128)
Observations	424	

Wald Chi-square	165.008***
Log likelihood	-628.199

Note: * p < 0.1, ** p < 0.05, *** p < 0.01; Standard errors in parentheses; HFIAS is household food insecurity access scale; LD is livelihood diversification; HFIAS is estimated using extended ordered probit
Source: Produced by the author using Primary Data 2022.

Household size is significant at 1 percent with a negative coefficient of 0.219 for HDDS whilst it is significant at 5 percent with a negative coefficient of 0.097 for HFIAS. Bigger household size is associated with higher HFIAS (Ragasa et al., 2019) and lower access to house dietary requirements. This implies youth headed households (YHH) consume less of the 12 different food groups when they come from a bigger household whilst the opposite is for YHH from smaller households. This then implies that YHH that have larger numbers are less likely to meet their daily dietary requirements for their wellbeing and thus are food insecure. This aligns with studies (Beyene & Muche, 2010; Awoyemi et al., 2023) who explained that an increase in the household size increases the number of people to be fed and taken care of. This therefore limits the quantity and quality of the food accessed and consumed.

In terms of education, primary education is significant at 1 percent with a positive coefficient 0.572 for HDDS and 0.336 for HFIAS. This implies that YHH with primary education are able to consume 0.572 more of the 12 different food groups compared to those with no primary education. YHH with primary education are 0.336 more likely to be food secured compared to their counterparts who do not have primary education. This can be explained to be as the educational status of a household head increases, the probability of consuming more of the 12 food groups increases, which improve their daily dietary requirements and overall wellbeing thereby increasing their food security status. Also, as the educational level of YHH increases they are less likely to be food insecure. This is because educated YHH have better knowledge, skills, capabilities and experience to search for different sources of income and make better food choices. These results align with other studies by Ahmed et al., (2018), Gecho, (2017)

and Muluneh (2022). HDDS for secondary and tertiary education respondents is not significant but it is significant for HFIAS. The significance is at 5 percent with a positive coefficient of 0.508 for secondary and 1.027 for tertiary. This implies YHH with secondary and tertiary education are more likely to be food secured with 0.508 and 1.027 as additional units respectively, compared to those with no education. It can be deduced that generally, the higher the level of education the less likely the YHH will diversify. This means that the more educated the YHH the more likely the YHH will specialize in one activity rather than diversification.

For membership in community group, the HDDS is not significant, however it is significant at 1 percent with a negative correlation of 0.421 for HFIAS. This implies YHH who are members of groups in the communities are less likely to have available and access to food compared to their counterparts. This contradicts the findings on the positive influence of group memberships on food security through improved market access, better production practices, access to credit amongst others (Ingutia & Sumelius, 2021; Nkomaki et al., 2019; Shumeta & D'Haese, (2018); Zeweld et al., 2015).

Generally, it can be explained as youth headed households (YHH) who are into different livelihood activities experience lower food insecurity, through having access to the 12 food groups to meet the daily dietary requirements. Also, YHH who have diversified are able to reduce their food insecurity and improve their food security status. These results align with other studies on the influence of food security by livelihood diversification Hanazaki, (2013); Onunka & Olumba, (2017); and Olawuyi & Olawuyi, (2022) found that food security among farming households was influenced by livelihood diversification.

After estimating the parameters of the HFIAS model, Table 4.11 reports the specific treatment effect of livelihood diversification on HFIAS.

Table 4.11: Treatment effect of impact of diversification on food security outcomes

Outcome	ATE estimate	Standard error
HDDS	2.043***	0.074
HFIAS (Pr0)	-0.461***	0.074
HFIAS (Pr1)	0.064***	0.014
HFIAS (Pr2)	0.048***	0.011
HFIAS (Pr3)	0.348**	0.084

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; HDDS is household dietary diversity; HFIAS is household food insecurity access scale; Pr0, Pr1, Pr2 and Pr3 are the respective estimates for the first, second, third and fourth categories of HFIAS.

The results show the ATE estimates for the four categories of HFIAS outcomes. The ATE estimate for the first category (Pr0) HFIAS outcome is significant at 1 percent with a negative coefficient of 0.461. This explains that diversified YHH are 46.1 percent less likely to be severely food insecure. The outcome for the HFIAS ATE estimates for the second (Pr1) and third (Pr2) classes are significant at 1 percent with positive coefficients of 0.064 and 0.048 respectively. These imply that diversified YHH are 6.4 percent and 4.8 percent more likely to be moderately and mildly food secure. The ATE estimate for the food secured (Pr3) of HFIAS is significant at 5 percent with a positive coefficient of 0.348. The implication is that YHH who diversify are 34.8 percent more likely to be food secured. Therefore, diversified YHH are food secure and less likely to be severely food insecure.

The transmission mechanism through which livelihood diversification affects food security is through boosting income of fisheries households. Table 4.12 presents tests of means of total income and income from only fisheries.

Table 4.12: Test of means of income of youth headed households

Variable	Diversification status		Difference
	Diversified (n = 200)	Not diversified (n = 224)	
Total income	3008.231	1589.944	1418.287***
Fisheries income	1442.447	1589.944	-147.4969
	Regional status		
	Greater Accra (n = 211)	Central (n = 213)	
Total income	2111.892	2404.622	-292.7298
Fisheries income	1406.39	1633.279	-226.8885

Source: Field survey, 2022

The results in Table 4.12 indicate that there is a statistically significant difference in total income between households that diversified and those that did not diversify. Specifically, households that diversified earn GHS1,418.287 more in total income per annum than households that did not diversify. However, there is no statistically significant difference in income from fisheries between households that diversified and those that did not diversify.

This means that diversified and non-diversified households make similar income from their primary activities in fisheries. The implication of these observations is that income from diversification is the reason why diversified households have more total income than non-diversified households. Therefore, the positive impact of diversification on food security is through income from diversification that enables these diversified households to purchase food to boost their food security status. While there are statistically significant differences in total income and fisheries income between diversified and non-diversified youth headed households, there are no statistically significant differences in the two incomes between the Greater Accra and Central regions.

4.5.3 Testing robustness of baseline estimates

To test the robustness of the models, two alternative econometric models are estimated, and results reported in Table 4.13. The extended linear model is used to estimate the model for HDDS and the ordered probit control function is used for the HFIAS model. The results show that livelihood diversification has a positive impact on HDDS and HFIAS. Specifically, diversified households consume 2.56 more food groups than households who are not diversified. Further, diversified households are 1.012 more likely to be food secured relative to households who are not diversified. These results confirm the results of the baseline estimates, where diversification is found to boost food security.

Table 4.13: Impact of livelihood diversification on food security outcomes (robustness tests)

Variable	HFIAS	LD	HDDS	LD
Livelihood diversification	1.012***		2.526**	
	(0.022)		(0.999)	
Gender	-0.265	-0.179	0.083	-0.166
	(0.164)	(0.156)	(0.238)	(0.156)
Age	0.024***	-0.004	0.008	-0.003
	(0.008)	(0.008)	(0.012)	(0.008)
Household size	-0.093**	0.046	-0.202***	0.046
	(0.040)	(0.039)	(0.057)	(0.037)
Marital status	-0.170	-0.067	0.410*	-0.101
	(0.150)	(0.152)	(0.232)	(0.152)
Primary	0.337	-0.334*	0.584**	-0.358**
	(0.216)	(0.184)	(0.293)	(0.181)
Junior Secondary School/Middle School	0.305	-0.002	-0.045	-0.010
	(0.199)	(0.185)	(0.277)	(0.185)
Senior Secondary School/Technical/Vocational	0.629**	0.059	0.189	0.057
	(0.261)	(0.251)	(0.337)	(0.240)
Tertiary	1.326***	0.460	-0.323	0.439
	(0.390)	(0.422)	(0.589)	(0.405)
Access to loan	-0.252*	0.222	-0.063	0.194
	(0.147)	(0.142)	(0.214)	(0.143)
Access to health insurance	0.138	-0.234*	0.373	-0.248*
	(0.155)	(0.141)	(0.231)	(0.141)
Training in relevant skills	-0.085	-0.416	-0.413	-0.500*
	(0.278)	(0.324)	(0.376)	(0.302)
Membership in community group	-0.368**	0.375***	-0.146	0.392***
	(0.165)	(0.137)	(0.234)	(0.138)
Income reason	-0.214	-0.038	-0.005	0.029
	(0.160)	(0.164)	(0.251)	(0.183)
Primary occupation in fishery	0.085	-0.080	0.148	-0.042
	(0.144)	(0.152)	(0.225)	(0.154)
Ownership of radio	-0.068	0.408***	0.040	0.344**
	(0.177)	(0.153)	(0.275)	(0.157)
Ownership of TV	0.589***	-0.302*	0.537**	-0.236
	(0.166)	(0.161)	(0.241)	(0.161)
Ownership of motorbike	-0.202	1.237*	-0.428	1.175**

Variable	HFIAS	LD	HDDS	LD
	(0.527)	(0.651)	(0.912)	(0.550)
Ownership of mobile phone	0.632***	0.077	-0.172	0.133
	(0.232)	(0.205)	(0.334)	(0.215)
Training in previous livelihood activities	0.147	0.131	0.419	0.150
	(0.269)	(0.250)	(0.359)	(0.253)
Regional dummy	0.186	0.061	0.641***	0.061
	(0.135)	(0.138)	(0.204)	(0.137)
Training in current livelihood activities		0.608***		0.703***
		(0.206)		(0.165)
Average no. of people diversifying		2.414**		1.965*
		(1.192)		(1.094)
Livelihood diversification residual	-0.821***			
	(0.018)			
Constant		-1.385**	4.145***	-1.280**
		(0.616)	(0.632)	(0.555)
cut1	2.294***			
	(0.490)			
cut2	2.775***			
	(0.498)			
cut3	3.050***			
	(0.499)			
Corr(e.liv and e.hdds)				-0.736***
				(0.200)
Observations	424	424		424
Wald Chi-square	77.119***	50.907***		49.815***
Log likelihood	-364.073	-265.969	-1065.526	

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; Standard errors in parentheses; HDDS is household dietary diversity; LD is livelihood diversification; HFIAS is household food insecurity access scale; HDDS model estimated using extended linear regression; HFIAS model estimated using control function ordered probit; LD in column 5 is the first stage probit model used in estimating livelihood diversification residual; Source: Produced by the author using Primary Data 2022.

4.6 Gendered roles in fisheries in coastal communities

A total of 180 individuals from 10 communities participated in the FGD for the study in the two regions. Central region had 44 males and 48 females participate in the activity whilst 44 women and 44 men participated in the Greater Accra region focus group discussions respectively. Table 4.14 and 4.15 shows the breakdown of the numbers by district, community and male and females.

Table 4.14: Table of region, districts and participants for FGD in the Central region

Central region			
District	Community	*FGD	Number of participants
Mfantsiman	Anomabo	2 (1 male, 1female)	Women (10) Men (8)
Abura Asebu Kwamankese	Moree	2 (1male, 1female)	Women (10) men (9)
Komenda Edina Eguafo Abirim	Elmina	0	
	Komenda	2 (1 male, 1female)	Women (8) Men (9)
Cape Coast	Cape Coast	2 (1male, 1female)	Women (9) Men (8)
Effutu	Winneba	0	
Gomoa West	Mumford	2(1male, 1female)	Women (11) Men (10)
Total		**10**	**92**

Table 4.15: Table of region, districts and participants for FGD in the Greater region

Greater Accra region			
District	**Community**	***FGD**	**Number of participants**
Accra	Chorkor-Galilea	2 (1 male, 1female)	Women (8) Men (8)
Tema	Tema Canoe Beach	2 (1male, 1female)	Women (10) men (9)
Ga South	Kokrobite	0	
	Tsokomey	2 (1 male, 1female)	Women (8) Men (10)
	Bortianor	2 (1male, 1female)	Women (9) Men (9)
Gbegbeyise	Gbebgeyise	2(1male, 1female)	
Krowor	Nungua	0	Women (9) Men (8)
		10	**88**

Source: Field survey 2022.

4.6.1 Roles in fish supply chain

From the focused group discussions (FGD) with the members of the communities in the coastal areas, artisanal fisheries dominate their fishing activities and serve as the main livelihood in the various communities. They go to the sea on all days except some days (e.g. Tuesdays) which were long instituted by the traditional leaders and weekends as a taboo day. This is in order not to disturb the goddess (referred to as "Abosom") and her children, which are mostly fish (Acheampong, 2010). The tradition was instituted to control and manage natural resources and its sustainability (Acheampong, 2010; Dosu, 2017). The community faces the consequences (e.g. drought, famine., less fish catches, sudden death or drowning) of breaking such laws and traditions. Thus, there is little or no activity at the beaches or landing sites during the taboo day (Acheampong, 2010).

Fisher folks stay away from fisheries when there is a ban on their fishing activities. The ban could be due to a local traditional observance day, an event for a very important person in the community, etc. Majority of the fish catch are done by men with the youth playing the major role. The men believe women are weak to pull the nets, deal with storms, capsizing of boats, canoe, etc. and less prepared to stay out on the sea for longer periods. This highlights the social constructions of norms and roles in fish capture and is parallel to findings by Torell et al., (2020). However, there are women who fish in small waters close to the communities such as edges of lagoons, and in estuaries and catch species like crabs, oysters, and this is in line with findings by Torell et al. (2015) and Aduomih (2019). Fish catches are done in groups of between 3- 10 depending on size of canoe and manage different roles as crew members.

The 10 communities for the study have landing sites / beaches that facilitate the fishing activities. The modern facilities include cold storage facilities, appropriate sheds for the

processors and other buyers who wait for the fishermen to come back with their harvest. Table 4.16 breaks down the activities in the fisheries supply chain in the study areas.

Table 4.16: Role of men and women in fisheries supply chain

Activity	Role	
	Men	**Women**
Ownership and finance of fishing expeditions	Involved in ownership more than finance of expeditions Mobilization of materials for canoe construction and construction	Involved more in financing of expeditions compared to ownership
Before & during fishing	*Prepare to go fishing:* repairs and maintenance works include mend nets, paint canoes, and pre- mix fuel *Cost of pre- mix fuel:* GHS 7.2 – GHS 7.5 per litre and quantity used depend on number of hours or days spent at sea	Mobilize food (e.g. gari, tomatoes, salt, pepper, etc.). and clothes for the men (depend on the duration at sea)
Harvesting	*Fishing:* by boat / canoe * Stay at sea: 6 hours – 3 days depending on size of boat	
Post - harvest		Gleaning and nearshore fishing Cutting & Gutting of fish Sorting & classifying fish Fish processing (smoking, frying, salting & drying, etc.) Transportation of fish to market centres (commercial drivers)

**Price of pre-mix fuel as at the time data was collected in May, 2022*
** Canoe sizes range from 6 by 8 feet; 6 by 9 feet; 6 by 10feet; 6 by 11 feet; 6 by 12 feet)*
Source: Field Survey 2022

There were general agreements on the decline in fisheries and this has forced them to increase their intensity of fishing or look for alternative livelihoods. One of the many factors is the increase in canoes as the number of fishers increased with an increase in fishing from 2004 to

2013 by 13 percent (Ameyaw, 2017). By increasing the intensity, they stay longer at sea and sometimes they are able to get more fish. There are cold storage facilities to store the fish when they stay longer at sea, especially after a day.

Other factors are the high cost of premix fuel, the irregular supply to their various communities by the government making it more expensive to stay longer at sea or going longer distances to catch more fish. Coupled with the high cost of premix fuel is the scarcity of it in communities. Previously, premix fuel used to be distributed and sold in communities regularly (between 3 days intervals). Recent times, it can take over 2- 3 weeks before they are able to buy premix fuel. At other times, fisherfolks travel to neighboring communities to buy at a higher price or end up using petrol.

> *"I have a desire to leave the fisheries as I make more losses any time I go to sea. This is because of high cost and irregular supply of premix fuel. The distribution has turned political because it is mostly handled by party people unlike before where it was mostly handled by committee members. Low fish catch has also contributed to the losses. I do not have any other skill to depend on as fishing is all I know"* – ***Fisherman, Anomabo***

According to the fisherfolks, the longer the stay at sea the more hazardous conditions faced such as treacherous winds and strong waves. The common fish species caught include herring, mackerel, tuna, marlin, skipjack, manta ray, all varieties of shark, sailfish, dolphins, and turtles among other species. A small amount of lagoon fishing is done with set nets and crab traps and the fish species caught include crabs, mudfish tilapia and perwinkles.

In terms of sales, the fishermen indicate the catch is sold to the women, sometimes their spouses or at the beach to random customers from the communities and surrounding towns. Payment may be cash for random customers and sometimes based on agreement with their wives or customers after selling the fish. Other buyers of the fish do sometimes loan money to the fishermen to buy the needed inputs for fishing. Fishermen will only payback after a recoup of

their investment by selling the fish. These women lend them money to purchase pre-mixed fuel, fishing nets, and food. Income after sale of fish is distributed based on predetermined and agreed-upon proportions by the canoe crew. The proceeds from the sale of fish are split equally. Fuel, equipment repairs, outboard motors, and other operational and maintenance costs are covered by a portion of the funds, and the remaining portion is distributed among the crew members based on factors such as age (elderly crew members receive more than young crewmen), position (boat owner receives more than manager), etc. Most times the captain receives twice the amount, the second in command receiving 1.5 times and the rest to the crew members. The big canoes run for a number of years, a minimum of between 1- 2 years two years before the profits are shared.

The small canoes on the other hand share proceeds after every fishing season - major upwelling season occurs between June-September while the lean fishing season spans February–May. Fishermen currently face the ***"closed season"*** for the month of July every year which started in 2019 as a policy, where they are banned from going fishing. The ban they comply with are consistent with previous studies (Al-Subhi et al., 2013; Guirkinger et al., 2021; Bose and Crees-Morris, 2009; Owusu et al., 2023). The purpose of the closed season is to replenish the fish stocks in the sea. According to the fisherfolks, canoes can last for up to 12 years depending on the regular maintenance of it. In terms of obtaining the materials for fishing, the canoes or wood are obtained from the forest zones of the country, whilst the other materials such as outboard motor, fishing nets can be bought from the markets of cities such as Accra, Takoradi, Tema, etc.

"The closed season in July is really affecting our livelihoods. We do not have any other alternative to earn an income. Sometimes I borrow from family members or women we give the fish to, to be able to take care of my family. When I make some money, I pay back but then it becomes a cycle of always borrowing and paying back adding stress to my life. In times where we do not have enough money to pay back, it becomes very difficult and embarrassing" - ***Fisherman, Tema Canoe Beach***

The fish is traded at the shore, landing sites or sale points either as dressed (partially processed) or ungutted whole fish to hawkers/vendors (primarily women) as customers. Processing fish includes cleaning, cutting, and packaging for sale. However, not all landing sites have the facilities for the proper processing and storage of fish. The women indicated they perform the majority of the work in processing the fish, whether it be by salting, frying, or drying. The women processors indicated it is primarily a family business as a means of livelihood which were mostly started by a parent, an aunt, cousin. Family labour is mostly used and occasionally hired labor to assist in the processing activities. It is noted that when the owner ages, she gradually cedes control to the younger woman and become supervisor. The aging women processors feel confident doing this because they think the younger worker or family member has gained enough knowledge, earned their trust, and comprehend the network that has been established over time to continue the business.

I currently manage the processing and sale of fish with my Aunty and elder sister. I support them during the bumper season and during off season I focus on my hairdressing business. Sometimes they pay me something for my time- ***Processor /hairdresser, Tsokomey***

The sale of the fish is mostly done either in the communities or other markets in various capitals of the country. Some of the respondents indicated they take their fish as far as to Kumasi (Kejetia), Sunyani and Accra (Kaneshie and Agbogbloshie) to sell or they have customers who come to buy from them. Depending on the agreement with the customers, it could be cash or

on credit and payment made after a number of days or weeks.

> *"Some of our customers have run away with our monies after establishing trust and working relationship over a period of time" We are not able to reach them after numerous calls so we end up letting go and not pursuing the matter. I had to find money to inject into the business after losing my capital"* ***--- Fish processer, at Kokrobite***

4.6.2 Access to services

The focus group members were engaged on the kind of services (e.g. finance, associations / groups / networks) they are able to access. The members did indicate they sometimes obtain finance to support their business. About 44 percent of the 100 members responded yes, they have had some form of access to credit or microfinance to support either their fisheries or another source of income. And 56 percent of the youth responded they have not accessed any form of credit from any financial institution. Some of their sources of finance are from their customers who do business with them. Through the agreement the fishermen use the money for their fishing operations.

Other than close family and friends, they access funds from their various community groups: Savings and Loans companies (Opportunity, Adehyeman, Asa, Sinapi Aba, ADB, Ghana Commercial Bank, Community banks (i.e. Gomoa, Akatakyiman) and Access Bank. Quick loans and quick credit are other financial institutions for the source of credit to run businesses they operate in. However, the respondents indicated the interest on the loans, wait period (processing time) and other requirements sometimes deter them from accessing such loans. However, the pandemic limited their access to financial services. Studies in the Philippines had similar outcome for coastal communities during the pandemic (Maliao et al., 2023; Pomeroy et al., 2020).

"Consistently making losses from the sale of fish made me divert to the food business. However, the wait period for me to obtain a loan to support the business deterred me from going for the loan. Unfortunately, COVID made access to the small loans very difficult. Also, I decided to use my small savings to reduce the stress of paying interest on the loan" – ***fish processor, Komenda***

Table 4.17: Access to services in the communities

Service	Area of service	
	Men	**Women**
Finance	The men have access to financial institutions but we prefer the banks e.g. Ghana Commercial banks, Access Bank, ADB, Adehyeman, Akatyiman, etc as they are able to access huge sums of money to invest in the business. Quick loans and quick credit are also avenues to obtain smaller amounts to invest in the business	Have access to institutions but mostly the microfinance institutions (Opportunity, Adehyeman, Asa, Sinapi Aba, Gomoa, Akatakyiman, Quick loans and quick credit a target for financing as they are able to make quick turn over for their monies
Capacity building	Attend trainings but infrequently due to nature of activities. Are targeted for trainings mostly in technical aspect of fishing e.g. use of illegal methods for fishing. Training in business management financial management sometimes	Attend meetings frequently as it is beneficial for market information e.g. prices of fish, market dynamics Mostly make time to attend trainings as gatherings help us interact more with community members NGOs mostly target for trainings in areas of Technical, vocational, Business management and development and financial management training

Source: Field Survey, 2022

Respondents who are part of groups or networks in the sampled communities, stressed on the importance of such groups in obtaining important information. The respondents who are also members of the groups or association indicated they are able to obtain the necessary information which motivate them to get into different livelihood activities. National fisheries and its related organizations such as such as Ghana *National Canoe Fishermen Council* (GNCFC), *National Fisheries Association* of *Ghana* (*NAFAG*), National Fish Processors and

Traders Association, (NAFPTA) provide periodic trainings for their members. The private sector institutions that support with capacity building identified by respondents include NGOs such Hen Mpoano (HM), Central and Western Fishmongers Improvement Association (CEWEFIA), Development Action Association (DAA). Other than this, other microfinance companies and community groups give trainings and education on access to finance and the benefits to their businesses.

4.6.3 Gendered dimension in choices of strategies as diversification

Men and women typically have various options to choose from when it comes to their livelihood choices. These are based on existing norms and culture, different adaptation, coping and mitigation measures. These are due to the differences in the roles and responsibilities as well as access to resources. About 50 percent of the 200 respondents who have diversified indicated they have an additional source of income as a necessity whilst the other half indicates its by choice. The women are more inclined to diversify out of necessity compared to the men to supplement the household income. The women admitted, when they are not able to obtain money for their needs (education, funeral, engagement, outdooring events and other social responsibilities, etc.), they tend to look for money from some other places.

Qualitative analysis of choices of livelihoods indicated women find it easier to engage in different activities such as trading in groceries and food business to supplement their economic activities. The men look for menial jobs, such as labour for buildings and other activities, farming, or migrate to other communities for similar opportunities. These are during the off season or low bumper seasons experienced during the months of January – May. The respondents indicate they are very busy during the peak season from May – December, during which the local economy is buoyant and vibrant. The members complained of the negative

impact of the "closed season" on their businesses and income. The *"closed season"* which is backed by the fisheries policy is instituted in July every year to replenish the sea fish stocks.

4.6.4 Diversification and food security

The focus group discussions highlighted the challenges faced which affects their food security status in the communities. It came to light; the food security status was mostly affected during the minor season of fisheries. However, many more factors are compounding the challenges. These they identified as the high cost of inputs for both fishing and processing, high transportation costs, fish stock decline and the closed season instituted to name a few. These have affected their livelihoods in many ways. In terms of their food security status, the inability to have a stable income source all year round also affect their ability to afford the food much needed for their wellbeing. This is exacerbated during the minor season every year where reduced or no income is experienced at that time of the year.

The COVID-19 travel restrictions meant access to their market (Kaneshie, Kasoa, Makola, Kejetia, Agbogbloshie, etc.) was blocked and availability of fuel for motorized fishing was limited, affecting money and food coming into those households in the coastal communities. This finding meets expectations of empirical evidence (Bennett et al., 2020; Ferrer et al., 2021) on the adverse impact of the pandemic on the whole value chain of capture and culture fisheries. Studies further highlights that these effects are more evident in artisanal fisheries with low job multiplicity (Maliao et al.,2009). Greater Accra and Greater Kumasi were under lock down during the pandemic, restricting movements of goods and services to and from these locations. The respondents were able to intra - trade in neighboring communities as they were not affected by the travel restrictions during the lockdown.

The focus groups also identified some shocks to livelihoods further affecting their food security. These include loss of income from the main or primary income earner or head of household through illness, accident, abandonment. The other kinds of shock are the loss of job, family loss such as death which leads to financial obligations, the failure of a business, not able to access credit applied for to invest back in business, loss of savings with the informal savings group and clients not paying back after business, among others.

Safety nets and mechanisms developed over a period to mitigate the adverse consequence on their livelihoods include migration to other communities that is Accra, Takoradi, Winneba, Kumasi) and countries (i.e. Abidjan, etc) to work and supplement household income. Others identified the engagement in different jobs such as petty trading, labour for other businesses to supplement livelihoods. Others just cut down on spending during such seasons to be able to survive till the next bumper season. Remittance by family members both in country and outside the country also support the households and cushion them against the shocks experienced.

The gender analysis undertaken supports previous studies carried out in coastal communities (Kleiber et al., 2018; Kleiber et al., 2015; Prieto-Carolino et al., 2016; Siason, 2000; Torell et al., 2020 and Yap et al., 2017).

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary, conclusions and recommendations drawn from results of the study. It begins by looking at a summary of the initial aims and objectives, its rationale, and findings. It then includes a brief discussion presented according to each of the main research questions followed by the outcomes of this study. The contributions of this study are covered in this section. It concludes with a list of recommendations based on the study.

5.2 Summary of the study

The study aimed at identifying the livelihood diversification strategies and relevant skill sets available to youth headed households (YHH) who are within the ages of 18- 35 years, analyze the factors that influence livelihood diversification strategies for youth headed households in coastal fishing communities and estimate the impact of livelihood diversification on food security among youth headed households in coastal fishing communities in Ghana. The last objective was a qualitative gendered analysis of fisheries and livelihood diversification in the coastal communities in Ghana. The rationale is to come up recommendations to guide intervention activities for the coastal folks.

The socioeconomic and demographic characteristics of the study highlights:

- The focus of the target is between 18- 35 years and a total of 424 respondents were interviewed from 2 coastal regions. Of this, 70 percent of the respondents fall within 26- 35 years age bracket and the 30 percent within the 18- 25 age bracket. The mean age of the sample is 29 years and YHH who are 32 years form the highest group of 45

(11%) respondents. The age group of 19 years are about 2 (0.5%) of the sample. The majority of households 270 (63.7 percent) are headed by males, with 36.3 percent as females.

- About 219 YHH have diversified their livelihoods whilst 201 YHH have not. YHH who have diversified statistically consume 0.315 units more diverse diets than non-diversified YHH.

The key findings of the study are;

Objective 1: The livelihood diversification strategies and relevant skills sets available for youth headed households in coastal fishing communities in Ghana.

- The secondary livelihood activities are classified into categories: 1) Fishery only 2) Non- agricultural wage 3) Farm based livelihoods, 4) self-employed. YHH in fishery only form 219 (52%) of the sample and YHH respondents in self-employed activities form 197 (46.5%) respectively. YHH involved in non – agricultural wage and farm-based activities are 4 (1%) each. YHH who are involved in fishery and non-agricultural wage have the highest income of GHS 932.50 and the least of GHS 173.25 for those who are into farm-based livelihood activity in addition to fishery. The income of YHH who have diversified into self-employed activities are GHS 290.42 and that of those into only fisheries are GHS 241.91. The mean incomes of YHH are statistically different for the types of diversification activities YHH are engaged in. These incomes are per season for the YHH.

- The skill sets captured in the study are business management, entrepreneurial, and money management skills. The rest include financial management training, technical

and vocational abilities. In terms of capacity in the highlighted skill set, respondents representing 52.6 percent, have acquired previous livelihood training while respondents who have current livelihood training are in the minority of 45.3 percent. Respondents representing 60.6 percent have received training in relevant skills. About 41.5 percent of the sample size are members of community group association. In addition, 44.3 percent of the sample applied for and obtained loans from financial institutions. A total of 330 (78 percent) of the 424 respondents did indicate they have had some form of skill training. A total of 330 (78%) out of 424 respondents have had some form of capacity building in one or more of the listed areas. About 3% of youth (frequency of 9 persons in total (330)) have skills in all areas (Business, technical and financial) to effectively engage in diversification.

Objective 2: Estimate the factors that determine the choice of livelihood diversification strategies for youth headed households in coastal fishing communities in Ghana.

- A probit model was applied to estimate the determinants of livelihood diversification of YHH. The results indicate that 7 variables are significant determinants of livelihood diversification for this study. These are ownership of assets, social grouping and institutional characteristics. Except primary education which influence diversification positively, HH characteristics are not significant, implying similar traits of YHH. Ownership of assets are significant and influence diversification positively except TV. Social grouping (group membership) and institutional characteristics (training in current livelihood activities) positively influence diversification.

- Specifically, YHH who received primary education are 12. 4 percent more likely to engage in livelihood diversification. Diversification with fisheries requires the understanding of the environment to be able to identify opportunities, risk analysis and future trend forecast. Other household characteristics such as gender, age, marital status. household size and location are all not significant for the study. Marital status and household size do not influence diversification for the study.

- Social grouping (group membership / association) positively influence diversification. Respondents who belong to community groups or associations are 14.7 percent more likely to engage in livelihood diversification relative to respondents who are not in any group in the community.

- Ownership of assets (radio, motobike and mobile phones) all have positive influence on diversification. On the other hand, ownership of TV influence diversification negatively. YHH are more likely to diversify when own a radio. In specific terms, radio owners are 16.1 percent more likely to diversify than those who do not own a radio. Owners of radio are spurred to engage in livelihood activities through the information they receive.

- Households that have access to motorbikes are 39.1 more likely to diversify compared to households who do not have motorbikes. However, households are less likely to diversify when they have access to TV. YHH who have access to TV are 11.7 percent less likely to diversify compared to those who do not have TV.

- Access to extension (training in current livelihood) is a positive determinant of livelihood diversification. Specifically, respondents who received training are 24.7 percent more likely to diversify relative to respondents who have not received training in their current livelihood.

Objective 3: Estimate the impacts of livelihood diversification on food security among youth headed households in coastal fishing communities in Ghana.

- The study used household dietary diversity score (HDDS) which measures the access and utilization of 12 food groups as part of the food security measure. The household food insecurity access scale (HFIAS) measured the availability and access. The results indicated that livelihood diversification has a direct correlation to food security for both food security measures. It is noted that YHH that diversify their livelihoods do have 2.043 units more of the 12 food groups compared to their counterparts who do not diversify. The more of the 12 food groups YHH consume, the more they can meet their nutritional requirements; thus, the more food secured the households are for the HDDS. YHH who diversify are estimated to be more food secured by 1.426 units food secured using the HFAIS measure. YHH who diversify into other livelihood activities from fisheries are 34.5 percent more likely to be food secured compared to their counterparts who are not diversified. YHH are 46.1 percent less likely to be severely food insecure compared to their counterparts who have not diversified.

Objective 4: To characterize the gendered perspective on fisheries and livelihood diversification of youth headed households in coastal fishing communities in Ghana.

- Analysis of the focus group discussions was carried out from a gendered perspective on fisheries. Highlights included the role of men and women, effect of the decline on their livelihoods, access to training, access to finance, diversifying into different activities and livelihoods and food. Results from FGD highlighted the majority of men in fishing, and women are into processing into various forms for the market. Sales of fish are undertaken in major market centres in the country. Access to credit and capacity building enhances the business operations of the lean season, the COVID pandemic and the closed fishing season. Other shocks such as loss of business, family member, inability to access credit, further exacerbate the plight of YHH. However, coping mechanisms such as reduced spending, switching between businesses, migrating to other communities to look for jobs, labour for other businesses are engaged to reduce the adverse effect of the negative impact on households.

5.3 Conclusions of the study

Fisheries continue to be an important economic activity of coastal folks in Ghana and main source of livelihoods for households. There is also a significant number of young people between the ages of 18 – 35 years who make up the population of the country. The contribution to the country's GDP by the youth in fisheries cannot be overlooked. There is a decline in fish stocks over the past three decades due to challenges such as overfishing, open access nature of fishing, climate change, overcapacity, etc and recently the closed season. These many challenges faced by households involved in fisheries continue to affect their income, hinder

their livelihood activities and their food security status of these youth headed households (YHH).

Drawing from the empirical findings, this study has the following conclusions based on the thesis hypotheses:

1. There are no significant differences in income among YHH in coastal fishing communities in Ghana from their livelihood diversification strategies.

There are significant differences in the mean incomes among YHH in coastal fishing communities in Ghana. The incomes measured are for a season. The mean incomes statistically differ with the types of diversification YHH are engaged in. Diversification into non-agricultural wage provide the highest income. Diversification into farm-based activities provide the least income for a season.

2. Socioeconomic and institutional characteristics do not influence the choice of livelihood diversification strategies of YHH in coastal fishing communities in Ghana.

Socioeconomic and institutional characteristics have a significant positive association to livelihood diversification. Except primary education which influence diversification positively, HH characteristics are not significant, implying similar traits of YHH. Ownership of assets are significant and influence diversification positively except TV. Social grouping (group membership) and Institutional characteristics (training in current livelihood activities) positively influence diversification.

3. Livelihood diversification does not improve food security status of youth headed households (YHH) in coastal fishing communities in Ghana.

Livelihood diversification has a positive correlation to food security. Respondents from youth headed households who are diversified have 2.043 units more of the 12 food groups compared to their counterparts who do not diversify. The more of the 12 food groups YHH consume, the more they can meet their nutritional requirements; thus, the more food secured the households are for the HDDS. The results show that the livelihood diversification significantly improve household dietary diversity. Therefore, we do not accept the null hypothesis.

YHH who are diversified are estimated to be more food secured by 1.426 units using the HFAIS measure. YHH who diversify into other livelihood activities from fisheries are 34.5 percent more likely to be food secured compared to their counterparts who are not diversified. YHH are 46.1 percent less likely to be severely food insecure compared to their counterparts who have not diversified. It suggests that livelihood diversification has a positive effect on HFIAS Indicating probability of a higher level of food security. As YHH diversify their livelihood, their probability of food insecurity decreases.

Further, it can be concluded that;

- The majority of men in are into fishing, and women are into processing into various forms for the market. Sales of fish are done in major market centers in the country. Access to credit and capacity building enhances the business operations of YHH in coastal fishing communities. The food security status of the households is affected negatively during the lean season, the COVID pandemic and the closed season. Other shocks such as loss of business, family member, inability to access credit, further exacerbate the plight of YHH. However, coping mechanisms such as reduced spending, switching between businesses, migrating to other communities to look for jobs, labour

for other businesses are engaged to reduce the adverse effect of the negative impact on households.

5.4 Policy recommendations of the study

The findings of the study have key policy implications for Ghana and other developing economies as the decline in fisheries impacts livelihoods and food security negatively. Based on the findings of the study, the proposed recommendations are made to improve the lives of youth headed households in coastal fishing communities in Ghana:

Ministry of Fisheries and Aquaculture Development (MOFAD), Ministry of Youth and Employment, Ministry of Food and Agriculture (MoFA), ongoing projects such as USAID Ghana Fisheries Recovery Activity (GFRA), etc. and future interventions should work closely and integrate these in their activities;

- There are significant differences in income among YHH in coastal fishing communities in Ghana from their livelihood diversification strategies.

The different skills (business, technical and financial) should be a priority for stakeholders in terms of capacity building. This is because only 3% of youth (frequency of 9 persons in total (330)) have skills in all areas (Business, technical and financial) to effectively engage in diversification. Also, diversification into non – agricultural wage provides the highest income for a season. These activities should be a target for stakeholders and assets (human and social) may serve as a leverage for diversification with fisheries.

- Socioeconomic and institutional characteristics do influence livelihood diversification strategies of youth-headed households (YHH) in coastal fishing communities in Ghana.

These characteristics influence livelihood diversification and help mitigate the challenge of lower income of coastal fishing communities in pursuit of no poverty and zero-hunger agenda (SDG1 & SDG2). Therefore, socioeconomic and institutional support systems such as access to education, group membership, should be strengthened. These will aid YHH to make informed choices about livelihood strategies in coastal fishing communities in Ghana.

- Livelihood diversification does improve food security status of youth-headed households (YHH) in coastal fishing communities in Ghana.

Promote livelihood diversification as a pathway to food security for YHH in coastal fishing communities in Ghana. To promote food security of youth headed households, diversification into non-agricultural wage activities (labour, masonry, carpentry work, etc.) with fisheries is strongly recommended. Livelihood diversification improves household dietary diversity (HDD), therefore pursuing diverse livelihoods is beneficial for improving food security in the study area without adversely affecting the natural asset (sea, biodiversity and ecosystem health). Also, livelihood diversification reduces household food insecurity. Therefore, we conclude that diversifying livelihood may hence food security.

- The gendered activities of YHH in coastal fishing communities indicate the need for a gendered approach for interventions. Different implementation strategies are needed to target men and women in terms of assets (financials, human, and social) to promote diversification in pursuit of Gender (*Economic)* equality (SDG 5). Therefore, stakeholders should approach livelihood diversification activities with a gendered lens in terms of access to the different assets for men and women to achieve equal and greater impact in coastal fishing communities.

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APPENDICES

Appendix 1: Household Questionnaire

May, 2022

Note for interviewers

Please introduce yourself and the objective of the survey properly and openly to your respondent before you start questioning. Establish a good relationship with the respondent.

This study aims to identify livelihood diversification strategies, relevant skills set and factors that inform such choices of livelihood strategies. Further, the food security status will be measured. Information given will be helpful in informing policy and practice targeted at coastal folks especially youth on their diversification of livelihoods and food security. Recommendations that will ensure economic and social well-being of youth headed households in coastal communities will be outlined. We request you to spend about 1 hour of your time to respond to the questions, to make this research possible. In addition, you will be compensated for your time after completing the questionnaire. Thank you.

- All information provided by the respondent is treated with strict confidentiality.
- All answers to the questions in the questionnaire should be true and sincere.
- This is part of my PhD thesis at the Department of Agricultural Economics and Agribusiness, University of Ghana, Legon

Data quality information

Q1.	Name of interviewer		
Q2.	Name of supervisor		
Q3.	Date of interview	DD MM YY	
Q4.	Time taken for interview	……Minutes	
Q5.	Household ID		

Thank you for participating in the survey.

Section A: Socio-economic characteristics of household

No	Question	Options	Comments
Q6.	Head of household:	1=Yes 2=No (if no, do not proceed)	
Q7	What is your age group?	1 = 18 – 25 years 2 = 26 – 35 years	
Q8.	What is your main livelihood activity?		
Q9.	If into fisheries, what exactly do you do? (fisherman, processor, trader (e.g. wholesaler, retailer) (*can tick more than 1)*	1=Fisherman 2=Fish processor 3= Fish trader 4=other (specify) 5 = Not Applicable	
Q10.	Name of Region		
Q11.	Name of District		
Q12.	Name of Community		
Q13.	Community Code		
Q14.	Contact Address/Contact No./Email/Digital Address		
Q15.	Total number of household members		
Q16.	Number of male household members		
Q17.	Number of female household members		
Q18.			
Q19.	Main source of lighting for the household?	1=Electricity 2=Kerosene 3=Gas lamp 4=Candles/Touches (flashlights) 5=Solar energy 6=Generator	

		7= No lighting 8= Other (specify)	

COMMUNITY CODE: CENTRAL 1 = Anomabo. 2 = Biriwa, 3 = Moree, 4 = Elmina, 5 = Komenda, 6 = Branu Akyinu, 7 = Ampanu, 8 = Cape coast, 9 = Winneba, 10 = Dago, 11 = Mumford, 12 = Other (specify)
GREATER ACCRA 1 = Chorkor, 2 = Kokrobite, 3 = Tema, 4 = Tsokomey, 5 = Bortianor, 6 = James Town, 7 = Osu, 8 = Nyanyano, 9 = Labadi , 10 = Other (specify)

Table 1.1: Household details

Q20.	Q21.	Q22.	Q23	Q24	Q25.	Q26.	Q27.	Q28.	Q29.	Q30.	Q31.	Q32.
HH mem	**Name**	**Relation to HH head**	**Sex**	**Age**	**Yrs. In fisheries related activities**	**Mar. status**	**Type of Marriage**	**Highest level of Educ**	**Read or write in English?**	**Prim Occup /Type of Work**	**Secon Occup / Type of Work**	***Religion***
ID		Relate Code	0 = male 1 = fem	Yrs		1 = Married/ consensual union 2 = Single 3 = Separated 4 = Divorced **3** = Widowed **3** = Specify 7 = Not Applicable	1=Monogamous 2=Polygamous 3=Other (specify) 4 = Not Applicable	Education Code	1 = Cannot read and write 2 = Can write only 3 = Can read only 4 = Can read and write 5 = Other (specify)	Occup Code	Occup Code	1=Christian 2=Traditional (specify) 3=Islamic 4=0ther(specify)
1												

2												

RELATE CODE: 1 = HH head / 2 = Spouse / 3 = child (including in-law) / 4 = Brother or sister (and in-law) / 5 = Father or mother (and in-law) / 6 = Niece or nephew (and in-law) / 7 = Cousin (and in-law)/ 8 = Grandchild / 9= Other (specify)

SCHOOL CODE: 1 = No formal schooling / 2 = Primary school / 3 = Junior Secondary School / 4= Senior Secondary School / Technical/ Vocational / 5 = Tertiary / 6 = Other (specify)

OCCUPATION CODE: 1 = Fisheries / 2 = Farming other crops / 3= Agriculture business ventures (Agro processing and Marketing) / 4= Paid employment on other HH's farm / 5 = Paid employment off-farm (civil service, construction, private company) / 6= Non-Agriculture business ventures / 7 = others (specify)

Section B: Livelihood Diversification Strategies in Communities

No	Question	Options	Comments
Q33.	What else are you into apart from your main occupation? (Can tick more than 1)	1=Food seller 2=Electrician 3= Non-fishing trader 4=Mechanic 5=Seamstress 6=Tailor 7=Driver 8=Baker 9=Farmer 10=other (specify)	
Q34.	Which of the above do you focus on / dedicate more time to?		
Q35.	Do you have someone from the household supporting you with this economic activity?	1=Yes 2=No	
Q36.	If yes, who? (Can tick more than 1)	1=Spouse 2=Child(ren) 3=Other (specify)	

Q37.	If yes, how many people from your household?		
Q38.	If labour is employed, how much are you paid/ is paid to the employee?		
Q39.	How are you paid?	1= Daily 2 =Weekly 3= Monthly 4= Other (specify)…	
Q40.	By what means do you get to your livelihood?	1=Yes 2=No	
Q41.	If no, where is it? (specify community)		
Q42.	What is the distance to your source of livelihood/activity?		
Q43.	How much do you pay to go to your source of livelihood?		
Q44.	How often do you go to your source of livelihood?	1= Daily 2 =Weekly 3= Monthly 4= Other (specify)……	
	Relevant skills		
Q45.	If main activity is fishing, how did you get into this livelihood/ what informed your choice of livelihood?		
Q46.	If main activity is non-fishing, how did you get into this livelihood/ what informed your choice of livelihood?		
Q47.	Have you had any training in previous livelihood activities?	1=Yes 2=No	
Q48.	Have you had any training in current livelihood activities?	1=Yes 2=No	
Q49.	If yes, name training	1 = Business Dev't 2 = Technical 3 = Financial	

		4 = Other (specify)…….	
Q50.	Did you have any skills related to the livelihood?	1=Yes 2=No	
Q51.	If yes, who gave you the idea / knowledge?	1=Family member 2=Friend 3=NGO 4=Government Institution 5=Private Organization (name) 6=Other (specify)	
Q52.	Which year was this?		
Q53.	Did you pay for the knowledge?	1=Yes 2=No	
Q54.	If yes, how much		
Q55.	If no, then who paid for the knowledge?	1=Family member 2=Friend 3=NGO 4=Government Institution 5=Private Organization (specify) 6=Other (specify)	
Q56.	How long did you study this livelihood activity?	1=Less than 1 year 2= 1- less than 3 years 3= 3-5 years 4=More than 5 years	
Q57.	Have you employed someone?	1=Yes 2=No	
Q58.	How much do you pay the person / labour?		
Q59.	How often is the person or labour paid?	1= Daily 2 =Weekly 3= Monthly 4= Other (specify)……	

Q59.	Were you given set – up kits to start the livelihoods	1=Yes 2=No 3=Other (specify)	
Q60.	If no, how much did you start with?		
Q61.	Is the activity in the community?	1=Yes 2=No	

Income from fisheries compared to other livelihood strategies ***(List all strategies starting with fisheries, then other ones)***

Q62.	**Q63.**	**Q64.**	**Q65.**
Items / Activity	Expenditure (GHS) (Weekly) (Costs per input / per activity)	Revenue generated /Gross income (GHS) (Weekly)	Income (GHS) per week

Q66. What is the total number of revenue sources for the household**? …….**

SWOT Analysis of Engagement in Different Activities

Q66.	**Q67.**	**Q67.**	**Q68.**	**Q69.**
Activity	Strengths	Weaknesses	Opportunities	Threats

Section C: Factors that determine the choice of livelihood diversification strategies

No	Question	Options	Comments
Q70.	What made you decide to choose this particular economic activity	1=Income 2=Prestige 3=Security 4=Passion 5=other (specify)	
Q701	Are you a member of any community group?	1=Yes 2=No	
Q72.	If yes, are you an active member of the group? (Example hold a position?)	1=Yes 2=No	
Q73.	If yes, please name		
Q74.	Have you ever obtained a loan before?	1=Yes 2=No	
Q75.	Have you received a loan in the last 2 years?	1=Yes 2=No	
Q76.	If yes, from where (tick more than one if apply)?	1 = Formal sources 2 = Semi formal sources 3 = Informal sources	
Q77.	How much did you apply for?		
Q78.	How much did you receive?		
Q79.	Was the amount given adequate?		
Q80.	How was the loan disbursed, was it in installments?		
Q81.	Was there any interest on the loan?	1= High 2= Moderate 3= Low	
Q82.	Who recommended these options?	1= Self 2=Friend 3=NGO	

		4=Government Institution 5=Private Organization (name) 6= Family member 7=Other (specify)	
Q83.	What was the main purpose of the loan?	1= Invested in fisheries activities 2=Invested in other livelihood activities 3= Invested in both 4=To meet household needs (education, food, health) 5=Social Needs (Funeral, marriage, naming ceremony) 6= Other (specify)	
Q84.	Do you have a health insurance?	1=Yes 2=No	
Q85.	Where do you go to when sick?	1= Health facility in community 2=Health facility outside community 3=Self-medicate 4=Use herbal medication 5=Other (specify)	
Q86.	Do you have a mobile phone?	1=Yes 2=No	
Q87.	Do you use a mobile phone?	1=Yes 2=No	
Q88.	Do you have a motorbike?	1=Yes 2=No	

Q89.	Do you have a bicycle/ tricycle?	1=Yes 2=No	
Q90.	Do you use a bicycle?	1=Yes 2=No	
Q91.	Do you use a motorbike?	1=Yes 2=No	
Q92.	Do you own a house?	1=Yes 2=No 3=Partly	
Q93.	Do you own a Television?	1=Yes 2=No	
Q94.	Do you own radio?	1=Yes 2=No	
Q95.	Do you use radio?	1=Yes 2=No	
Q96.	Do you own a vehicle?	1=Yes 2=No	
Q97.	Do you own a canoe?	1=Yes 2=No	

Section D: Food security status of youth HH

Dietary Diversity Questions

5. Please describe the foods (meals and snacks) that you ate or drank yesterday during the day and night, whether at home or outside the home. Start with the first food or drink of the morning. Write down all foods and drinks mentioned. When composite dishes are mentioned, ask for the list of ingredients. When the respondent has finished, probe for meals and snacks not mentioned.

HH dietary diversity table

Q98.	Q99.	Q100.	Q101.	Q102.	Q103.
Breakfast	Snack	Lunch	Snack	Dinner	Snack

[Households: include foods eaten by any member of the household, and exclude foods purchased and eaten outside the home] When the respondent recall is complete, fill in the food groups based on the information recorded above. For any food groups not mentioned, ask the respondent if a food item from this group was consumed.

No	Food group	Examples	Yes=1 No=0
Q104.	Cereals	corn/maize, rice, wheat, sorghum, millet or any other grains or foods made from these (e.g., bread, noodles, porridge or other grain products) + insert local foods e.g., Koko, rice water, banku, etc.	
Q105.	White roots and Tubers	white potatoes, white yam, white cassava, or other foods made from roots (gari, fufu, acheke, etc)	
Q106.	Vitamin A rich vegetables and tubers	pumpkin, carrot, squash, or sweet potato that are orange inside + other locally available vitamin A rich vegetables (e.g., red sweet pepper)	
Q107.	Dark green leafy vegetables	dark green leafy vegetables, including wild forms + locally available vitamin A rich leaves such as amaranth, cassava leaves, kale, spinach, kontomire, etc.,	
Q108.	Other vegetables	other vegetables (e.g., tomato, onion, eggplant) + other locally available vegetables	

Q109.	Vitamin A rich fruits	ripe mango, cantaloupe, apricot (fresh or dried), ripe papaya, dried peach, and 100% fruit juice made from these + other locally available vitamin A rich fruits	
Q110.	Other fruits	other fruits, including wild fruits and 100% fruit juice made from these	
Q111.	Organ meat	Liver, kidney, heart or other organ meats or blood-based foods (e.g., towel, intestines, etc.)	
Q112.	Flesh meats	beef, pork, lamb, goat, rabbit, game, chicken, duck, other birds, insects	
Q113.	Eggs	eggs from chicken, duck, guinea fowl or any other egg	
Q114.	Fish and seafood	fresh or dried fish or shellfish, oysters, shrimps, squid, octopus, etc.	
Q115.	Legumes, nuts and seeds	dried beans, dried peas, lentils, nuts, seeds or foods made from these (e.g., hummus, peanut butter)	
Q116.	Milk and milk products	Milk, cheese, yogurt or other milk products (e.g., wagashie, etc.)	
Q117.	Oils and fats	Oil, fats or butter added to food or used for cooking (coconut oil, palm oil, groundnut oil, frytol, etc.)	
Q118.	Sweets	sugar, honey, sweetened soda or sweetened juice drinks, sugary foods such as chocolates, candies, cookies and cakes	
Q119.	Spices, condiments, beverages	spices (black pepper, salt), condiments (soy sauce, hot sauce), coffee, tea, alcoholic beverages	
Q120. Household level	Did you or anyone in your household eat anything (meal or snack) OUTSIDE the home yesterday?		

Q121.	"Could you please detail the primary source for obtaining food (the below responses can be listed for each food group of interest) for your household" for various seasons (example codes below) (Place the letter of choice in the table below. It is possible to indicate two answers for every season.)	1= Fisheries activities 2=Purchased 3=Borrowed/ battered/ exchanged for labor/gift from friends/family	

		4=Own Production/gathering/hunting/ 5=Food aid 6=other (name)	

Section E: Household Food Security (Household Food Insecurity experience measure / scale)

		No	Yes	Rarely (1- 2 times)	Sometimes (3- 10 times)	Often (More than 10 times)
Q122.	In the period of 30 days, did you worry that your household would not have enough food?					
Q123.	In the period of 30 days, have you ever had to eat a food, you did not like because there was nothing else to eat.					
Q124.	In the period of 30 days, Did you or any household member have to eat a limited variety of foods due to a lack of resources?					
Q125.	In the period of 30 days, Did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?					
Q126.	In the period of 30 days, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?					
Q127	In the period of 30 days, did you or any household member have to eat fewer meals in a day because there was not enough food?					

Q128.	In the period of 30 days, Was there ever no food to eat of any kind in your household because of a lack of resources to get food?					
Q129.	In the period of 30 days, Did you or any household member go a whole day and night without eating anything because there was not enough food?					
Q130	In the period of 30 days, did you or any household member go to sleep at night hungry because there was not enough food?					

Q131	Can you tell me about the biggest problem / challenge you have about your livelihoods?		
Q132.	What do you do to try and mitigate them?		
Q133.	Any comments or thoughts you will like to share with us?		

Thank you for your time!!!!

Appendix 2: Interview Guide

Interview guide for Focus Group Discussion (F.G.D)

Welcome to our session. Thank you for taking the time to join us to talk livelihood activities in this community. This group discussion is for the purposes of understanding livelihood activities of this community and how it affects food security. This is for purposes of research been conducted at the University of Ghana, Legon by the interviewer. Feel free to share your thoughts and there are no wrong answers but rather differing points of view. Do note we are just as interested in negative comments as positive comments, and at times, the negative comments are the most helpful. We will record the session because we do not want to miss any of your comments. People often say very helpful things in these discussions and we cannot write fast enough to get them all down. We will be on a first name basis and we will not use any names in our reports. You are assured of complete confidentiality.

Name of Interviewer:		
Community:		
Region:		
Date:		

1. What are the economic activities undertaken in this community?	
2. What are the economic activities undertaken in this community?	
3. Is the community engaged in fisheries and the youth?	
4. Which areas mostly for the whole community and the youth? ✓ Fish catch. ✓ Processing ✓ Sale (wholesale / retail)	
5. How is the trend of the fishing activities? ✓ On season? Off-season?	
6. Where do you access financial services?	
7. Do you access to resources to fishing activities?	
8. Is it open to all or there is specific criteria for such services?	
9. Do you have access to other resources in the community	
10. Is it limited to men/ women / all?	

11. If yes, how do you qualify?	
12. Are there times you are not able to go to sea (for fisher folks)?	
13. Why, if yes?	
14. What about other livelihood activities?	
15. At what times of the year do you generally get hungry/ go without food for the day in the community?	
16. Why? ……..	
17. What do you normally do to mitigate that challenge?	
18. What are some advantages? Are you part of any group in the community?	
19. Name them?	
20. Any other comment / statement you will want me to note.	

Thank you for your time!!!!