



Research Article

Vulnerability to food insecurity and coping strategies of agrarian households in the lower river region of the Gambia: Implication for policy

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Abstract

This study assessed the extent of agrarian households' vulnerability to food insecurity and coping strategies in the Lower River Region of The Gambia and implication for policy. The data was collected principally through questionnaires administered to 230 households and 10 key informants. Data was analysed using descriptive statistics with the aid of Statistical Package for Social Science 20. A modified Consolidated Approach to Reporting Indicators (CARI) was also used to analyse vulnerability to food insecurity in the study area. The study found out that on average, the degree of vulnerability to food insecurity in the study area is about 45%. Vulnerability to food security is partly due to the large sizes of families, low income level of households, limited access to land and limited availability of food due to low food production, droughts and extreme climatic conditions. About 1,309 households were found to be highly vulnerable, and 4,394 households moderately vulnerable. Among the different districts in Lower River Region, the majority of the food insecure households are located in Jarra West District. As a coping strategy, 65.3% to food insecurity households, tend to reduce their expenditures on other needs to have money to buy food, 53.7% turn to the consumption of low quality and cheaper foodstuff with high carbohydrate content like rice, 52.1% borrow food from relatives, friends and neighbours and 51.3% reduce adults' food consumption to secure the need of children for food in times of food deficit. Weak institutional and governance capacity, as well as unsustainable and inequitable use of natural resources among others were identified as common drivers of protracted crises. The study concluded that the trends in food security and nutrition in The Gambia are intrigued by climate variability and vulnerability to shocks and crises. To reduce food insecurity among vulnerable populations, special subsidy packages should be designed to ease access to farm inputs, to better manage risks and respond to shocks in the short and long term. The government should also provide a regulatory environment which establishes basic conditions within which farmers, input suppliers, and food companies, among others can operate and make investment decisions in order to boost their production. The managerial and technical capacity of these farmers should also be built through the extension services, and the extension services should work with farmers to achieve the national priority of zero hunger. The government should reduce the amount of taxes levied on companies that produce or import quality planting materials and inputs and then negotiate with these companies to step down the cost of inputs to farmers. There is also a need for the introduction of new, appropriate and sustainable technologies to farmers and for intensification purposes.

Abbreviations

ANR: Agriculture and Natural Resources; CAADP: Comprehensive Africa Agriculture Development Programme; CARI: Consolidated Approach to Reporting Indicators; CFSVA: Comprehensive Food Security and Vulnerability Analysis; CSI: Coping Strategies Index; FAO: Food and Agriculture Organization of the United Nations; FNSCF: Food and Nutrition Security Conceptual Framework; GBOS: Gambia Bureau of Statistics; GNAIP: Gambia National Agricultural Investment Plan; LGA: Local Government Areas; LRR: Lower River Region; NARI: National Agriculture Research Institute; NASS: National Agriculture Sample Survey; NeMA: National Land Development and Management Project; NEPAD: New Partnership for Africa; NFSCG: National Food Security Council of The Gambia; NHD: National Human Development; PAGE: Program for Accelerated Growth and Employment; R&D: Research and Development; SDG: Sustainable Developments Goal; UNDP: United Nations Development Program; UNECA: United Nations Economic Commission for Africa; WFP: World Food Program

Introduction

Maintaining food security at the country and household levels is still a major challenge for many developing countries [1]. Food security is a multi-dimensional concept that has changed over time. However the 1996 World Food Summit adapted definition of Food Security is “when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life”. This definition entails four essential components: availability, stability, accessibility and utilization. On the other hand, Food insecurity is the uncertain or limited access to nutritionally adequate and safe food [2,3].

Food security has many dimensions, ranging from global, regional, national, local, and household to the individual levels. According to FAO estimates, in 2017, globally, close to 10% of the world population was faced with severe food insecurity, which corresponds to about 770 million people. At the regional level, values range from 1.4% in Northern America and Europe to almost 30% in Africa. Estimates indicate that the total number of people affected by undernourishment, or chronic food deprivation globally increased from about 804 million in 2016 to nearly 821 million in 2017 and the numbers are continually increasing [4]. The situation is getting worse in South America and in most regions in Africa. Without increasing efforts, there is a risk of falling far short of achieving the Sustainable Developments Goal (SDG) target of zero hunger by 2030 [4]. To worsen the situation, there is a continual increase in the proportion of the population experiencing severe food insecurity due to their inability to access food in the region.

The food security situation has worsened, particularly in some parts of sub-Saharan Africa, South-Eastern Asia and Western Asia [5]. Nonetheless, some parts of the world are more food secured and coping better than others. Those unable to meet their food requirements are food insecure, and a plethora of problems make them vulnerable to this. According to Zeller [6], vulnerability refers to people’s propensity to fall or stay

below a pre-determined food security line. The food security line could be caloric-based (i.e., food requirement) or it could include all basic needs. Vulnerability is a function of exposure to risks/shocks (events that threaten households’ food access, availability and utilisation and hence their food stability) and the resilience to these risks.

The ability to ensure adequate food security lies in the ability to identify and support vulnerable households. The extent of vulnerability of an individual, household or group of persons is influenced by their exposure to the risk factors and ability to cope with or withstand traumatic situations [1].

Not all households can be at the same level of volatility in temporary consumption deficit. Vulnerable households, like agrarian households, landless agricultural workers and small-scale subsistence farmers are more exposed to food insecurity. This deficit in consumption can push them into harder conditions of already existing food insecurity. Thus, the need to understand the risks households in vulnerable areas face, as well as their coping strategies, define the level of exposure to food insecurity and their ability to prevent severity, or improve the household’s situation is of utmost concerned.

A study on global food security and nutrition revealed that in most developing countries, national governments and international development policy have not invested much in agriculture [7]. In these countries, there is often the shortage of advice, knowledge, capital and well-functioning infrastructures. Where they do exist, farmers frequently do not have access, lack opportunities to process the products or to preserve them. In most cases, there is inadequate support from the agricultural policy as well as of good governance.

The level of food self-sufficiency that prevailed in The Gambia 50 – 60 years ago, especially among agricultural households, was much higher than in recent times. The first major food crisis struck the country in the early eighties, which was as a result of drought and crop failure. Today, the food security situation continues to worsen, particularly for populations reliant on agriculture as their livelihood source [8]. Consequences of food insecurity range from lowered food production, reduced income, reduced assets holding, and increased indebtedness [9].

Food insecurity and vulnerability serve as unhappy reminders of the gravity of food scarcity and the need to put in place reliable and sustainable measures for enhancing food security [10].

While little literature seems to focus obliquely on vulnerability levels and coping strategies, very little attention is also paid on implications on policy for household food insecurity. Policy influences food security to a great extent. However, a critical analysis of the relationship is key.

It is against this backdrop that this study seeks to assess the degree of agrarian households’ vulnerability to food insecurity and coping strategies in the Lower River Region of The Gambia and implication to policy.

Materials and methods

Study area

The Gambia is located at Latitude 13°N and longitude 15°W, midway on the bulge of the West African coast and stretches over 400 kilometres inland from west to east on either side of The River Gambia. The country is bound to the north, south and east by the Republic of Senegal and to the west by the Atlantic Ocean (GBoS, 2007).

The Gambia is divided into five administrative regions and two municipalities respectively; Banjul Municipality, Kanifing Municipality, West Coast Region (WCR), North Bank Region (NBR), Lower River Region (LRR), Central River Region (CRR) and Upper River Region (URR).

Lower River Region being the study area is located between latitude 13.3553°N and longitude 15.9230°W. It covers a total surface area of 1,618km² and has a total population of 81,042 inhabitants (i.e. 38,772 male and 42,270 female) and a total number of 10,837 households with average household size of 9.2 persons as indicated in the 2013 Gambia Bureau of Statistics (GBoS) household mapping data.

The Gambia lies in the Sahelian agro-climatic zone and its climate is characterized by two diverse seasons: a 5 months rainy season (June to October) and a long dry season from November to May. The average annual rainfall is 836 mm, with a spatial disparity from over 1,000 mm in the south to less than 800 mm in the north, hence high variability and erratic nature of precipitation and high variability in inter-annual and annual rainfall variability (2018 climate report).

Lower River Region falls within the Sudano-Sahelian agro-ecological zone. It has prolonged periods of dryness known for its longer growing season (79 - 119 days) and within a 600 to 900 mm rainfall isohyets well suited for groundnut, sorghum and cotton in the upland areas. However, the flood plains along the Gambia River and associated lowland valley systems are an excellent rice growing catchment for tidal irrigation [11].

The geomorphology of The Gambia is dominated by the Gambia River, the Country's most valuable natural resource. The river flows through the centre of the country from East to West, emptying into the Atlantic Ocean. According to Hug, et al. (2007), climate change is projected to increase runoff in the catchment area of the Gambia River by 50%. This in turn will have a growing effect on the salt water intrusion in the river, by increasing runoff by 3% which would result in major alterations to the river's balance.

According to work done by Healey [12], there is inadequate data on The Gambia River's water quality and Lower river region in particular where the study was carried out. However, various studies have been conducted on specific areas of the Gambia River, such as those located further downriver, have inferior water quality, with respect to irrigation and consumption, due to the presence of salt water, anthropogenic disturbances, and effluents. The entire river is deemed unfit

for water consumption by humans due to high salt levels, from the mouth of the river to site 12, and the presence of coliform bacteria at all sites.

However, the river water is widely used, ecosystem health appears to be good, and the upper reaches are suitable for agricultural purposes. The lower areas of the river, though unsuitable for irrigation due to its brackish nature, have a more diverse fish fauna [13].

The soils are acid sulphate soils either affected by salinity or are under the influence of the potential acid sulphate condition. Soils outside the real delta and its tidal influence can only be used for rice cultivation during the rainy season when fresh water flush pushes down the salinity level in the river waters and in the soil profile (FAO, Jatta 2013) Figure 1.

Study population and sampling strategy

The study population consisted primarily of members of agrarian households in the Lower River Region of The Gambia and key informants from relevant institutions. To select study participants, a multi-staged sampling procedure was employed. In the initial stage, a simple random sampling technique was used to select villages in the Lower River Region of The Gambia using the random number table. A simple random sampling method was used because in simple random sampling, each data point has an equal probability of being chosen whilst systematic sampling chooses a data point per each predetermined interval.

In the random table sampling, all the villages were numbered, from 001 to 157 and random numbers generated to represent the villages. In the second stage, a 3% sampling intensity in each of the 115 villages was used to determine the number of households per village and adopted as our sample. This is because some villages have larger population size thus an equal representation. In the third stage, agrarian households were purposively and conveniently selected from the selected villages, as only households where agriculture constituted a significant proportion of income and food was selected. In the final stage, the households' head was targeted; however, in their absence, available household members were conveniently selected and constituted a sample of 285 households' head.

Data collection

Primary data was principally obtained from a structured questionnaire containing open and close-ended questions and divided into four sections. The total number of questionnaires administered was 230, because some of the villages did not have any agrarian household. The primary data was complemented with secondary data from relevant institutions and available literature.

The final analysis of this work is a result of triangulating the available secondary and primary data collected using Food and Nutrition Security Conceptual Framework. The level of vulnerability to food insecurity was determined by taking into

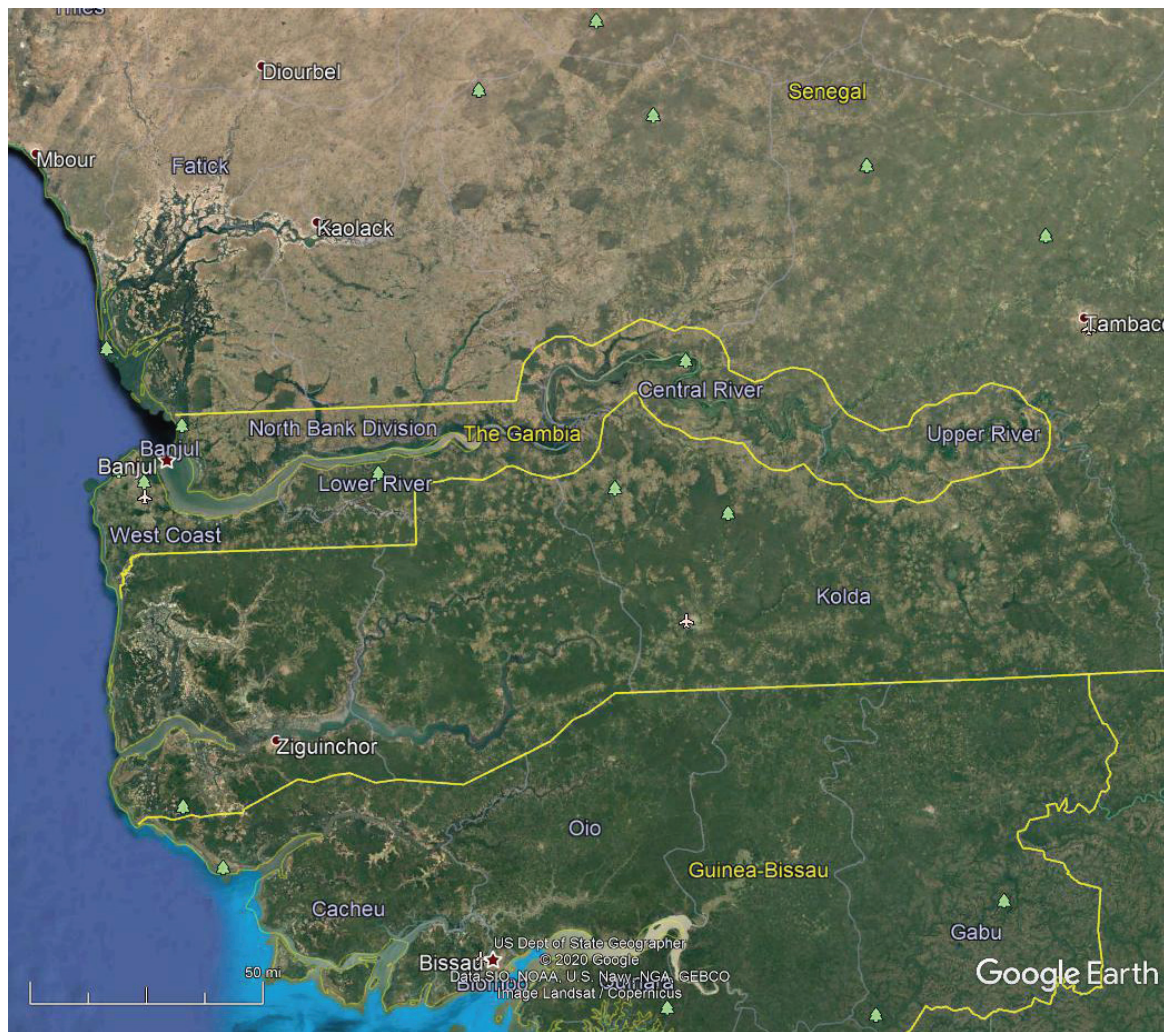


Figure 1: The study area .

Source: www.google.com>earth.

account household's food consumption (dietary diversity and frequency) and ability to access food (physical and economic access). In order to identify the population who are vulnerable to food insecurity, a modified Consolidated Approach to Reporting Indicators (CARI) food security analysis was used. Accordingly, the degree of households' vulnerability to food insecurity was estimated using the modified method with three descriptive groups: Food secure, moderately food insecure and highly food insecure. Figures were obtained by applying the percentages of vulnerability on the population.

Analytical approach

Descriptive statistics was employed to analyse data obtained from the questionnaire (i.e. frequency and percentages). The data was analysed using IBM® Statistical Package for Social Sciences version 20. Qualitative data was analysed using content analyses techniques. These analysis were presented using narratives, tables and charts. Charts and tables were developed using Microsoft Office 2013.

Vulnerability analysis helped to estimate the proportion of people who will be at the risk of food insecurity in the future.

The CARI method was adopted in the study. The approach is a World Food Program (WFP) method used to analyse and report the level of food insecurity within a population. Under this approach each household is classified into one of the four food security categories based on the household's current status of food security using food consumption indicators and their coping strategies.

Results

The socio-demographic profile of study respondents

Table 1 presents the socio-demographic profile of the 230 study respondents. A majority (197; 85.7%) household heads were males, mostly (64.7%) above 45 years. This data shows that agriculture is not a major activity of the active population. This is an indicator of serious implications on agricultural production. Three quarter 173 (75.2%) of the agrarian population had no formal education. Most of the respondents 129 (56.1%) were in the highest income category. Most households 136 (59.1%) were very large and constituted of more than 10 persons. Most 131 (57%) of the households have kids age 0 - 17 months indicating special dietary needs.



The extent of agrarian households' vulnerability to food insecurity in the Lower River Region of The Gambia

Food Insecure and Vulnerable Population: The distribution of households in the study areas based on degree of vulnerability to food insecurity (Table 2) shows that 10,475 people (10.3%) or about 1,309 households are highly vulnerable and 35,151 people (35%) or 4,394 households are moderately vulnerable to food insecurity.

The analysis of vulnerability to food insecurity indicates that on average, the degree of vulnerability in the study area is about 45%. Households in Jarra West district are highly vulnerable (2.65%) followed by those in Jarra East district (1.97%), which can be attributed to the fact that most of the households in these two districts are not strictly agrarian. The main economic activity is trade, especially in the towns of Soma and Wellingara-ba in Jarra West and Jarra East, respectively, where there are daily and weekly markets (Lumos). According to this study, households in Kiang East are less vulnerable to food insecurity (0.98%). The results show significant differences in vulnerability to food insecurity across the districts. This is an indication that district-specific coping strategies are needed. Hence, food security intervention programs should give priority to highly vulnerable areas like Jarra West and Jarra East districts.

Households' vulnerability to food insecurity

Table 3 below summarizes the distribution of households in the study areas based on degree of vulnerability to food insecurity.

Table 1: Socio-demographic characteristics of respondents.

Characteristics	Frequency	Percent	Characteristics	Frequency	Percent
Status of hh head			Age		
Mother	29	12.6	16-30	8	3.5
Father	179	77.8	31-45	73	31.7
Elder sibling	18	7.8	46-60	93	40.4
Others (Guardian)	4	1.7	Above 60	56	24.3
Gender			Annual Income		
Male	197	85.7	< D5,000	33	14.3
Female	33	14.3	D5000- D10,000	68	29.6
Total	230	100.0	>D10,000	129	56.1
Level of education			Household size		
No formal	173	75.2	1-5	22	9.6
Vocational	19	8.3	6-10	72	31.3
Primary	10	4.3	>10	136	59.1
Secondary	26	11.3			
University	2	.9	hh (0-17mths kids)		
			Yes	131	57.0
			No	99	43.0

Table 2: Food Insecure and Vulnerable Population in the Lower River Region of the Gambia.

		Jarra West	Jarra East	Jarra Central	Kiang West	Kiang East	Kiang Central	Total
1	No of people	2,682	1,988	1,099	1,763	992	1,951	10,475
	%	2.65	1.97	1.09	1.74	0.98	1.93	10.35
2	No of people	9,039	7,295	4,430	6,976	3,973	3,438	35,151
	%	8.93	7.21	4.38	6.90	3.93	3.40	34.74
3	No of people	16,579	11,380	6,156	10,557	5,257	5,761	55,691
	%	16.39	11.25	6.08	10.43	5.20	5.69	55.05
	Total	11.58	9.18	5.47	8.64	4.91	5.33	45.10
1	Highly food insecure		2	Moderately Food Insecure		3	Food secure	

Table 3: Household's degree of vulnerability to food insecurity.

Districts	Jarra West	Jarra East	Jarra Central	Kiang West	Kiang East	Kiang Central	% of sample
Non-vulnerable	16.39	11.25	6.08	10.43	5.20	5.69	55.04
Vulnerable	11.58	9.18	5.47	8.64	4.91	5.33	45.11

The analysis of vulnerability to food insecurity indicates that on average, the degree of vulnerability in the study area is about 45%. Households in Jarra West district are highly vulnerable to food insecurity (11.58%) followed by those in Jarra East district (9.18%). Households in Kiang East are less vulnerable to food insecurity (4.91%). There is a significant difference in vulnerability to food insecurity across the districts.

Coping strategies of agrarian households to food insecurity in Lower River Region of The Gambia

Food insecurity coping strategies: The study revealed that most food-insecure households tend to reduce the expenditure of the household to the least to buy food (65.3%), turn to the consumption of low quality and cheaper foodstuff (Shift to less preferred food) (53.7%), borrow food from relatives, friends and neighbours (52.1%) and reduce adults' food consumption to secure the need of children for food (51.3%) in times of food deficit Table 4.

Implication for policy on agrarian household's food insecurity

Institutional structural implication: According to key informant information, declining per capita food production has been a long-standing problem in The Gambia. This problem is compounded by a projected near-doubling of the country population. The situation is particularly worrisome in rural settlements where farmers have lost 25% of their purchasing power over the years due to low production, and average annual farm incomes are below GMD 5,000 per capita.

**Table 4:** Consumption coping mean in the study.

Coping strategy	% population that used the strategy			
	Jarra West	Jarra East	Kiang West	Total
Consumption of low quality and cheaper food stuff (shift to less preferred food)	76.8	37.2	45.7	53.7
Borrow food from relatives, friends and neighbours	62.1	56.2	37.6	52.1
Buy food by debt	60.0	14.6	31.5	34.4
Sell some food ration items to buy other food items	50.0	46.9	46.3	47.7
Consume less food within the meals	71.0	3.2	50.6	42.0
Reduce number of daily meals	82.6	6.5	50.5	46.6
Reduce adults' food consumption to secure the need of children for food	68.4	40.0	43.6	51.3
Reduce the expenditure of the household to the least to buy food	76.4	64.6	55.4	65.3
Send some members of the household to eat with relatives or with other households	7.5	9.4	34.1	17.0
Ensure feeding the employed members of the household rather than those not working	60.2	25.0	37.1	40.6

In another key informant information, agriculture in The Gambia is a major player in the economy, and is faced with structural policy constraints such as weak institutional arrangements for project implementation, weak policy environment, low adoption of agricultural mechanization, inadequate access to inputs, low private sector investment, underdeveloped markets, poor infrastructure which continue to hamper necessary progress toward achieving food security in The Gambia. Low private investment, especially in value-added, declining international agricultural commodity prices; soaring prices of food commodities and essential production inputs; inadequate domestic policies, institutional support and investment in the sector, particularly roads and equipment have been major challenges faced by the country.

The strategy for food security in The Gambia also identified low levels of input use as constraints to increased agricultural productivity. Thus several credit schemes were initiated as part of all agricultural development projects. The schemes were designed to allow producers to buy inputs like seeds, fertilizer etc. for crop production, drugs and other veterinary products for animal health and production, among others. Despite these efforts farmers continue to face issues of low levels of inputs [10].

As a result of the subsistence nature of farming, agrarian households do not produce enough to attain marketable surplus. There is limited income from agriculture and other sources which is often due to insufficient output marketing opportunities. Since markets are poorly developed, farmers are not able to sell their excess products, and the fact that there was, in general, no collateral for these loans, loan repayments were generally poor leading to the collapse of these credit schemes.

However, according to the Gambia poverty assessment report 2009, access to credit, membership in producer associations and use of extension services are also found to be significantly associated with higher production and productivity. Access to

credit for rural farmers appears to be surprisingly reasonable, at an estimated 40 per cent, and more than half of the farmers received credit from microfinance institutions. The significant estimates of the impact of producer associations and extension services need to be interpreted with caution and should be further analysed. The causality relationship could go either way given that more extensive and higher productivity farmers could, for various reasons, be more likely to be a member of associations and receive extension services.

The appraisal report also indicates that the LRR, CRR/N and CRR/S regions have particularly high productive potential. They are key rice and leafy vegetable growing areas with relatively fertile lowland soils, which can be developed to increase national food security. The uplands, particularly in the north of the LRR, have a high potential for the production of coarse grains which are vital sources of household income for smallholders.

The potential is certainly there, however, realizing these gains is particularly difficult in a country where most farms are under two hectares, most significantly small. According to the 2007 National Agricultural Sample Survey (NASS), 85 per cent of farms is smaller than one hectare. However, there is a need for expansion and land development to increase production.

Implication on investment levels: Improving access to global markets will be key to sustaining agricultural growth in the Gambia. But this is not an instant panacea given their supply rigidities. Policy makers in the Ministry stressed that there is also a need to be sensitive to the real possibilities of a damaging trade-off between food security and export earnings. The key to expanding options for the Gambia lies in closing the chronic investment gap facing the rural sector, such as infrastructure (roads, irrigation, markets, etc.). According to a key informant, there is a need for increase investment to enhance farmers' productive capacities, enhance adoption of new technologies and innovations, develop public infrastructure (roads, irrigation, etc.) and expand related market services.

Enhancing local agricultural support institutions: Recent experiences have exposed the danger of relying too heavily on market forces to bolster agricultural development. The role of the Ministry of Agriculture and its partners is key in providing supportive macroeconomic environment and efficient infrastructure for the sector, and socializing risks and helping farmers to manage shocks. This will therefore involve forging new partnerships with a focus, in particular, on strengthening small-holder farmers. Such farmers often face severe institutional constraints concerning land tenure arrangements, access to inputs and technological support services which restrict their ability to respond to external and internal shocks. The Government should also protect small-holders' rights to land and other assets while promoting sustainable use of natural resources. The Ministry of Agriculture should support and engage with farmer groups and cooperatives and find ways to enhance the role of women. Women play a major part in the agriculture sector of the country.

Ensuring the availability of financing (both short and long term) will require innovative institutional responses such as soft loans and grants, seed-financing programmes, tax credits, micro-finance programmes, etc.

Implication on policy: Government identified policies to improve productivity and diversification, among others, restructuring the land tenure and inheritance system to correct gender bias, improving the supply of good fertilizers and pesticides, use of excellent and improved quality seeds and promoting pest and disease control programmes, exploiting the opportunity from the fisheries, forestry and underground water resources, crop diversification and enhancing climate risk management. However, Government should also encourage and facilitate the participation of the private sector and small-scale farmers in all aspects of agriculture to enhance food security.

The Agriculture and Natural Resources (ANR) and the Gambia National Agricultural Investment Programme (GNAIP) combine policies, institutional, infrastructure and technology-related measures to address the multiplicity of supply-side constraints to enhance the growth in agriculture, in The Gambia. Within the context of GNAIP, the government plans to improve agricultural growth from 4% in 2009 to 8% by 2016 and to increase national household's incomes (reduction in the number of people below the poverty line from 61% in 2009 to 44.6 % in 2016). The GNAIP is comprehensive in scope and aligned with the national goals of Vision 2020, and supports the realization of the main national strategic programmes, including the PAGE as well as the Comprehensive Africa Agriculture Development Programme (CAADP) framework, a programme of the New Partnership for Africa (NEPAD).

The areas of focus for the GNAIP are mainly improvement of agricultural land and water management, improved management of other shared natural resources, development of agricultural chains and market promotion, national food and nutrition security, sustainable farm development, improved access to farmlands as well as markets and social services, and coordination, monitoring and evaluation.

As indicated in the United Nations, Economic Commission Country Profile, The Gambia, even though these policy measures are within the implementation capacity of the Government, there is a limited level of success with little quantifiable effect on rural poverty or agricultural productivity. Although monitoring and evaluation are a fundamental part of the design stage, there has not been any review of GNAIP known to allow pinpointing its constraints and weaknesses. Despite the involvement of several development partners, the goals of Vision 2020 concerning agriculture are still far away. Agricultural productivity is unstable and not high enough to cater for the current population growth. The PAGE mid-term evaluation shows that food insecurity persists for those engaged in agriculture and to a great extent pinpoints failures by institutions and inadequate planning that are frustrating the efforts of the Government to reach its objectives in agriculture.

The Government, therefore, needs to strengthen organization and management of agricultural extension

programmes that can provide a sustained flow of technological and technical information pertinent to farmers' production problems, and integrate irrigation and water resources management into farming practices to boost agricultural productivity and safeguard it from weather-related risks.

Technological capacity: Technological advancement in agriculture requires more significant investment in research and development (R&D) as well as adapting existing knowledge architectures to ensure that on-going research and allied activities promote sustainable agricultural development that responds to local needs and conditions. A common vision for technological needs and capacity building in the agriculture sector linking farmers, researchers and policy makers is still missing in the country. Public research institutions, such as the National Agriculture Research Institute (NARI), have a key role to play. Increased attention to knowledge diffusion, management and dissemination of innovative approaches/practices and positive experiences is a place to begin with particular attention to the challenges facing small-holder producers in the country.

Among the key informant respondents, 90% believed that there is an immediate need to reverse the declining trend for agricultural research in The Gambia. The international community has as a significant role to play given the generally small national budgets for R&D in the agriculture sector in the country. The establishment and strengthening of regional centres of excellence for agricultural research could also help build critical research capacity drawing on common agro-ecological conditions and challenges along with providing the financial resource mass required to achieve economies of scale.

Improvement in agricultural productivity also requires investment in technology adaptable to the particular needs of small farmers. A small percentage of the arable land in The Gambia uses irrigation systems. Therefore, the extensive use of irrigation systems in drought-prone areas may likely contribute to the increase of productivity; especially for those commodities which depend on rainfall. Otherwise, the use of drought-tolerant crops can be implemented to improve or assure production in times of lack of rainfall. The use of fertilizers could also play an essential role in the improvement of productivity. An increase in productivity can translate into additional income and contribute to an improvement in the availability of food

Discussion

The extent of agrarian households' vulnerability to food insecurity in the Lower River Region of The Gambia

A number of factors influence household food security [14], size of the family, cultivated land size, fertility of soil, irrigation access, number of extension visits, fertilizer use and improved seed [15].

In the study area, 9.6% had a household size of 1 to 5 people, 31.3% household size of 6 to 10 persons and 59.1% had household size of 10 persons and above. A negative implication

of household size could be that large household sizes can easily become vulnerable to food insecurity as they have a greater number of people to cater for.

The factors influencing household food security in Nigeria were examined by Amaza, et al. [16] using logistic regression methodology. Results of the study revealed that household size is the key determinant of food security. Food insecurity increases with the increase in the number of family members and vice versa.

Bogale, 2012 [15] examined the factors which determine the household level of vulnerability to food insecurity by utilizing method of expected poverty approach having data obtained from 277 randomly selected household in Ethiopia. The food insecurity of household is associated with many factors including the household size, cultivated land size, the fertility of soil, irrigation access, number of extension visits, fertilizer use and improved seed. The cut-off level has been computed and household whose expenditure falls below the specified level was identified as vulnerable. The total number of food insecure household was lower (103) than vulnerable household (111).

According to this study, 10,475 people (10.3%) or about 1,309 households are highly vulnerable and 35,151 people (35%) or 4,394 households are moderately vulnerable to food insecurity.

Jarra West has the highest prevalence of food insecurity; 2.65% of the population representing 335 households. Jarra East and Kiang Central recorded prevalence levels of 1.97% and 1.93% respectively. Kiang east is the district with the least proportion of people considered highly vulnerable (0.98%). This translates to 124 households. However, the 2016 Comprehensive Food Security and Vulnerability Assessment (CFSVA) found that about 14,845,8 persons are food-insecure or vulnerable to food insecurity at the National level. This represents approximately 8% of the total population, of which 0.6% are severely food insecure (2016 CFSVA). This, therefore, represents an increase in the proportion of the food insecure population from 5.6% in the 2011 CFSVA. 29.1 per cent of the households interviewed were found to be marginally food insecure. The results of the 2016 CFSVA highlighted that food insecurity extremely affects households in mainly rural areas. Thus, Basse, Kuntaur, Janjangbureh and Mansakonko were found to have the highest number of food-insecure households in the country. In these four LGAs, the number of food-insecure households ranges between 12 per cent and 18 percent.

This study shows that the Jarra strata have the highest percentage of food insecure households compared to the data from the 2016 CFSVA which shows that the Kiang strata have the highest percentage of households that were food insecure when compared to other strata or districts. Previous studies like the 2016 CFSVA have indicated vulnerability high levels in and around Kiang. An in-depth review of available development interventions targeting Kiang may provide answers to the elevated vulnerability levels shown in the data.

According to key informants, drought and other climatic extremes are also major contributing factors to vulnerability to food insecurity. In the past years, the Lower River Region has not received normal rainfall thus not free from climatic abnormalities such as flood or drought. Drought is the most appalling natural event that causes widespread vulnerability in the region, but this is by no means the only natural hazard facing the people of the area. Periodically, floods afflict localized parts of even the driest areas. These factors contribute negatively to crop production.

According to work done by Demeke, et al. 2011 [17]; Collier, et al. 2008 [18]; Di Falco, et al. 2011 [19] the level of vulnerability and food insecurity mainly depends on the performance of agriculture. Hence, household vulnerability and food security is largely be influenced by a combination of both natural and man-made factors, including rainfall patterns, land degradation, population density, climate change, low levels of rural investment, volatile input and grain prices, drought, pest hazard, frost, and flooding [20-23]. In addition, access to different resources and institutional factors, such as access to land and labour, infrastructure, technologies, credit, and geographic suitability also affect the level of vulnerability.

However, the 2016 CFSVA survey results indicate that households having access to improved water and sanitation facilities are at least twice less likely to be food insecure, while households with an unimproved source of drinking water and poor sanitation facilities are more likely to be vulnerable to food insecurity.

Although some of these factors are beyond governments' control, progressive policies that aimed at strengthening agriculture and food security, improving nutritional outcomes and building resilience can lessen the impact of future shocks [24].

Coping strategies of agrarian households

Households employ different coping strategies in times of food deficit in the study area. Food insecurity is a climate-induced shock or risk, and coping strategies are those commonly used in mitigating vulnerability. The potential food insecurity coping strategies practiced in the study areas include relying on less preferred food and less expensive foods like carbohydrates. Generally, rice is the main carbohydrate meal accompanied by different stews or soup in The Gambia. Vulnerable households eating less than three meals a day turn up to eat rice as "nyangkatango" that is dry white rice. Other substitutes include "cherreh" which is locally processed millet. These dishes are socially accepted, affordable and cheaper. Some households also turn to gather wild foods and/or hunting. Other unfortunate strategies occasionally adopted include reducing expenditures on essential non-food items such as on education and health, selling household assets and goods like jewellery, phone, furniture etc., The coping strategies adopted varied significantly across the different districts.

Analysis of coping strategies in work done by Grobler and Dunga (2017), shows that higher levels of food insecurity are

associated with the use of more coping strategies. Although the analysis shows that food secure households also use some coping strategies. These are mostly food saving and income saving which are necessarily a planning strategy, unlike food shortage strategy.

Maxwell, et al. 2003 [25] argue that coping strategies used may differ from household to household and within households. In this context, Mjonono, et al. 2009 [26], indicates that the coping strategies used will vary between different poverty levels. In this regard, this study analyses the coping strategies used by the food secure group in a community versus the insecure food group in the community.

According to key informant information, households in Jarra East district seek off-farm or non-farm sources of food and income or reduce household food consumption. Kiang East district is focused more on investing in social capital and food aid from effective government strategies as compared to other districts. While for Jarra Central district, the most effective coping strategy reported engaging in off/non-farm activities.

Consumption coping strategy Index

Consumption coping strategies index (CSI) is a quick qualitative method and ranking on food insecurity mitigating options. It is an indexing tool that provides real-time information (at a lean period). It is relatively quick and easy to use. It can be administered and correlated subsequently with more complex measures of food insecurity at the district level. A comprehensive study of households' food insecurity would require a detailed consideration of livelihoods and assets. The CSI is entirely satisfactory as a rapid indicator of household food insecurity status.

The CSI had been similarly used by Mjonono, et al. 2009 [26], Sample households were asked how often their households had to do with particular coping mechanisms, that is, if there were times when they did not have enough food or money to buy food in the past 12 months. 83% revealed that they reduce the number of daily meals as measures to food insecurity faced by their households. 76.4% indicate the use of reducing the expenditure of the household to the least to buy food as their primary coping strategy. The major consumption coping strategies used is borrowed food from relatives, friends and neighbours, and reduce the number of daily meals in order of importance. Households with less CSI scores applied those consumption coping strategies less frequently than households with high CSI scores.

The current study revealed that most food-insecure households tend to reduce the expenditure of the household to the least to buy food (65.3%), turn to the consumption of low quality and cheaper foodstuff (Shift to less preferred food) (53.7%), borrow food from relatives, friends and neighbours (52.1%) and reduce adults' food consumption to secure the need of children for food (51.3%) in times of food deficit).

Food insecure households in Jarra West district are most likely to reduce the number of daily meals (82.6%), turn to consumption of low quality and cheaper foodstuff (76.8%),

reduce the expenditure of household (76.4%) and consume less food (71.0%). In Jarra East district, reducing household consumption (65%) and borrowing food from friends, neighbours and relatives (56%) are reported as major consumption coping strategies. In Kiang West, reducing household expenditure, consuming less food and reducing number of meals are said to be consumption coping strategies in times of food deficit. Households coping strategies of the areas are, however, influenced by the geographical location of these districts and its characteristics. For example, Jarra East and West have market centres wherein households could engage in other sources of livelihoods through trade, unlike the other areas where there are little or no other economic activities that households can engage in, for livelihood needs.

According to this study, areas (districts) with households that rely on agriculture as their primary source of livelihoods have lower levels of food insecurity compared to areas that depended on other sources as their primary source of livelihoods. Contrarily, the results of the 2016 Comprehensive Food Security and Vulnerability Assessment (CFSVA) have shown that food insecurity levels are higher in households that mainly depend on agriculture as their primary source of livelihood.

Farzana, et al. [27] found a significant association between the different types of coping strategies used and the level of household food insecurity. In this study, it was found that severely food insecure households are more inclined to a wider selection of coping strategies to cope with food insecurity, than mildly or moderately food insecure households. Mabuza, et al. [28], indicated that households do not act in an arbitrary way when it comes to food insecurity. In most cases, they develop strategies to minimise the risk to immediate food insecurity.

Implication of Findings

Implication for policy on agrarian household's food insecurity: Recent experiences have exposed the risk of relying heavily on market forces to boost agricultural development. The role of the Ministry of Agriculture and its partners is key in providing supportive macroeconomic environment and efficient infrastructure for the sector, and socializing risks and helping farmers to manage shocks. The implication is therefore forging new partnerships with a focus on strengthening small-holder farmers. Such farmers often face severe institutional constraints concerning land tenure arrangements, access to inputs and technological support services which restrict their ability to respond to external and internal shocks. Therefore, a clear mechanism has to be put in place with the government providing a regulatory environment that can help to address issues related to access to inputs and technological support services among others. The Ministry of Agriculture should also support and strengthen farmer groups and cooperatives.

According to the study agriculture is not in the hands of the active population that is 64.7% are between the age of 46 and above 60, therefore the government should find ways to promote youth participation in the agriculture sector of the country.

Implication on agricultural production: The study shows that agriculture is not in the hands of the active population. Only 3.5% of the respondents involved in agriculture were between 16 and 30 years. Conversely, 31.7% were between 31 and 45 years, up to 40.4% were between 46 and 60 years and 24.3% were above 60 years. This is very common for first generation agriculture, where most youths prefer to leave their villages to towns/cities for white and semi-white collar jobs, a phenomenon known as rural exodus. This poses serious implications on agricultural production. Most Agriculture value chains in The Gambia thus suffer problems of low productivity levels as a result of low labour force; thus the need for government policies that will encourage youth participation in agriculture. To remedy the situation, a Youth and Trade Roadmap of The Gambia 2018–2022 was developed to enhance and develop economic opportunities for youths in the nuts and agro processing sector. According to the Youth and Trade Roadmap of The Gambia (2018–2022) [29–32]. It employs nearly half of the working population and remains the leading employer for Gambian youth.

According to the UNDP's NHD report (2014) [33] Limited incentives are provided to maintain youth involvement in agriculture. In line with these challenges, there are policy response and intervention by The Ministry of Agriculture and partners in which most of the International Fund for Agricultural Development Projects like National Land Development and Management Project (NeMA) targeted mainly youths and women in a bid to enhance youth participation and productivity.

According to the National Youth Policy 2009–2018 [34], low motivation towards agriculture and lack of livelihood skills hinder the development of young people in The Gambia. The policy uses the Back to the Land Initiative as the precursor to draw private and public investment in youth and agriculture. The policy also highlights the significance of promoting investment in agriculture for youth in the areas of training, inputs, access and ownership to land.

The Programme for Accelerated Growth and Employment (PAGE) (2012–2015) [35] also highlights policy initiatives intended to promote youth employment in the agriculture sector. The policy emphasizes youth development and mobilizing young people for increasing agricultural productivity.

In terms of level of education in the study, most of the respondents (75.2%) were without any formal education, (8.3%) did Vocational training, (4.3%) had primary education, whilst (11.3%) obtained secondary education and 2 (0.9%) attended university education. This has serious implication on agricultural production because education plays a pivotal role in improving on production. Today, as compared to the past, we have witness a lot of technological innovations in the agricultural sector especially in the developed countries. For Africa to make positive steps in its quest to increase production especially for smallholder farming systems, there is need for adequate transfer of technology to enhance production and productivity.

Implication on Vulnerability to Food Insecurity: In terms of household size as shown in the study, (9.6%) had a household size of 1 to 5 people, (31.3%) had a household size of 6 to 10 persons and (59.1%) had a household size of 10 persons and above. In a similar study done by Abdullah, et al. 2017 [36–46], the food insecurity of household is associated with many factors including the size of the family.

One of the positive implication to large household sizes could be that, they can provide easy access to family labour during farming. However one of the negative implication could be that, some large household sizes can easily become vulnerable to food insecurity as they have a greater number of people to cater for. Thus the need for safety net programs to encourage household food saving in times of abundance.

As shown in the study, the degree of vulnerability in the study area is about 45%. Jarra West has the highest prevalence of food insecurity; 2.65% of the population representing 335 households. Jarra East and Kiang Central recorded prevalence levels of 1.97% and 1.93% respectively. Kiang east is the district with the least proportion of people considered highly vulnerable (0.98%). This translates to 124 households.

The results show significant differences in vulnerability to food insecurity across the districts. This has implication on policy, thus, district-specific coping strategies are needed. Hence, food security intervention programs should give priority to highly vulnerable areas like Jarra West and Jarra East districts.

Implication on livelihoods: Households coping strategies of the areas are, however, influenced by the geographical location of these districts and its characteristics. For example, Jarra East and West have market centres wherein households could engage in other sources of livelihoods through trade, unlike the other areas where there are little or no other economic activities that households can engage in, for livelihood needs. According to this study, areas (districts) with households that rely on agriculture as their primary source of livelihoods have lower levels of food insecurity compared to areas that depended on other sources as their primary source of livelihoods.

Contrarily, the results of the CFSVA (2016), have shown that food insecurity levels are higher in households that mainly depend on agriculture as their primary source of livelihood. However, this differences could also be attributed to the fact that the study primarily focused on agrarian households and the main consumption patterns or means of livelihood assessment was focused on agriculture and related sources and not monetary values. (CFSVA, 2016).

Conclusion

The study concluded that food insecurity is a major problem in small-scale agrarian households of The Gambia. Trends in food security and nutrition are intrigued by climate variability and vulnerability to shocks and crises. Vulnerability to food insecurity varies significantly across the three districts of LRR. On average, the degree of vulnerability in the Lower River Region of The Gambia is about 45%. Most food insecure



households tend to reduce the expenditure of the household to the least to buy food (65.3%), turn to the consumption of low quality and cheaper foodstuff (shift to less preferred food) (53.7%), borrow food from relatives, friends and neighbours (52.1%) and reduce adults' food consumption to secure the need of children for food (51.3%) in times of food deficit. The challenges to promote food security and improve nutrition in "vulnerable areas" are diverse. They include frequent or continued exposure to shocks that undermine livelihoods, food and market systems. Weak institutional and governance capacity, as well as unsustainable or inequitable use of natural resources, are also a common feature of protracted crises. Emergency interventions in these contexts are often not well integrated with development approaches to address structural issues and promote resilience. Also recognizing the importance of crop diversification in smallholder production systems, particularly its role in ensuring that farmers do not depend exclusively on production and income from a single crop. Future advances in practice and research are needed to better promote resilience.

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Authors' contribution

This work was carried out in collaboration between all authors. Author JM designed the study, data collection instrument, collected the data, performed the statistical analyses and co-wrote the draft with the guidance of Author AGA and NRN. All authors co-wrote the draft of the manuscript, read and approved the final manuscript.

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