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Poverty measurements in the small-scale fishery of Liberia: A step towards poverty eradication

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Abstract

The Small-Scale Fisheries (SSF) sector is engulfed with too many challenges ranging from poverty to vulnerability and marginalization of fisherfolks within these underdeveloped fishing communities along the nine coastal counties of Liberia. This study used FGT techniques and the Sumaila Relative Poverty Indices to examine the measurements of poverty in two of the SSF communities in Liberia. Using a semi-structured questionnaire, data was collected from the two segments that interact in the SSF of Liberia (Kru and Fanti). Marshall Kru and Marshall Fanti sampled 100 people from where a response rate of 100% was obtained, and Westpoint Fanti and Westpoint received a response rate of 99% (99 people) and 98% (98 people) respectively. This phenomenal response was due to the highly targeted nature of the interview and the author's notable experience and working relationships in the industry. Findings from the analysis show that poverty head-count index was between 48% and 97% using the 2011 Upper Global Poverty line and between 50% and 100% using the Upper Global Poverty line of 2017. This is an indication that poverty is pervasive in the two fishing communities. The two fishing communities face similar vulnerability and marginalization ranging from lack of access to basic socio-economic services such as safe drinking water, electricity, markets, and schools to fisheries management issues such as sea level rise, competitions among users and conflicts. This is compounded with the lack of postharvest loss or value addition facilities to preserve and process catches from the SSF to obtain the actual market value and prevent spoilage. To mitigate this malice, several management recommendations are proposed to alleviate poverty in the SSF of Liberia and improve the livelihood of coastal communities' dwellers.

Keywords: Marginalization, poverty line, poverty, small-scale fisheries, vulnerability

Introduction

Liberia's 579 km coastline and 246,000 km² EEZ that harbours considerable amount of restored valuable demersal and pelagic oceanic resources, which in turn are a priority to food security, where fish provides around 65% of the animal protein consumed in Liberia. The fisheries in the country provide a vital means of employment and livelihoods for about 70,000 Liberians (on a full- and part-time basis including fishermen and fish traders along the fish value chain) and are a major source of revenue for the government, accounting for nearly 10% of national gross domestic product (GDP), (Belhabib, Sumaila and Pauly, 2015) ^[14]. Because of the high rate of unemployment and the open access regime of the small-scale fisheries (SSF), the fishing industry in Liberia is regarded as a buffer for many jobless young Liberians (Belhabib, Mendy, Subah *et al.*, 2016) ^[13].

Fish provides both food and economic benefits for residence living in coastal communities and along inland waters body (Pinello, Gee & Dimech, 2017) ^[66]. Globally, there is a declined in capture fish production and it is proportionate to the economic value accrue from its sale (FAO, 2022) ^[30]. This declining trend in marine capture fisheries globally, will exacerbate the already challenge small-scale fisheries (SSF) of most developing state including Liberia thereby affecting their livelihood (Salas *et al.*, 2007) ^[70]. Moreover, the perception of most people including policy makers are that only poor people are engage into SSF and that returns from the fishery can only allow for daily sustenance and that poverty is pervasive. However, if care is not taken to sustainably manage the use of Liberia's valued marine resources, that is continuously contributing to national food and nutrition security, livelihoods, and incomes for the coastal communities as well as wealth generation, the perception of policies makers will be a reality with the declining trend of capture fisheries (Abissa, 2021) ^[21].

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In the small-scale fishery sector, there is currently limited knowledge on monetary and non-monetary poverty measurements that are conceptually essential, instead of the normal measure of poverty based on income in the fisheries sector (Ofori-Danson *et al.*, 2013; Chakravarty, 2009) ^[63, 223]. The combination of both qualitative and quantitative analysis will be used on a wide range of data encompassing income, poverty gap, consumptions, headcount ratio, assets, debt, poverty severity, access to basic human needs such as health, education, loans among others to determine the levels of poverty-stricken segments of people engaged in the SSF of Liberia (Ofori-Danson *et al.*, 2013) ^[63].

The SSF of Liberia consists of two groups of peoples and two types of craft, namely. The Kru that uses the Kru-style' wooden dug-out non-motorized canoes with one to four crew members and the Fanti that uses motorized large craft made with the combination of planks and logs and a crew member of 12 to 20 persons (Juseah *et al.*, 2021) ^[46, 49]. The level of poverty among these fisher folks are unknown and social economics statuses are also unknown. Therefore, this study focuses on determining the social economic statuses including poverty indices of the SSF of Liberia.

The main aim of this study is to assess the social-economic status of the SSF sector of Liberia and recommend possible strategies to eradicate poverty.

The objectives of the study that will lead to delivering the above aim

1. Assess and measure poverty in the SSF sector considering both monetary and nonmonetary indicators/ indices.
2. Promote equity in the distribution of income between the fleet segments.
3. Examine the level at which SSF is vulnerable and has been marginalized.
4. Propose possible ways to eradicate poverty in the small-scale fishery and increase earnings of fishers.

From these objectives the below research questions were derived

1. What are the levels of poverty in the SSF of Liberia and among which groups?
2. What is the means of credit and access to basic social economics services?
3. What is the level at which SSF is vulnerable and has been marginalized?

4. What are the required policies needed to eradicate poverty within the SSF sector of Liberia?

Materials and Methods

Study Area

Liberia is a relatively small coastal state located in West Africa and has the second longest coastline of 579 kilometres consisting of relatively warm waters and low nutrient contents with 100 plus landing sites. This study focuses on two of the landing sites (Westpoint beach in Montserrado County; and Marshall in Margibi County). The first site is situated in a semi-urban area, outside Monrovia, the capital city of Liberia, while the second site is a rural fishing community. The two fishing communities were selected based on the high number of fisher folks, geographical location, and accessibility of these communities due to the road's conditions and serve as potentially interesting contrasts and points of comparison.

Data Collection Method

Primary and secondary data were collected from survey of canoe owners', fishermen, desk review and analysis of existing documents, focus group discussions and participatory assessments. The 2020 Artisanal Frame Survey report was used through a stratified random sampling technique to select the representative fishing households and individual fishermen for the study. Considering the total number of fishermen and canoe owners within the selected sites, a total of 50 household-head including canoe owners, and 50 fishermen (crew members) were selected per sampling sites and the types of fishing/ canoe category, thus giving an initial total sample of approximately 400 individuals across the two sites. The data collection took place between May and June 2023.

The primary data collection took place after contacting the selected fishermen and canoe owners via telephone and explaining the purpose and objectives of the research to them. A follow-up meeting was conducted at the two selected sites respectively to inform the research participants about their selection to participate in the research and more clarity was provided on the aims and objectives of the research. Questions pertaining to the confidentiality of the identity of the targeted respondents were asked during the meetings and addressed adequately. Table 1 below shows the total number of people who consented to the research and were interviewed per fishing units or fisherman types.

Table 1: Summary of sample size in household and fisher surveys

Fishing Community	Type of Fishermen	Sample size	Sampling Strategy	Responsive Participants
Marshall	Marshall_Kru	100	Stratified Random Sampling	100
	Marshall_Fanti	100	Stratified Random Sampling	100
Westpoint	Westpoint_Kru	100	Stratified Random Sampling	98
	Westpoint_Fanti	100	Stratified Random Sampling	99

From the above table, Marshall Kru and Marshall Fanti have 100% response rate, while out of the 100 people from Westpoint Kru, 98 people agreed to take part, thus giving a response rate of 98%; and Marshall Fanti had a response rate of 99%.

The questionnaire that was administered to the research participants was designed in a way that addresses the objectives of the study and answers the research questions. Table 2 below summarizes the types of questions that were asked to achieve the desired outcomes of the study. The

questionnaire was divided into six different sections and with 51 questions in total all of which ask for specific quantitative data pertaining to fishing economies, income, and necessary market data. No questions were designed to capture qualitative responses on opinions and attitudes since the research focuses on quantitative elements of industry analysis. The questionnaire was created using XLS Form and programmed into the Open Data Kits (ODK) Aggregate Server on Google Cloud and the ODK apps installed on mobile phones to collect the data (Hartung *et al.*, 2010) ^[37].

The questionnaire was tested on five respondents, who took an average of 22 minutes to conduct one interview. From the test conducted, the adequacy of the results in achieving the research objectives and answering the research questions was

ascertained (Table 2). After the successful testing of the interview questionnaire, an interview schedule was developed for the individuals who agreed to take part, from where the face-to-face interview was conducted.

Table 2: Summary matrix showing how the questionnaire was designed to answer the research questions.

Research Questions	Sections of the Questionnaire that Addresses the Research Questions
What are the levels of poverty in the SSF of Liberia and among which groups?	Section 1 to 4- General Information, Fishing Program, Fishermen’s Sale/ Income and Fish species caught addresses this question.
What is the means of credit and access to basic social economics services?	Section 5- Socio Economics Status answers this research question.
What is the level at which SSF is vulnerable and has been marginalized?	Section 5 & 6- Socio Economics Status and Fisheries Management Issues.
What are the required policies needed to eradicate poverty within the SSF sector of Liberia?	Results from analysis of the collected data and focus group discussions including review of literature on fisheries management and governance.

The data collected from the various segments within the artisanal fishing communities selected included general quantitative data about demographic information, types of fishing gears and units, breakdown of expenditure incurred doing a fishing trip, average catch per fishing trip, cost and life span of the fishing equipment, monthly expenses, and maintenance cost of fishing equipment. Other numerical data that were collected are access to credit facilities, electricity, water, school, health facilities, fishing inputs and affordability of said inputs.

Poverty measurements

To establish the poverty levels in the two selected fishing communities, the below methodologies were used. The income and expenditure data that were collected from the selected fishing communities were used in establishing the poverty indices using the below models.

Construction of the poverty lines

The following sources were used to establish the poverty lines: Jolliffe *et al.* (2022) [44], Tetteh-Baah *et al.* (2022) [79], and Castaneda Aguilar *et al.* (2022) [21] were used to construct the poverty lines used for this study. This was used since there are no recent poverty lines established for Liberia, and consideration was also placed on poverty lines defined by the World Bank Poverty & Equity Brief for Sub-Saharan Africa (Liberia) 2018 and Backiny-Yetna *et al.* (2012) [12]. Backiny-Yetna *et al.* (2012) [12], who computed the annual lower and upper poverty lines in 2007 for Liberia at LRD\$ 20,066.16 and LRD\$ 30,223.74 respectively, equivalent to LD\$ 1,672.18/month (lower) and LD\$ 2,518.65/month (upper). Globally, the lower, and upper poverty lines estimated in 2011 were 1.91 USD, and 5.47 USD respectively, while the latest poverty lines estimated in 2017 are: lower is 2.15 USD and the Upper as 6.85 USD (Jolliffe *et al.*, 2022; Tetteh-Baah *et al.*, 2022; and Castaneda Aguilar *et al.*, 2022) [44, 79, 21]. This study therefore uses the latest available 2011 to 2017 poverty lines, which despite being somewhat outdated, serve as the most reliable period currently available.

These estimated poverty lines were used to estimate the poverty gap and relative poverty indices. It was also used as the baseline for comparison of the poverty indices that were estimated from the various target groups. The poverty indices, when compared with the established poverty lines, indicate whether those target groups and their dependents are poor people, considered in the middle class, or living above the poverty lines. If they are living below the poverty lines, meaningful interventions to lift them out of poverty-stricken situations will be proposed for government or the private

sector to intervene where necessary.

The Foster-Greer and Thorbecke (FGT) technique

The following poverty indices head-count index ($\alpha = 0$); poverty gap index ($\alpha = 1$); and poverty severity index ($\alpha = 2$) was calculated using formula as modified by the World Bank (2005) below.

$$P_{\alpha} = \frac{1}{n} \sum_{i=1}^q \left[\frac{Z - Y_i}{Z} \right]^{\alpha}$$

Where,

α : is the measure of index to poverty sensitivity

Z: The value of the poverty line

Y_{pi} : The poor groups of people expenditure

n: The total population

n^* : Respondents with proportion of expenditure below the poverty line and

q_i : The number of persons within the group below the poverty line

When $\alpha = 0$,

$$P_0 = \sum q_i / n = H$$

H is defined as the head-count ratio, meaning, The proportion of people that their total income is below the poverty line.

When $\alpha = 1$, P1 is the income-gap measure (the poverty-gap index (PG):

$$P_{\alpha-1} = PG = \frac{1}{n} \sum_{i=1}^q q_i \left[\frac{Z - Y_{pi}}{Z} \right]$$

The average poverty-gap, or the amount needed or the amount when used that will bring everyone right at the poverty line, which is then divided by total population.

When $\alpha = 2$, the Squared Poverty Gap index (SPG)

$$P_{n-2} = SPG = \frac{1}{n} \sum_{i=1}^q \left[\frac{Z - Y_i}{Z} \right]^2$$

Relative poverty index

The relative poverty indices were calculated based on the formula proposed by Sumaila (2003) [76] as in Ofori-Danson *et al.* (2013) [63] below:

$$P\text{-Index fishing community} = \frac{\text{Income fishing community}}{\text{Income poverty line}}$$

By using these algorithms, the extent and level of poverty among the various target groups or stakeholders within SSF of Liberia was determined. This helps to answer the first research question as defined above. The required data was collected from the various segments of SSF using a well-structured questionnaire, and the poverty lines constructed herein, thus represent the required inputs for the algorithms defined above. As early stated in paragraph 1 of Section 3.2 of this proposal, the 2020 NaFAA Frame Survey report was used through random stratified sampling method to select 50 household-head including canoe owners and 50 fishermen (crew members) each per site. These selected target groups were interviewed using a structured questionnaire, as detailed above, covering questions on incomes, expenditures, access to basic social services, fishing inputs among others important questions as described above.

Results

Income, Expense and Non-Monetary Indicators

The two fishing communities in the research are rural and urban communities. Therefore, the higher the income the higher the consumption or expenditure. However, expenditure is low in Marshall fishing community a rural community per household. Table 3 below presents the socio-economic conditions among fishing units in the selected fishing communities. Marshall Fanti had the highest expenditure of US\$1,536.75 and the per capita consumption at US \$59.11. One of the reasons why this so is because Marshall Fanti has the highest average monthly salary per crew member at US \$289.18, followed by Westpoint Kru (US \$192.97),

Westpoint Fanti (US \$104.32) and Marshall Kru (US \$94.71). The next reason is that most of the inputs used for the outboard motors such as fuel and lubricant which is almost 60% of the expenditure for canoe owners are sold at a higher price because of the associated transportation cost incurred by business owners. However, as expected Marshall Kru had the least consumption and per capita consumption because almost all the food items are produced locally by other farmers and or from the fishermen own farms.

Overall, the monthly net income per canoe owner was: Marshall Fanti US\$1181.95, Marshall Kru US\$2185.33, Westpoint US\$2647.83 and Westpoint Kru 2447.17 (Table 3). The high expenditure for Marshall Fanti on salary, fuel and lubricant is the reason for the lowest monthly net income per canoe owners.

Regarding households with savings, it was observed that only canoe owners had some form of savings, but the crew members did not have any form of savings. All the canoe owners from all the fishing units constituting 50% per fishing unit had some form of saving (Table 3). The form of saving varies from Monthly Susu (saving union), Club (annual saving union), bank deposits, lending and keeping cash at home. Bank deposit is the least among the saving methods, canoe owners do not trust the banking sector of Liberia. They have the perception that when they are ready to expend their money, the bank will not have the cash readily available. Monthly Susu and Club were the preferred form of saving. In terms of households with assets, all the target groups or households (100%) possess some form of asset. All the target group has land and or house. Some of the form of assets owned by the target groups are: land, house, outboard motors, farms, furniture, cars and canoes.

Table 3: Socio-economic conditions among the fishing units in the selected fishing communities.

Indicators	Marshall Fanti	Marshall Kru	Westpoint Fanti	Westpoint Kru
Monthly consumption (USD) canoe owner	1536.75	251.35	1122.57	484.05
Monthly consumption per capita (USD)	59.11	9.67	43.18	18.62
Monthly net income per canoe owner	1181.94	2185.33	2647.83	2447.17
Monthly net income per crew member	289.18	94.71	104.32	192.97
Monthly per capita income per crew member	9.64	3.157	3.48	6.43
Household with saving (%)	50%	50%	50%	50%
Household with asset (%)	100%	100%	100%	100%

Absolute Poverty Indices

Table 4 below shows the head-count index, poverty gap index and poverty severity index computed using the lower global poverty line of 2011 and 2017, which as explained in the methodologies, are the most recent computed global poverty lines currently available. The computed estimates indicate the incidence of poverty were: Marshall Kru (2% and 3%), Marshall Fanti (1% and 2%), Westpoint Kru (28.57% and 40.81%) and Westpoint Fanti (50% and 50%) for 2011 and 2017 respectively. The poverty head-count index was significantly different between the two sites (ANOVA, DF=3, p<0.05). The incidence of poverty depicts that the incidence of poverty is high in the Westpoint fishing community and lower in the Marshall fishing community considering the

lower level of the global poverty lines of 2011 and 2017 (Table 4). Poverty was higher in urban community (Westpoint) than in the rural community (Marshall).

The distance separating the poor people from the poverty line (poverty gap) and the inequality among the poor (poverty severity) were computed as seen in Table 4 below. The computed indices were: Marshall Kru- 0.008 P₁, 0.006 P₂ (2011) and 0.0096 P₁, 0.007 P₂ (2017); Marshall Fanti- 0.002 P₁, 0.0003 P₂ (2011) and 0.0038 P₁, 0.0008 P₂ (2017), Westpoint Kru- 0.102 P₁, 0.051 P₂ (2011) and 0.127 P₁, 0.064 P₂ (2017) and Westpoint Fanti- 0.155 P₁, 0.053 P₂ (2011) and 0.193 P₁, 0.079 P₂ (2017). The poverty gap was significantly different for the two sites (ANOVA, DF=3, p<0.05).

Table 4: Poverty indices based on lower global poverty line of 2011 and 2017

Poverty index	Marshall Kru		Marshall Fanti		Westpoint Kru		Westpoint Fanti	
	2011	2017	2011	2017	2011	2017	2011	2017
Head-count index-P0	2	3	1	2	28	40	50	50
Poverty gap index-P1	0.008	0.0096	0.002	0.0038	0.102	0.127	0.155	0.193
Poverty severity index-P2	0.006	0.007	0.0003	0.0008	0.051	0.064	0.053	0.079

The upper global poverty lines for 2011 and 2017 were used to compute the poverty gap indices in Table 5 below. The incidence of poverty was computed as follows: Marshall Kru (97% and 100%), Marshall Fanti (48% and 50%), Westpoint Kru (90.8% and 92.86%) and Westpoint Fanti (76.77% and 89.9%) for 2011 and 2017 respectively. These results indicate that the Kru fishermen regardless of which community they belong to, poverty is higher as compared to the Fanti fishermen in Liberia. These differences may be due to the size of the craft or canoe they are using, paddling as the mode of mobility and the low catch rate. From the analysis, almost all of the Kru fishermen are poor. However, poverty is high amongst the Marshall Kru than the Westpoint Kru. This is so because the two groups are targeting the same species and the annual estimated production (catch) for Marshall Kru (16.5 tons) is lower than Westpoint Kru (19.9 tons), meaning the higher the production the higher the income. The reverse of what is happening among the Kru for the two selected fishing communities is true for the Fanti fishermen living in these communities. The Westpoint Fanti are poorer than the

Marshall Fanti. Using the upper poverty line of 2017, 50% of Marshall Fanti are living above while only 11% of Westpoint Fanti are living above. Overall, the incidence of poverty is high and significantly different among fishing units in the two selected fishing communities (ANOVA, DF=3, p<0.05).

The poverty gap and poverty severity indices were estimated as follows: Marshall Kru- 0.285 P₁, 0.122 P₂ (2011) and 0.425 P₁, 0.209 P₂ (2017); Marshall Fanti- 0.137 P₁, 0.059 P₂ (2011) and 0.208 P₁, 0.102 P₂ (2017), Westpoint Kru- 0.44 P₁, 0.353 P₂ (2011) and 0.531 P₁, 0.353 P₂ (2017) and Westpoint Fanti- 0.461 P₁, 0.317 P₂ (2011) and 0.534 P₁, 0.383 P₂ (2017). Considering the 2017 poverty gap indices for Marshall Kru, Westpoint Kru and Westpoint Fanti have very high incidence and higher gaps, while Marshall Fanti has lower incidence and lower gap comparatively. Comparatively, poverty is most severe in Westpoint fishing community (both Fanti and Kru), then Marshall fishing community (both Fanti and Kru). The incidence of poverty is high and significantly different among fishing units (ANOVA, DF=3, p<0.05). However, poverty gap is high for Marshall Fanti with low poverty severity.

Table 5: Poverty indices based on upper global poverty line of 2011 and 2017

Poverty index	Marshall Kru		Marshall Fanti		Westpoint Kru		Westpoint Fanti	
	2011	2017	2011	2017	2011	2017	2011	2017
Head-count index-P0	97	100	48	50	89	91	76	89
Poverty gap index-P1	0.285	0.425	0.137	0.208	0.44	0.531	0.461	0.534
Poverty severity index-P2	0.122	0.209	0.059	0.102	0.353	0.353	0.317	0.383

Relative Poverty Indices

The results of relative poverty indices are presented below in Table 5 using Net Per Capita Income of canoe owners for both fishing units (Fanti and Kru). The results show that Westpoint Fanti are the richest with upper and lower relative index computed as 1.82-5.81 (using 2017 poverty line),

followed by Westpoint Kru (1.81-5.77) and Marshall Kru (1.48-4.70), while Marshall Fanti is the least with upper and lower relative poverty index estimated as 0.95-3.03. The low relative poverty indices computed for Marshall Fanti is due to high expenditures mainly on the crew members' salaries.

Table 6: Comparative analysis of relative poverty-index by types of fishermen using the lower and upper global poverty lines of 2011 and 2017 respectively between Marshall and Westpoint

Community	Types of Fishermen	Net Per Capita Income (USD)	P-Index (Lower)		P-Index (Upper)	
			2011	2017	2011	2017
Marshall	Marshall_Kru	12.4	6.49	2.27		
	Marshall_Fanti	6.51	3.41	1.19		
Westpoint	Westpoint_Kru	10.11	5.29	1.85		
	Westpoint_Fanti	12.5	6.54	2.29		
			2017	2017		
Marshall	Marshall_Kru	12.4	5.77	1.81		
	Marshall_Fanti	6.51	3.03	0.95		
Westpoint	Westpoint_Kru	10.11	4.70	1.48		
	Westpoint_Fanti	12.5	5.81	1.82		

Vulnerability and Marginalization

Fishermen from the Small-Scale Fisheries sector (SSF) in developing countries suffer some levels of vulnerabilities and marginalization. As shown in Table 7, the urban community Westpoint has relatively better social amenities (42.9%), than Marshall fishing community (28.6%). From the survey, government provided subsidies to the two selected fishing communities by the provision of fishing nets, outboard motors, life jackets and grant to women in fisheries. They both have access to secondary education. Access to market is

one of the biggest challenges for fishers of Marshall fishing community. However, fishmongers usually leave from Monrovia to Marshall to buy fish, and the wives of the fishers also transport their fish to Monrovia for sale. No access to safe drinking water, and there are high interest rates from the banking sector making it almost impossible for small businesses. There are no medical facilities within the two fishing communities, and they can travel outside their communities to access medical care.

Table 7: Fishermen vulnerabilities and marginalization indicators.

Community	Access to medical facilities	Access to safe drinking water	Access to loan/ credits	Government subsidies	Access to secondary education	Access to tertiary education	Access to market	%
Marshall	-	-	-	+	+	-	-	28.6
Westpoint	-	-	-	+	+	-	+	42.9

+ = present - = absent

The sources of vulnerability within the targeted fishing community's derived responses are presented in Figure 1. From the responses, sea level rise/ erosion/ weather related issues and conflicts with other users are the most prevalence amongst the vulnerability encounter by both communities. Lack of school/ low education, poor market and low price, and lack of infrastructure are most affecting Marshall fishing

community, while diseases/ health issues are one of the major issues affecting the people of Westpoint fishing community (Figure 1). Both fishing communities were moderately vulnerable to lack of credit/capital/ ccess to cash, farming related issues, family related issues, fishing season/ fish stock related issues, and lack/ poor fishing equipment.

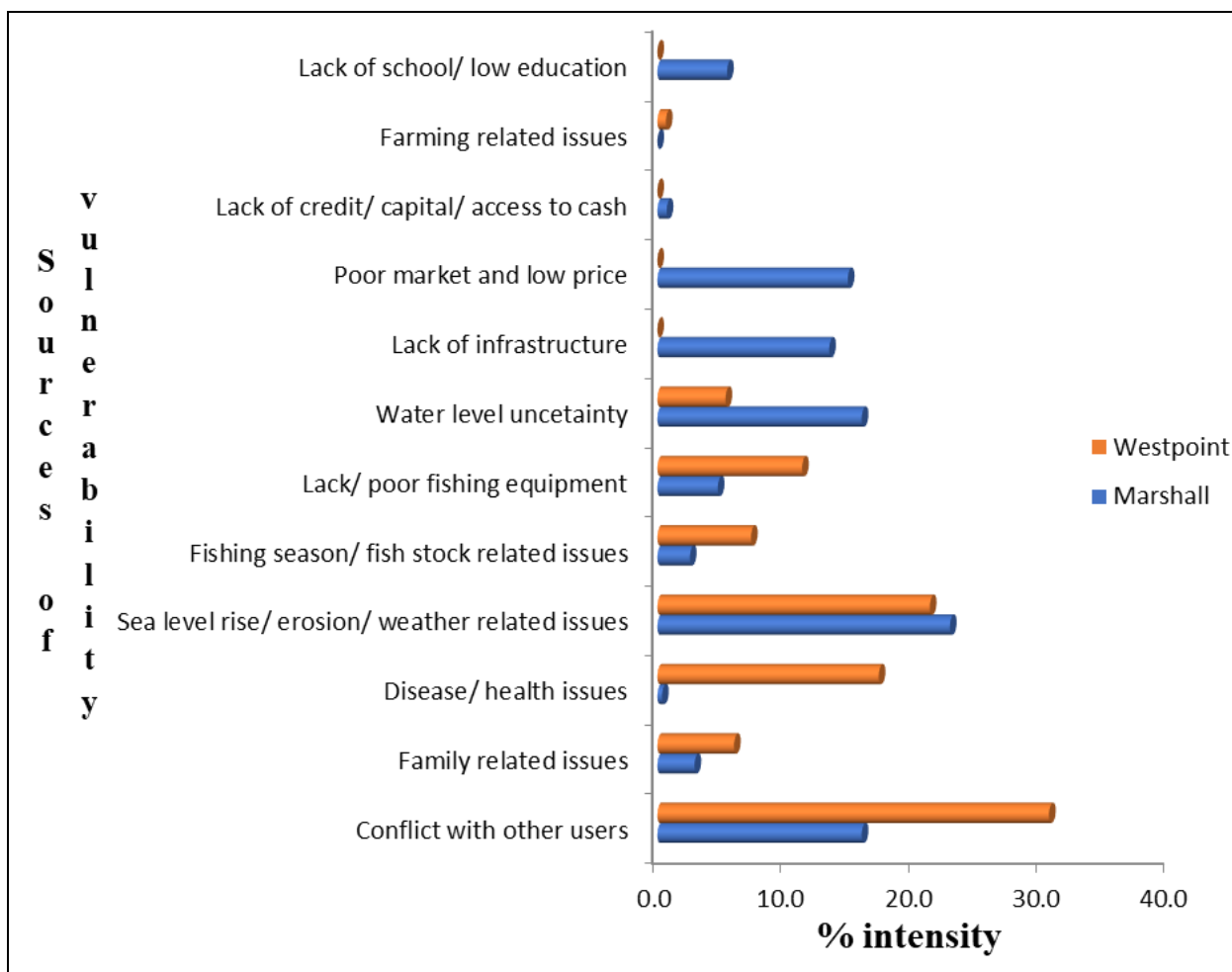


Fig 1: Comparative analysis of vulnerability between fisher folks in Westpoint, Montserrado County and Marshall, Margibi County

Discussions

Income, Expense and Non-Monetary Indicators

The annual per capital income of the Kru canoe owners and the Fanti canoe owners are by far above the 2021 annual national per capital income of US \$680.00, while the annual per capital income of Kru crew members and Fanti crew members are below the national per capita income except for the Marshall Fanti crew members that are slightly above the national per capita income by 2% (IMF, 2022) [41]. This is evidence by the high per capita consumption of canoe owners based on the data collected from the respondents. The high per capita income is also the reason why canoe owners have some form of savings. Therefore, it can be concluded that the higher the per capita income, the higher the probability or likelihood of savings. It can also be deduced that canoe owners are economically stable and happier than the crew members. According to Ferrer-i-Carbonell (2005) [32] the higher the income the happier you are. However, the crew members of Marshall Fanti and Westpoint Kru are paid above the minimum wage, while Westpoint Fanti and Marshall Kru crew members are paid below the minimum wage (The Decent Work Act, 2015) [80].

The target groups have some form of assets such as fishing equipment, cars, houses, private landing sites and other valuables. However, it was observed that almost all of the people in the rural area (Marshall) own the house they live in, while in the urban area (Westpoint) most of the fisherfolks are renters. Household expenditure is much higher in urban areas than in rural communities. Most of the food or soup ingredients are sourced from the farms of fishermen themselves or from their neighbours' farms. From a study conducted in Ghana by Asiedu *et al.* (2013) [10], shows that most of the fishermen living in rural communities' food supply comes from their farms and the fishermen believe in traditional treatment when they get sick. Therefore, food expenditure which takes up a higher share of household expenditure is low for rural communities and high for urban communities due to factors discussed above.

Absolute poverty indices

Those who are below a set, arbitrary standard of well-being is identified by absolute poverty limits. In the context of developing nations like Liberia, where the emphasis is still on achieving minimal standards of living for significant

segments of the population, absolute poverty thresholds are appealing (Arndt, Mahrt and Tarp, 2017) ^[9]. The poverty head-count index for Westpoint fishing community using lower global poverty line indicates that the incidence of poverty is higher than Montserrado County (incidence of poverty of 20.3%), the county in which the fishing community is located, but slightly less than the national incidence of poverty of 50.9% (IMF, 2021; HIES, 2017) ^[40, 338]. While the resulting poverty head-count index for Marshall fishing community indicates that the incidence of poverty is significantly below Margibi county incidence of poverty (52.2%) and the national incidence of poverty (IMF, 2021; HIES, 2017) ^[40, 338]. Poverty is pervasive in Westpoint fishing community based on the resulting incidence of poverty, and it is very low in Marshall fishing community comparatively. However, considering the upper global poverty lines of 2011 and 2017, the incidence of poverty is comparatively the same and very high.

The income inequality extent and income disparity and shortfall are very cardinal in assessing wellbeing. Results from the four fishing units shows that there is significant difference in the poverty gaps and poverty severity (ANOVA, DF=3, $p < 0.05$). From the results presented (Table 4 and 5) Westpoint Fanti had a very high-income shortfall follow by Westpoint Kru and Marshall Kru respectively, while Marshall Fanti poverty gap and severity were very low. The high-income shortfall in Westpoint fishing community indicates that there is a high degree of poverty among the very poor fishermen if their income is transferred to the less poor. This means that there is very high level of impoverishment in Westpoint fishing communities among the fishermen, and lower among the fishermen in Marshall fishing community. Therefore, policymakers should develop a better policy to address the key issues of how the very poor fishermen can be lifted from poverty by addressing the income disparity amongst the fishing units. Livelihoods program that will improve the well-being of fishermen in slum fishing communities by providing basic social services are urgently required as part of poverty reduction measures and or strategy.

Relative Poverty Indices

The relative poverty indices computed for the four fishing units show higher indices for Westpoint Fanti and Kru, and Marshall Kru, but low index for Marshall Fanti. The relative indices were based on the net per capita income of canoe owners. The high relative indices for these three fishing units are evince why the crew members are very poor than Marshall Fanti crew members. Marshall Fanti canoe owners have the highest pay for their crew members, while Marshall Kru crew members are the least pay. The high poverty indices are an indication that Liberia fish stock is in a healthy condition with the global decline in capture fisheries fish stock (FAO, 2022) ^[30]. In general, the canoe owners within the two fishing communities have high per capita income due to the high catch of commercially valuable fish species.

However, this positive outcome of increase income is not felt by the crew members that risks their life everyday working for the canoe owners. The crew members suffered from marginal income as their salaries did not commiserate with the level of hard labor. Moreover, fishing is one of the most dangerous jobs in the world (Torné Reverté, Martínez de Osés and Isalgué Buxeda, 2022) ^[81]. Every aspect of SSF needs significant amounts of labor, including setting out to sea,

mending fishing gears and canoes, catching, sorting of catch, landing and offloading, fish processing, and marketing the fish (Inoni and Oyaide, 2007) ^[42]. These situations are compound with the fact that small-scale fisherfolks do not have any form of insurance scheme in Liberia. In case of injury or any form of health issues, they use their mega resources to take care of themselves. Therefore, the crew members should be pay handsomely to commiserate with the level of labor to avoid the risks of illegal transshipment at sea, thereby affecting the income of canoe owners negatively. According to Belhabib *et al.* (2016) ^[13], catches from the SSF of Liberia are grossly under-reported. These under-reporting maybe attributed to the marginal income of crew members that may leads to the high probability of transshipment at sea or sale of their catch at sea.

Vulnerability and Marginalization

The mechanisms used in Africa for the governance of fisheries sectors favor the industrial fisheries sector and serve as an impediment to SSF, which in turn leads to SSF marginalization despite industrial fisheries being the fisheries with the highest incidence of illegal, Unreported and Unregulated fishing activities (Okafor-Yarwood *et al.*, 2022) ^[64]. They further propended that the government of Liberia has been laxity on the socio-economic aspect of fisheries governance to people involved in the SSF despite the benefits accrued from the SSF outweighing the benefits from the industrial fisheries (Okafor-Yarwood *et al.*, 2022) ^[64].

From the study, the main source of vulnerability in the SSF of Liberia that is perpetuating pervasive poverty are lack of basic landing infrastructure that includes postharvest facilities for fish processing and storage, lack of basic social services like schools, safe drinking water and electricity and lack of dedicated fish market leading to the selling of fish in a disorganised way resulting in de-valuation or low price. According to Beaman *et al.* (2021), the primary factors impeding the promotion of entrepreneurship in Liberia are the lack of adequate incentives, government support, infrastructure, high utility costs, entrepreneurship awareness, and a lack of entrepreneurship education in high schools and universities. Moreover, Jueseah *et al.* (2020) ^[47, 48] indicated that the institution of microloan for SSF across the value chain helps fishmongers to access the right market and get the right value for their fish.

This is also compounded with the conflicts amongst fishermen as to territorial rights and the issues of climate change which has led to the high sea level rise and erosion. The Kru fishermen considered in Liberia as the indigenous fishermen believe that the ocean belongs to their forefathers and as such it is their inheritance and should not pay any fees to access the fisheries. They are always in conflict with the Fanti fishermen whose are mostly foreigners mainly from Ghana that settle in the Liberian fishing communities with bigger motorized canoes. Moreover, other towns and villages dwellers believe that the adjacent fishing ground to their community is their inherent right. These situations can be mitigated if the right grievance redress mechanism is put in place with the communities themselves taking on the leadership. The small-scale fishing communities in Liberia have management structures that have been put in place by the community itself and another structured by the government through the National Fisheries and Aquaculture Authority. The one established by the communities themselves are headed by fishing chiefs, and the government

established structures are the co-management associations and cooperatives. These structures need to be used collaboratively to mitigate conflicts among fishermen and fishermen groupings.

Conclusions

The study produced a comprehensive poverty profile of the SSF of Liberia in two of the densely populated fishing communities (Marshall and Westpoint) estimating both relative and absolute (head count index, poverty gap and poverty severity) indices including the vulnerability and marginalization were determined. The conclusions are hereby structured to answer the research questions systematically. Poverty was found to be pervasive in the two fishing communities with poverty indices very high for Marshall Kru, Westpoint Kru and Fanti, and low for Marshall Fanti. Fishermen in these fishing communities do not have any means of credit and lack access to basic socio-economic services including safe drinking water, banks, high school, and medical facilities. The two fishing communities have almost the same vulnerability and marginalization issues. To alleviate the pervasive poverty, including the vulnerability and marginalization issues in Liberia fishing communities, a deliberate action geared towards improving the livelihood of the fishing communities' dwellers by the provision of basic social services like safe drinking water, banks, schools, and microcredit institutions. And the formulation and implementation of policies that will improve the well-being of community's dwellers are urgently needed, while continued research is conducted in other fishing communities to know the full extent of poverty, vulnerability and marginalization within SSF of Liberia. These conclusions are applicable to the entire SSF of Liberia because it's covered both the urban and rural fishing communities and can be applied to other developing countries that have similar SSF structures as Liberia and or slightly different from Liberia. Moreover, the results from this study are comparable to the results obtained from Ghana by Aseidu *et al* (2013) ^[63], and results obtained from studies conducted in Nigeria using the same FGT method as discussed in this study.

Recommendations

To remedy the pervasive poverty within the SSF of Liberia, the following recommendations and strategies presented below will help in alleviating poverty and provides a pathway to experience growth in the SSF including requisite policies required to trigger the provision of basic social services:

1. Considering the lack of post-harvest or value addition facilities across the fishing communities of Liberia, particularly in the two fishing communities that the study was conducted, there is a need for urgent infrastructural investments in the SSF of Liberia. Investment in infrastructure will increase wealth and decrease vulnerability, thereby improving the livelihood of small-scale fishermen and their dependents. It therefore recommended that NaFAA work with development partners, NGOs, and the private sector in achieving these milestones. This singular activity will help increase the daily earnings, which is a crucial factor in helping fishermen escape poverty.
2. The management regime of the Liberia fisheries sector favors the industrial fisheries and the canoes owners thereby leading to them amassing more wealth than the crew members. However, the low income of crew members maybe based on the socio-economic issues within the two fishing communities. Therefore, it is recommended that the 2020 Fisheries and Aquaculture Policy and Strategy of Liberia is updated to capture specific anti-poverty policy interventions to improve the livelihood of small-scale fishermen.
3. The fact that this study only focuses on two of the nine coastal counties along the 570-kilometer coastline of Liberia, and it is the only study that has been conducted to focus on the measurement of poverty within the SSF Liberia, it is recommended that this study is replicated in the remaining seven coastal counties to obtain the holistic status of the level of poverty and the level of vulnerability within the fishing communities. To do this, the government and its donors' partners are encouraged to establish a consolidated research fund to provide grants for researchers, universities, and NGOs involved in poverty measurement and livelihood research targeting the SSF of Liberia.
4. Access to credits, fishing inputs, markets including basic social services like electricity and safe drinking waters are some of the major problems identified during the research. Those may not be the only socio-economic issues within the fishing communities and may various based on the location of the fishing communities whether it is rural or urban. Therefore, to provide a definite policy prescription as recommended in the first recommendations, a more comprehensive view of the poverty profile, taking into account all the characteristics, including vulnerability, marginalization, and asset ownership must be considered.

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