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Research Article

Livelihood Status of Paddy Rice Agro-Processors that Benefitted from Microfinance Credit in Jigawa State of Nigeria

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Abstract: The present research determined the livelihood strategy of rice processors in Nigeria's Jigawa State using a cross-sectional data collected from 200 rice processors (par-boilers and milers) in the year 2022 through a multi-stage sampling technique. Using an easy-route cost approach, data were collected through a structured questionnaire complemented with an interviews schedule. Both descriptive and inferential statistics were used to synthesis the data. From the empirical findings, it was established that high poverty incidence permeates the actors engaged in processing along the rice value chain. Besides, most of the processors were multidimensional deprived in more than 50% of the total deprivation. Further, food insecurity was of high concern among the par-boilers unlike the millers were almost half of the sampled population were food secured. Nevertheless, most of the processors adopted survival strategy to stay afloat in livelihood sustenance given the poor access of majority to livelihood capital assets. A further investigation revealed that the processors' livelihood was challenged by a large vulnerable household size, thus exacerbate the pressure of household's population on the available resources. Therefore, the study advise that the production credit should be supplemented with a consumption credit in order to enhance the productivity of the resources deployed by the processors in the rice value, thus enhancing their livelihoods and sustainability of the value chain. In addition, the processors need to be sensitized on the imperativeness of a sustainable household size for a better livelihood in the study area.

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1. Introduction

Natural, economic, and political risks are on the rise, with severe implications for poverty and food security (d'Errico, 2016). Poverty, whether absolute or relative, has remained a hot topic in every

community, region, and country. When formulating policies to alleviate poverty and create development goals for society, policymakers always examine the following factors. Poor people have low living standards and are unable to meet their basic necessities in order to survive in society (Afzal and Nazir, 2021). Poverty is a serious problem in developing countries, affecting the entire population. In emerging countries like Nigeria, unequal and lopsided income distribution in favor of the wealthy has exacerbated the situation. Poverty has always been viewed on the basis of income or consumption rather than as a result of several deprivations. With the large range of knowledge, the deprivation of living standards has gained a lot of attention. The available options in terms of capacities, assets (both material and social resources), and activities, i.e. the household livelihood strategy, determine how a household copes and withstands economic shocks (Alinovi et al., 2010; Ado et al., 2019). This is significant from both a positive and a normative standpoint. In fact, households from various socioeconomic classes have varied tactics for obtaining their own livelihood, which may result in varying levels of food insecurity resistance (Gambo et al., 2016; Ado et al., 2018). As a result, different treatments are required for households from various socioeconomic groups. Policymakers should customize their national food security strategy to meet the various requirements of the population. Understanding the elements that drive each livelihood choice is therefore critical for creating country response mechanisms to food insecurity and poverty. Food security has been a global policy priority since 1996, owing to its critical role in supporting development and human well-being (Xu et al. 2019). Nigeria has been working to become self-sufficient in rice production for about a decade, which has resulted in expansion of both the downstream and upstream rice supply chains. Several financial and non-financial interventions have been established to support the vision of rice self-sufficiency. These actions have increased the value chain of rice by employing the majority of the country's idle population, particularly youth and women.

Access to sufficient financing is critical to increasing agricultural productivity in the economy. As a result, the Nigerian federal government recommended commercial banks and microfinance institutions to allocate a portion of their loanable funds to the industry. Despite the order, commercial bank loan to on-farm and non-farm entrepreneurs in Nigeria is seen as a "Bad Business," with the credit management procedure being extremely "burdensome." The idea behind microfinance banking, according to Efiong et al. (2013), is to encourage rural development through rural commitment in modern financial institutions within the rural environment, to serve as machines for financial and economic emancipation as its growth is linked to the community in which it operates. For many agro-processing businesses in various nations, credit is the driver for economic growth. It has been a heavily promoted development strategy in Nigeria, as well as many other nations that see agribusiness as a means of overcoming economic stagnation. Credit provision is increasingly being seen as an important tool for increasing rural incomes, primarily by redirecting resources to more productive uses. Agriculture and agribusiness finance are critical for developing nations because they can help with inclusive growth, poverty reduction, productivity enhancement, agribusiness operator income, and overall regional development (Sharma and Zhang, 2012). The crucial and significant motor of rural growth and livelihood improvement is many financial investments in small-scale agribusiness. Microfinance has the potential to not only reduce poverty, but also to develop the institutional capacity of microfinance institutions to efficiently and effectively provide sustainable financial services to poor households who are otherwise excluded from the formal banking system due to a lack of collateral, according to leading advocates in the field. Microcredit has clearly become one of the most important initiatives in developing nations for alleviating rural poverty. To justify any further investment, the essence of intervention either governmental or non-governmental is aimed at improving the livelihood of the populace. Consequently, to the best of our knowledge, literature shows little or no empirical evidence of research on the livelihoods of rice value chain actors particularly the processors involved in the upstream rice value chain in Nigeria. This prompted this research with a focus on Jigawa state as it's among the targeted rice producing states that benefited immensely from these interventions. Therefore, to achieve a sustainable prospect from these interventions in the study area in particular and the country in general, it becomes imperative to investigate the livelihood status of the paddy rice processors, thus a guide framework for any informed future policy on rice upstream

value chain. Therefore, the objectives of the study centered on the food security of the rice processors; poverty status of the rice processors; the livelihood status; and, the idiosyncratic factors that influenced livelihood status of the rice processors in Nigeria's Jigawa state.

2. Research Methodology

Jigawa State was carved out of Kano State and it covers a total land area of around 22,410 square kilometers. Kano State borders it on the west, Bauchi and Yobe States on the east, and Katsina and Yobe States and the Republic of Niger on the north. The state's topography is generally flat, with undulating sand dunes running southwest to northeast across the northern, central, and eastern portions. The terrain surrounding Dutse, the state capital, is rocky, with some minor hills. The highest heights are found in the southern and western sections of the state, around Birnin Kudu and Kazaure, with hills reaching 600 meters above sea level. The Hadejia River runs through the state from west to east, passing through the Hadejia-Nguru marshes before emptying into Lake Chad. The state is located between latitudes 11˚00'N and 13˚00'N, and longitudes 8˚00'E and 10˚35'E, with a tropical climate that varies depending on the season. High temperatures are generally recorded during the months of April and September. The daily low and high temperatures are 15 and 35 degrees Celsius, respectively. May to September is the wet season, with average rainfall ranging from 600 to 1000 millimeters. The souern section of the state receives more rain than the northern part (www.jigawastate.gov.ng) The state is mostly covered by the Sudan savannah vegetation zone, but there are vestiges of Guinea savannah in the south. Due to rainfall patterns and deforestation caused primarily by the use of wood for cooking, the country's total forest cover is about 5%. Jigawa is a Hausa word that refers to a large loamy but non-marshy soil. The major occupation of the inhabitants is agriculture- crop cultivation, livestock rearing, non-farm activities; others being hunting, artisanal etc.

Table 1. Sampling frame of rice processors in Jigawa State

Zone	LGA	Village	Sampling frame		Sample size	
			Par-boiler	Miller	Par-boiler	Miller
Zone 1	Miga	Sakuwa	15	7	8	4
		Hantsu	10	11	5	5
		Gwari	8	9	4	5
	Jahun	Harbosabuwa	13	6	7	3
		Harbutsohuwa	18	10	9	5
		Agufa	15	8	8	4
Zone 2	Ringim	Sintimawa	21	9	11	4
		Yan-Dutse	18	8	9	4
		Yakasawa	19	6	10	3
	Taura	Maje	11	10	6	5
		Gilma	10	6	5	3
		Majiya	12	4	6	2
Zone 3	Kafin-Hausa	Bulangu	11	7	5	4
		Kafin-Hausa	13	6	6	3
		Baushe	19	5	9	2
	Auyo	Arawa	21	5	10	2
		Gatafawa	17	10	8	5
		Ayama	14	7	7	4
Total	**6**	**18**	**265**	**134**	**133**	**67**

Source: JARDA, Co-operative Society and Micro Finance Bank, 2019.

A multi-stage sampling technique was used to elicit information from a total of 200 actors of the processing chain of the rice value chain in Nigeria's Jigawa State. Based on high concentration of rice

production, three out of the four stratified agricultural zones were purposively selected; and the chosen agricultural strata were Zones 1, 2 and 3. From each of the chosen agricultural strata, two Local Government Areas (LGAs) were randomly chosen. The chosen LGAs from Zones 1, 2 and 3 were Miga and Jahun; Ringim and Taura; and, Kafin-Hausa and Auyo respectively. From each of the selected LGAs, three villages were randomly selected, thus given a total of eighteen (18) villages. The random selection of the LGAs and villages were achieved by using an inbuilt Microsoft sampling tool. Afterward, on the basis of activities in the processing chain, the processing population was stratified into par-boilers and millers. Using Yammane formula, a total of 200 processors composed of 133 par-boilers and 63 millers were randomly drawn from the sampling frame obtained from the relevant agencies-Jigawa State Agricultural and Rural Development Authority (JARDA), Co-operative societies and Microfinance Banks in the State (Table 1). Data collection was done through a well-structured questionnaire complemented with an interview schedule using an easy-route cost approach in the year 2022. Data syntheses were achieved using descriptive and inferential statistics. Objectives I and III were achieved using factor analysis while Objective II was achieved using Alkire-Foster multidimensional poverty index. Objective IV was achieved using Heckman's model. The normalization of the multidimensional food security indicators and livelihood capital assets were done using z-score and minimum normalization index respectively.

$n = N/1 + N(e)^2$ .....(1)

Where, n is the finite sample size, N is the population size and e is the error gap at 5%.

2.1. Empirical model

Food security index: The FAO based food security on four dimensions *viz*. Availability, Access, Utilization and Stability with each being composed of indicators (Table 2). The food security index model is given below:

a. $I = \frac{I_i - \bar{I}}{SD}$ ..... (2)

Where, *'I'* is the indicator index, I_i is the value of the i^{th}indicator; $\bar{I}$ is the mean value of the i^{th}indicator; and, '*SD*' is the standard deviation of the i^{th}indicator. The formula in Equation 2 is a Z-score.

b. $D_i = \sum_{i=1}^{n=0} \left(\frac{w_i * I_i + \ldots\ldots w_n * I_n}{w_i + \ldots . w_n}\right)$ ..... (3)

Where, D_i is the dimension index of i^{th} processor: Availability/Access/ Utilization/Stability.

c. $FSI_i = \frac{A+AC+U+S}{w_A + w_{AC} + w_U + w_S}$ ..... (4)

Where, FSI_i is the multidimensional food security index of i^{th} processor; *w* is the weighted average weight of i^{th} dimension; A, AC, U and S are the dimension index values of Availability, Access, Utilization and Stability respectively. A positive index (≥ 0) implies food secured while a negative index (< 0) means food unsecured.

Table 2. Food security dimensions

Dimensions	Indicators	Description
Availability	Monthly household food expenditure	Naira
	Ownership status of the firm	Rent=1; inheritance=2; purchased =3
	Firm size	Metre
	Number of firms	Number
	Farm size	Hectare
	Land tenureship	Inheritance=1; purchased=2; communal=3; rent =4

	Number of farms	Number
	Food stock for over 2-6 months	Quantity or in Naira
	Quantity of food assistance	Quantity or in Naira
	Income from sales of crop	Naira
	Income from sales of Livestock	Naira
	Quantity of purchased food product	kg or Naira
	Income diversification	Number
Access	Transport Cost for farm produce	Naira
	Transport Cost for Livestock	Naira
	Distance to market's road	Cost
	Distance to market	Cost
	Labor exchange for Food	Quantity obtained
	Storage facilities	Capacity (Quantity (bag) and size)
	Income from women and children	Naira
	Membership of trade association	Number
	Income from off-farm activities	Naira
	Income from farm activities	Naira
	Engagement in Non-Farm Employment	Number
Stability	Farm production	Rainy season =1; Dry season=2; Both= 3
	Rainfall in a month	Number
	Drought, Erosion, flood	Yes/No
	Political crises/ social unrest	Yes/No
	Price of a major commodity	Naira per month
Utilization	Disease prevalence	Number
	Water supply source(s)	Number
	Meals per day	Number
	Variety of eal per day	Number
	Number of food items consumed	Number
	Food habits	High =3; Moderate=2; Low=1
	Food preparation practices	Number
	Acceptable food substitutes	Number
	Adequate sanitation	High=3; Moderate=2; Low=3;Poor=4
	Access to health services	High=3; Moderate=2; Low=3;Poor=4

2.2. Livelihood strategy

The sustainable livelihood strategy is built on five livelihood capital assets, namely, Human, Natural, Social, Financial and Physical capitals.

The model is specified below:

a. $I = \frac{I_i - I_{min}}{I_{max} - I_{min}}$ ..... (5)

Where, 'I' is the indicator index, I_i is the value of the i^{th}indicator; $I_{min}$is the minimum value of the i^{th}indicator; and, I_{max} is the maximum value of the i^{th}indicator. Equation 5 is a minimum normalization formula.

b. $D_i = \sum_{i=1}^{n=0} \left(\frac{w_i * X_i + \ldots\ldots w_n * X_n}{w_i + \ldots . w_n}\right)$ ..... (6)

Where, D_i is the dimension index of i^{th} processor: Human/Natural/Social/Financial/Physical capital. The livelihood capital assets' classification is : < 20% = Very Poor; 20-39% = Poor; 40-59% = Moderate; 60-79% = Good; ≥ 80% = Very Good.

c. $LVS_i = \frac{H+N+S+F+P}{w_H + w_N + w_S + w_F + w_P}$ ..... (7)

Where, LVS_i is the Livelihood strategy index of i^{th} processor; *w* is the weighted average weight of i^{th} dimension. The livelihood strategy classification is: ≤4.99 = Survival strategy; 5.00-5.99 = Consolidation strategy; ≥ 6.00 = Accumulation strategy. This $\bar{X} \pm SD$ was the basis for classification.

i. Human capital is a valuable asset in the context of the livelihood approach since humans are essential subjects as actors and recipients of livelihood efforts (people centre).
ii. Natural capital is defined as a natural stock that provides carrying capacity as well as valuable advantages to human livelihood endeavors.
iii. Social capital is a social resource that helps the community and is used to help them achieve their livelihood goals. These intangible social resources have a positive impact on the community.
iv. Financial capital refers to all financial resources available to the community for the purpose of obtaining a living. Financial capital comprises of public and private reserves or supplies, as well as financial institution reserves and regular cash flows.
v. Basic facilities and other infrastructure constructed to support community livelihoods are referred to as physical capital. The construction of a physical environment that helps the community in carrying out productive activities is referred to as facilities and infrastructure.

Table 3. Livelihood assets

Dimension	**Indicator**	**Dimension**	**Indicator**
Human capital	Farming knowledge	Financial capital	Income
	Farming skills		Savings
	Farming experience		Assistance / Subsidies
	Health		Individual Credit
	Household size		Credit from Credit Institutions
	Other business skills		Remittances
	Other business experiences	Physical capital	Access to transportation and ICT
Natural capital	Firm location		Production facilities
	Water source		Infrastructures
	Climate suitability		Working equipment
	Firm production		
Social capital	Community Organizations		
	Social Networking		
	Mutual cooperation		
	Trust		

Source:Illu *et al*.(2021)

2.3. Multidimensional poverty index (MPI)

The MPI is a composite measure of poverty that reflects the prevalence of poverty as well as the distribution of deprivations. It also adds to money-based measurements by taking into account numerous deprivations and their overlap. The maximum score is 1, and each dimension is equally weighted. Below are the various indexes involved in MPI measurement.

Multidimensional headcount ratio (H): Is the proportion of persons who have been classified as multidimensionally poor, i.e. those who fall below the poverty line, and is expressed as:

$H = \frac{q(k)}{n}$ …… (8)

The number (or headcount) of multidimensionally poor persons according to parameter k is *q(k)*.

$(q(k) = \sum_{i=1}^{n} p_k(x_i, z))$ ……..(9)

The average deprivation share across the poor is defined as the intensity of poverty A, often known as the breadth of poverty. This is presented as:

$A = \sum_{i=1}^{q} c_i(k)/q(k)$ ……(10)

The percentage of the *d* indicators in which the average multidimensionally poor person is deprived is the intensity of poverty.

The measure M_0 is the so-called adjusted headcount ratio whenα =0.M_0refers to the headcount ratio of multidimensional poverty H, poverty incidence, multiplied by poverty intensity A:

$M_0 = HA$ …… (11)

When $\alpha = 1$, the measure M_1 ,adjusted poverty gap, defined as the weighted average of indicator-specific poverty gaps is used. M_1 can be calculated as the product of H, A, and the average poverty gap among the poor G.

$M_1 = HAG$……(12)

$G = \sum_{i=1}^{n} \sum_{j=1}^{d} g_{ij}^{1}(k) / \sum_{i=1}^{n} \sum_{j=1}^{d} g_{ij}^{0}(k)$ ……(13)

In other words, G represents the average depth of deprivation across all situations in which a poor individual is deprived. The sum of the (weighted) gaps is divided by all the positive (weighted) entries of the (censored) deprivation matrix. The M_1 scale is sensitive not only to the number of deprivations but also to the severity of those deprivations. In other words, M_1 rises when a poor person's deprivation in a given indicator rises. Similarly, if any indicator's shortfall from the deprivation cutoff is reduced, poverty decreases-even if the person remains poor.

Table 4. MPI dimensions

Dimension	Indicator	Deprivation if …….	Weight
Health	Nutrition	At least one household member does not take three square meals a day	**1/10**
	Child mortality	Does the household had one or more children within the age bracket of 0–5 years dead	**1/10**
Education	Year of schooling	No household member has completed six years of school	**1/10**
	School child attendance	At least one school-age child is not attending school in year 1 to 6	**1/10**
Standard of living	Electricity	The household is not connected to the national electricity grid	**1/30**
	Improved water	The household does not have access to clean drinking water (i.e. boreholes, hand pump, tap water, covered well, protected spring or rainwater); clean drinking water is within a walking distance of 30 minutes (round-trip)	**1/30**
	Sanitation	The household does not have access to adequate sanitation (i.e. water closet, pit latrine, pan/bucket latrine)	**1/30**
	Cooking fuel	The household uses “dirty” ooking fuel (dung, wood or charcoal)	**1/30**
	Flooring	The house has a dirt floor (non-concrete floor, mud or thatched floor)	**1/30**
	Assets ownership	The household owns no more than one of these assets: car, truck or similar motorized vehicle, bicycle, motorcycle, radio, refrigerator, telephone or television, farm assets, ownership of home	**1/30**
Infrastructure	Hospital	No hospital within 2 km distance from home	**1/30**
	Market	No market in the neighborhood to display produce	**1/30**
	Road network	Unavailability of an all-season road	**1/30**
	Transportation	The household does not have access to good transport facilities	**1/30**
	External assistance	Household can’t get support from those than family members in times of hardship	**1/15**

Social capital	Social networking	The household is being excluded from social and cultural activities	**1/15**
	Decision autonomy	The household does not have control in making decisions that affect their everyday life	**1/15**

Finally, when $\alpha = 2$, the adjusted squared poverty gap is calculated as the weighted average of the indicator-specific squared poverty gaps. M_2 can be calculated as the product of H, A, and the average squared poverty gap among the poor S, i.e. the severity of poverty.

$M_2 = HAS$ ……(14)

$S = \sum_{i=1}^{n}\sum_{j=1}^{d} g_{ij}^{2}(k) / \sum_{i=1}^{n}\sum_{j=1}^{d} g_{ij}^{0}(k)$……(15)

In other words, S is the average squared gap across all instances of poverty; similarly to G, the total of the (weighted) squared gaps is divided by all the positive weighted elements in the (censored) deprivation matrix. The M_2measure is sensitive to the number of deprivations that the poor face, the intensity of those deprivations, and the disparity between the poor.

The contribution of a population subgroup *I* to total poverty is given by:

$C_I = [(n_1/n)M_\alpha^1]/M_\alpha$……(16)

Where (n_1/n) and M_α^1 are subgroup *I's* population share and poverty measure, respectively, and M_ is the total population's poverty measure. When a region's or group's contribution to poverty exceeds its population share, it indicates that the country's poverty distribution is severely unequal, with some regions or groups suffering a disproportionate share of the burden. Clearly, the aggregate of all organizations' contributions must be 100 percent.

Since 2014, the Oxford Poverty and Human Development Initiative (OPHI) has also published the level of disparity in deprivation scores among the poor at the national and sub-national levels, using a distinct, decomposable inequality metric (Alkire *et al*., 2016). The measure is also used by OPHI to examine disparities amongst sub-national MPIs. Seth and Alkire (2014) suggested an additively decomposable inequality measure that is a positive multiple of "variance" and has within-group and between-group components. The inequality measure I^q employs the vector of deprivation scores of the *q* impoverished people $c_i(k)$ to quantify inequality among the poor at the national or sub-national level.

$I^q = \frac{\tilde{\beta}}{q}\sum_{i=1}^{q}[c_i(k) - A]^2$ ……(17)

To calculate the measure of inequality, the difference between each poor person's deprivation score and average intensity is squared, then the squared distances are added together and multiplied by a constant$\tilde{\beta}$. We set $\tilde{\beta}$=1/25 since the poor's deprivation ratings vary from 1/5 to 1.Given the range of deprivation scores, this is the highest allowable value for the inequality measure, ensuring that the inequality measure is confined between zero and one. However, a lower degree of inequality among the poor or a reduction in inequality among the poor does not always imply that poverty has decreased uniformly across all regions or demographic groupings.

2.4.Heckman's model

The model consists of a choice model and an outcome model, with the former having a dichotomous dependent component and the latter having a continuous predict variable (Sadiq *et al*., 2021). Because of its capacity to correct sample selection bias, the two-step Heckman's selection model was chosen. The model is shown below:

$Y_i = f(X_1, X_2, X_3 \ldots\ldots\ldots\ldots\ldots\ldots X_n)$ …… (18)

$Y_{it} = \beta_0 + \beta X_{it} + \varepsilon_i$ …… (19)

$Y_i^* = \alpha + X\beta + \varepsilon_i$…… (20)

$Y_i^* = \alpha + X_1\beta_1 + X_2\beta_2 + X_3\beta_3 + X_4\beta_4 + \cdots . + X_n\beta_n + \gamma IMR + \varepsilon_i$…… (21)

Equation 3 is a decision stage, a probit model with the dependent variable been binary while Equation 5 is an outcome stage, a censored model with the dependent variable been continuous.

Where, $Y_{it} = MPI\ status/Food\ security\ status/LV\ status\ (yes = 1, otherwise = 0)$; Y_i* = latent observation of i[th] processor (index); $X_1 - X_n$= Explanatory variables; IMR= Inverse Mill's ratio; β_0 = Intercept;β_{1-n} = Regression coefficients; γ= Lambda; and, ε_t = Stochastic.

Independent variables: Age (years); Gender (male =1, otherwise = 0); marital status (married =1, otherwise=0); Household size (HHS) (numbers); Education (years); Experience (years); Membership of association (yes=1, otherwise=0); Annual income in Naira (₦); Activity type (Par-boiler =1, otherwise =0); Credit acquisition ratio (CAR) (ratio of credit advanced to credit required); credit utilization (CU)(yes =1, otherwise =0); Population pressure (POP)(ratio of household size to firm size); Threshold poverty level (k= 30); and, Severe poverty level (k=50).

3- Results

3.1.Multidimensional Food Security Status of the Processors

The presented results in Table 5 shows that majority of the par-boilers and millers are food unsecured vis-à-vis 72 and 52.2% respectively, against 27.8 and 47.8% respectively who are food unsecured. Besides, for the pooled group, 65.5% of the rice agro-processors across the value chain are food unsecured against 34.5% that are unsecured. A further decomposition showed none in the categorized groups fall within the severe and alarming unsecured food categories, thus an indication that all fall within the .mild food insecure class. On the other hand, 24.1, 46.3 and 31.5% respectively for par-boilers, millers and pooled groups are mildly food secured; 0.8, 1.5 and 1% fall in the category of moderately food secured class; while 3 and 2% fall within the category of highly food secured class. The large proportion of the par-boilers being food unsecured may be attributed to low income base as they possessed little or no economic capital compared to the millers who possessed to some extent economic capital needed for the procurement of light plants for rice processing. Unlike the par-boilers, the proportion of the food unsecured millers outnumbers that of the food secured millers by a slight margin, thus justifying the evidence of economic power among the milling category. The possible reason for the slight proportion of the unsecured millers above the average might be attributed to idiosyncratic factors as both the food secured and unsecured miller's category faced the same markets forces given that they operate in the same environment. Besides, poor business turnover ratio due to diseconomies of scale may be a drawback that plunged slightly above average of the millers into food unsecured category. Generally, it can be inferred that the impact of the financial intervention had a fair progress on the food security of the millers against that of the par-boilers whose progress on food security status is very abysmal.

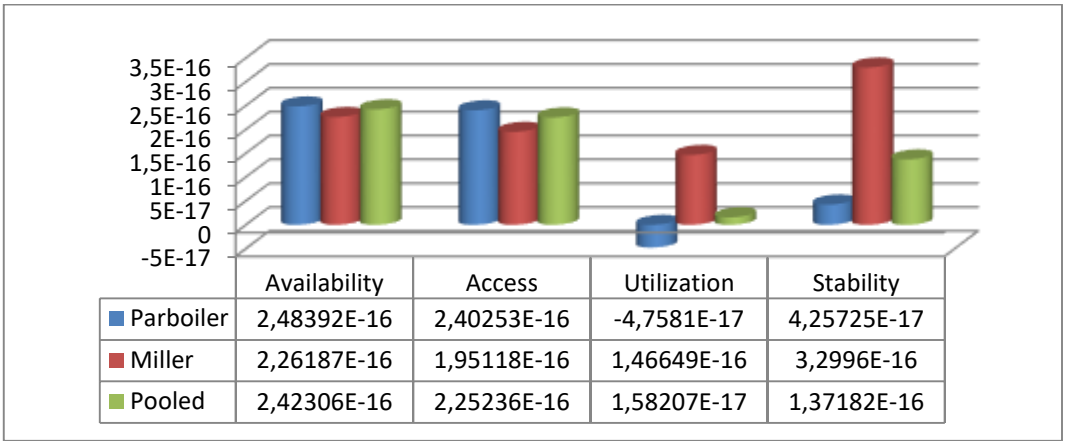
Table 5. Food security of the processors

Status	**Par-boilers**	**Millers**	**Pooled**
Mild unsecured	96(72.2)	35(52.2)	131(65.5)
Mild secured	32(24.1)	31(46.3)	63(31.5)
Moderately secured	1(0.8)	1(1.5)	2(1.0)
Highly secured	4(3.0)	-	4(2.0)
Total	**133(100)**	**67(100)**	**200(100)**
Unsecured	96(72.2)	35(52.2)	131(65.5)
Secured	37(27.8)	32(47.8)	69(34.5)
Total	**133(100)**	**67(100)**	**200(100)**

Field survey, 2022-Figure in parenthesis is percentage

More so, a cursory review shows poor utilization and low stability to be the food dimensions that affected the food security status of the par-boilers; low utilization is the challenge to food security status of the millers; while low utilization alongside low stability are the hindrance to food security status of the pooled category (Figure 1). Consequently, it can be inferred that poor utilization and stability are the food security dimensions that posed a threat to food security status of the agro-

processors in the study. The possible reason for poor utilization and stability might be attributed to market imperfection which is permeated by comprehensive inflation, thus affected the food security of the processors rice value chain actors. Theory is of the opinion that market forces need to be devoid of any subtly intervention. But in a situation of emerging markets especially in poor developed markets like in the study area in particular and the country in general, this will not augur well for the economy as a break in the value chain *viz*. food insecurity of the actors will seriously disrupt the rice value chain, thus jeopardize government effort of achieving rice self-sufficiency, import embargo on foreign rice, diversification of economy, employment creation and re-branding mantra of green revolution-agriculture driven economy. Therefore, onus lies on the policymakers to strengthen the macro-economic policies with effect on food security so as to strengthen and sustain the value chain of rice production which currently is very vibrant and profitable in the study area and the country in general. Little or no attempt will be a setback to the goal of local empowerment *viz*. its financial interventions-governmental and non-governmental.



	Availability	Access	Utilization	Stability
Parboiler	2,48392E-16	2,40253E-16	-4,7581E-17	4,25725E-17
Miller	2,26187E-16	1,95118E-16	1,46649E-16	3,2996E-16
Pooled	2,42306E-16	2,25236E-16	1,58207E-17	1,37182E-16

Figure 1. Food security dimensions of the processors

3.2. Multidimensional Poverty Status of the Processors

At the poverty threshold level (k=0.3), the incidence of poverty is very high among all the sampled groups *viz.* par-boilers, millers and the overall group as evident by their respective headcount indexes which are 0.86, 0.91 and 0.88 respectively (Table 6 and Figure 2). The implications is that 86, 91 and 88% of the sampled population among the par-boilers, millers and the overall group are multidimensional poor; with them been deprived in at least two poverty dimensions. Besides, at the severe-poverty point (k=0.5), the headcount ratio of the multidimensional poor among the par-boilers, millers and the overall group plummeted to 57, 69 and 59% respectively as indicated by their respective headcount indices that are 0.57, 0.69 and 0.59. This implies that foregoing headcount ratios are multidimensional deprived in at least three out of the five poverty dimensions. Also observed is that poverty incidences decrease with an increase in deprivation. However, the incidence of poverty is high among the millers against that of the par-boilers and the possible reason may due to consumption subjective factor- need for expanded investment which is unlikely among the par-boilers as their business activity is not capital intensive, thus affected their livelihood status. Also, the possible reason for the heightened poverty incidence among the par-boilers may be associated to poor harnessing of social capital pool as most of them other than social power; they lack economic power, thus worsening their state of livelihood. Furthermore, at the poverty threshold level (k=0.3), the intensity indices for the par-boilers, millers and the overall were 0.5924, 0.5933 and 0.5927 respectively. Besides, as the poverty level steep-upward- severe poverty level (k=0.5), the poverty intensity indices sharply inclined to 0.7003, 0.6634 and 0.6872 respectively for the par-boilers, millers and the overall group respectively. The implication is that on the average, the share deprivation of the par-boilers, millers and the overall groups at the poverty threshold level were 59.24, 59.33 and 59.27% respectively; while

at the severe level, it was 70.03, 66.34 and 68.72% respectively. Further, the multidimensional poverty indexes (MPI) at the poverty threshold cum severe levels are 0.5095 and 0.3969; 0.5370 and 0.4279; and, 0.5185 and 0.4071; respectively for the par-boilers, millers and the overall groups. The implication is that the deprived respondents at the threshold cum severe poverty levels experienced a potential share deprivations of 50.95 and 39.69%; 53.70 and 42.79%; and, 51.85 and 40.71% from the total deprivation respectively for the par-boilers, millers and the overall groups. Based on the poverty gap index, multidimensional deprivation gap of the deprived par-boilers, millers and the overall groups at threshold cum severe poverty levels were 35.05 and 16.98%; 36.81 and 21.71%; and, 35.63 and 18.53% respectively, as evident by their respective multidimensional poverty gap (MPG) indexes in their fractional proportion. More so, the poverty severity index showed the multidimensional deprivation severity at threshold cum severe poverty levels for the deprived par-boilers, millers and the overall to be 17.02 and 5.79%; 17.15 and 8.34%; and, 17.06 and 6.62% respectively, as shown by their respective multidimensional poverty severity (MPS) indexes in their fractional proportions.

A cursory review of the inequality index showed the level of inequality among the deprived population vis-à-vis the threshold cum severe poverty levels across the studied groups to be very low as indicated by their respective negligible inequality indices that are less than 1%.However, according to Seth and Alkire (2014) and Alkire *et al*.(2016), a lower level of inequality among the poor or a drop in the degree of inequality among the poor does not always imply that poverty has decreased uniformly across demographic subgroups. Furthermore, at the threshold cum severe poverty levels for the par-boilers, it was observed that the contribution to poverty is marginally less than its population share as evident by their respective indices- poverty contribution share cum population share: 0.6605:0.6723; and, 0.6555: 0.6723 respectively. While for the millers vis-à-vis the threshold cum severe poverty levels, the contribution to poverty marginally exceeds its population share as shown by their respective indices- poverty contribution share cum population share: 0.3394:0.3277; and, 0.3445: 0.3277 respectively. This implied that there is no serious unequal distribution of poverty within the par-boiler's group while the reverse is the case for the miller's group bearing disproportionate share of poverty for each group.

Table 6. MPI of the processors

Items	**Par-boilers**		**Millers**		**Pooled**	
	k=30	**k=50**	**k= 30**	**k= 50**	**k=30**	**k=50**
Head count	0.859974	0.566711	0.905149	0.644986	0.874778	0.592362
Intensity	0.592407	0.70035	0.59329	0.663416	0.592707	0.687171
Gap	0.688028	0.427858	0.685515	0.50735	0.687175	0.455242
Severity	0.333983	0.145786	0.31932	0.19487	0.329007	0.162695
M_0	0.509454	0.396896	0.537016	0.427894	0.518487	0.407054
M_1	0.350519	0.169815	0.368133	0.217092	0.356291	0.185308
M_2	0.170149	0.057862	0.17148	0.083384	0.170585	0.066226
Inequality	0.001269	0.000493	0.000961	0.00064	0.001165	0.000557
HHS(n)	757	757	369	369	1126	1126
HHS(q)	651	429	334	238	985	667
PS (n)	0.672291	0.672291	0.327709	0.327709	1	1
SPC-MPI(n)	0.66058	0.655513	0.33942	0.344487	1	1
PS (q)	0.660914	0.643178	0.339086	0.356822	1	1
SPC-MPI(q)	0.6494	0.627127	0.351204	0.37509	1	1

Source: Field survey, 2022

Note: HHS = Household size; SPC= Sub-population contribution; n = Total population; q = Deprived population; values in parentheses are %.

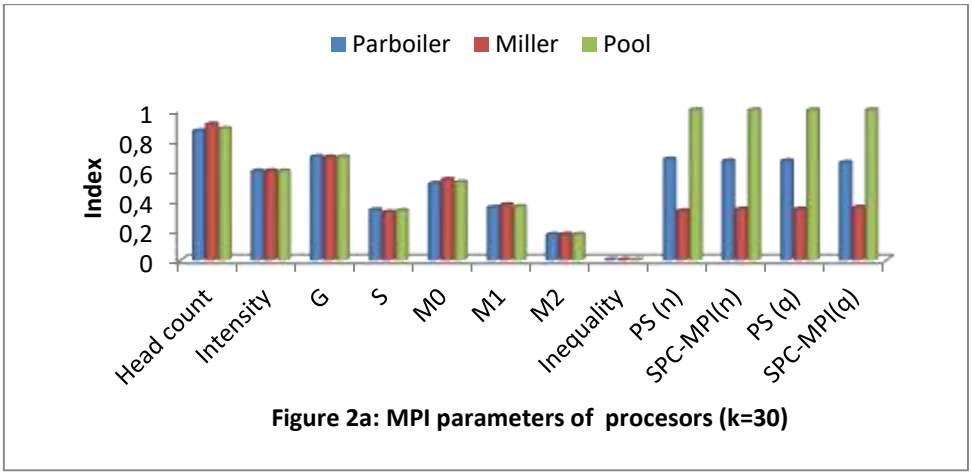


Figure 2a. MPI parameters of processors (k=30)

At the poverty threshold (k=0.30), the empirical evidences of the MPI percentage decomposition details *viz*. poverty-dimensions show poor standard of living (25.28%), closely followed by poor infrastructural facilities(23.7%) and poor social capital formation (23.04%) to have contributed most to the multidimensional poverty among the par-boilers (Table 7 and Figure 3). For the millers, poor standard of living contributed most to multidimensional poverty, followed by poor infrastructural facilities and then illiteracy- poor educational status. Likewise, the trend pattern observed for the overall group was similar to that of the millers. More so, at the severe poverty level (k=0.50), the trend patterns obtained for the millers and likewise the overall group were similar to the pattern that unfold at the threshold level, while the major contribution to the multidimensional poverty among the par-boilers is deprivation in infrastructure, followed closely by deprivation in standard of living. Except the percent values, the respective MPI deprivation indexes of the poverty dimensions obtained at the severe poverty level varied widely with those obtained at the threshold poverty point, i.e. the MPI dimensional values at the severe poverty level were lower than those obtained at the threshold poverty level. Generally, it can be inferred that the poor state of standard of living is the major dimensional deprivation across the studied categories that contributed to multidimensional poverty in the study area. Consequently, based on the MPI dimensional indices *viz*. the threshold cum severe poverty levels for the par-boilers, the share deprivation from the total deprivation of standard of living and infrastructure respectively were 12.88 and 10.27%. However, the MPI indices *viz*. the threshold cum severe poverty levels for the millers and the overall group, the potential share deprivation from the total deprivation for the standard of living are 14.60 cum 10.62%; and, 13.44 cum 10.23% respectively. It is worth to note that across the poverty dimensions, an increase in the poverty cut-off leads to a decrease in the incidence of poverty among the studied group; while the corresponding changes in the poverty intensity, MPI, MPG, MPS and inequality were on the decrease.

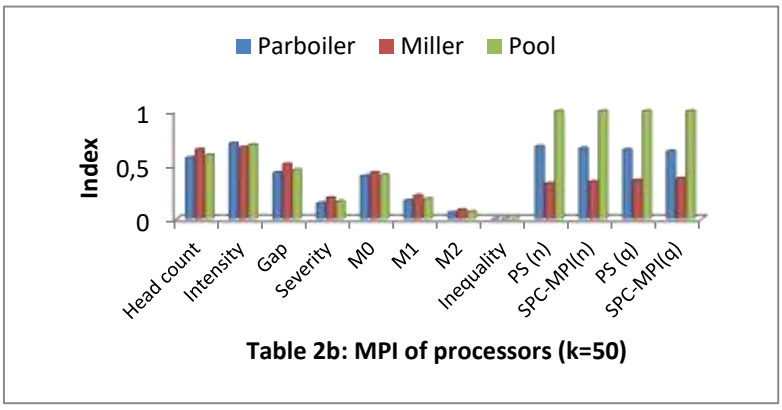


Figure 2b. MPI of processors (k=50

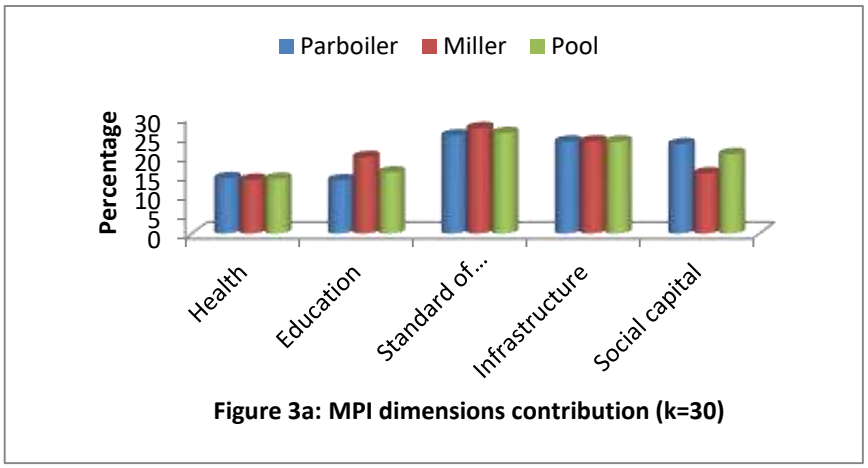


Figure 3a: MPI dimensions contribution (k=30)

Figure3a. MPI dimension contribution (k=3

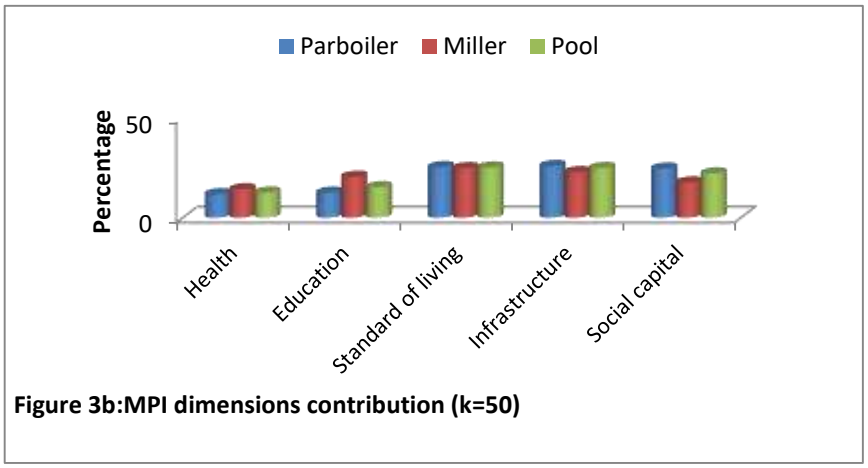


Figure 3b:MPI dimensions contribution (k=50)

Figure 3b. MPI dimensions contribution (k=50);

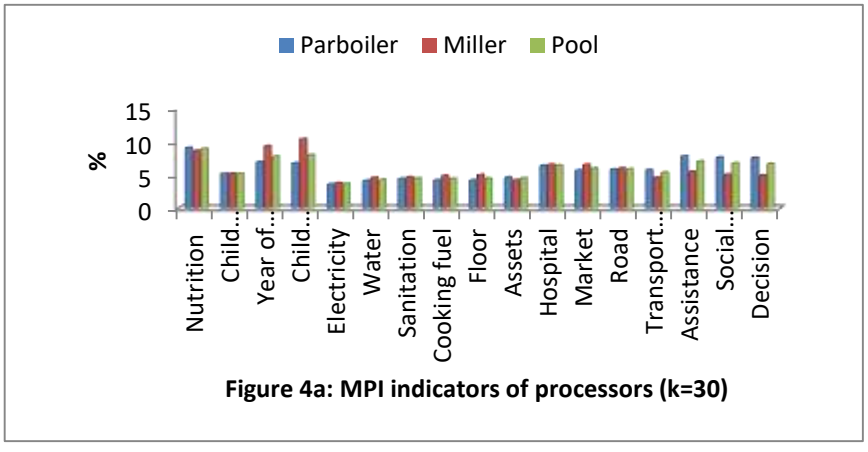


Figure 4a: MPI indicators of processors (k=30)

Figure 4a. MPI indicators of processors (k=30)

The indicator-wise results showed the shared deprivation in child school attendance, followed by year of schooling contributed most to the multidimensional poverty for the millers (Table 7 and Figure 4). In the case of the par-boilers, poor nutrition had the highest contribution to total deprivation, followed by lack of external support (assistance), then exclusion of household from social network,

and then lack of relative autonomy in household's livelihood decision. However, for the overall group, problem of nutrition contributed most to the total deprivation, followed by poor child school attendance, and then poor year of schooling. It is worth to mention that the trend is the same for the both cutoff points considered. Therefore, indicator-wise, it can be inferred that deprivation in education; poor health care and poor social capital; and, poor health care and poor education permeated total deprivation among the millers, par-boilers and the overall group respectively. The poor status of the social capital among the par-boilers comes as a surprise given that they lack economic power to wield influence in the social fabrics of the studied area. Likewise, the economic paucity affected their access to adequate and good health care in the study area. The middle-income households who are mostly the millers still have reservation for western education in the studied area, thus the possible reason for the poor educational status amidst their households. The study area is challenged with chunk of school children drop-out for menial job despite relentless effort of sensitization by both government and non-governmental organizations.

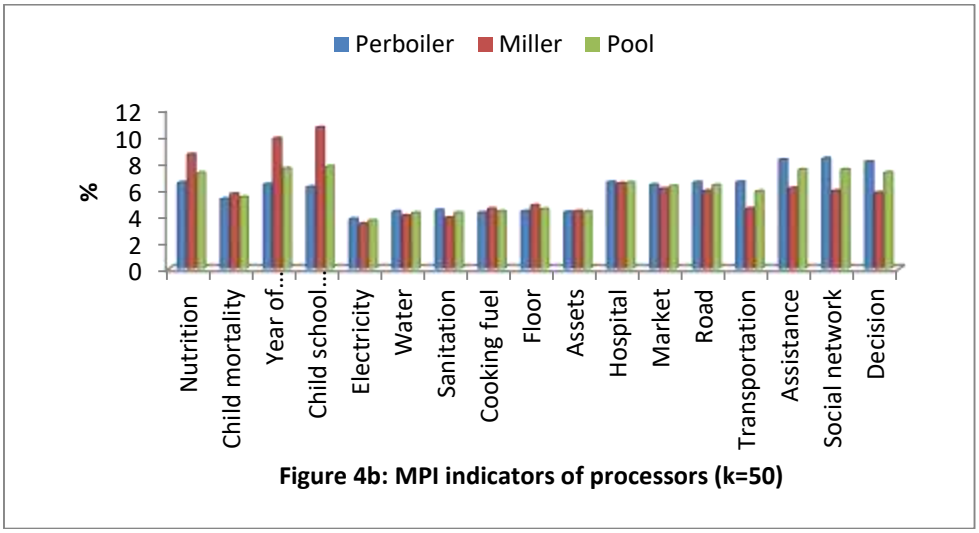


Figure 4b. MPI indicators of processors (k=50)

Table 7. Dimensional and indicator-wise contribution to MPI

Items	Par-boilers		Millers		Pooled	
	k=30	**k=50**	**k= 30**	**k= 50**	**k=30**	**k=50**
Dimensions' contribution to MPI						
Health	0.072655(14.26)	0.046631(11.75)	0.074255(13.83)	0.060976(14.25)	0.073179(14.11)	0.051332(12.61)
Education	0.069881(13.72)	0.04967(12.52)	0.105962(19.73)	0.087534(20.46)	0.081705(15.76)	0.062078(15.25)
Standard of living	0.128818(25.28)	0.100351(25.28)	0.145951(27.18)	0.106154(24.81)	0.134433(25.93)	0.102253(25.12)
Infrastructure	0.12074(23.7)	0.102708(25.88)	0.127507(23.74)	0.097696(22.83)	0.122957(23.71)	0.101066(24.83)
Social capital	0.117361(23.04)	0.097535(24.57)	0.083341(15.52)	0.075534(17.65)	0.106212(20.49)	0.090325(22.19)
MPI	**0.509454(100)**	**0.396896(100)**	**0.537016(100)**	**0.427894(100)**	**0.518487(100)**	**0.407054(100)**
Indicators' contribution to MPI						
Nutrition	0.046235(9.08)	0.02576(6.49)	0.046341(8.63)	0.036856(8.61)	0.04627(8.92)	0.029396(7.22)
Child mortality	0.02642(5.19)	0.020872(5.26)	0.027913(5.2)	0.024119(5.64)	0.026909(5.19)	0.021936(5.39)
Year of schooling	0.035403(6.94)	0.025231(6.36)	0.050136(9.34)	0.042005(9.82)	0.040231(7.76)	0.030728(7.55)
Child school attendance	0.034478(6.77)	0.024439(6.16)	0.055827(10.39)	0.045528(10.64)	0.041474(7.99)	0.03135(7.70)
Electricity	0.018527(3.64)	0.014865(3.75)	0.020301(3.78)	0.014488(3.39)	0.019108(3.68)	0.014742(3.62)
Water	0.021055(4.13)	0.017089(4.3)	0.024683(4.59)	0.017081(3.99)	0.022244(4.29)	0.017086(4.2)
Sanitation	0.022625(4.44)	0.017524(4.41)	0.024951(4.65)	0.016366(3.83)	0.023387(4.52)	0.017145(4.21)
Cooking fuel	0.021491(4.22)	0.01674(4.22)	0.026293(4.9)	0.019317(4.52)	0.023065(4.45)	0.017584(4.32)
Floor	0.021491(4.23)	0.017176(4.33)	0.026919(5.01)	0.02039(4.77)	0.02327(4.49)	0.018229(4.48)
Assets	0.023627(4.64)	0.016958(4.27)	0.022805(4.25)	0.018512(4.33)	0.023358(4.52)	0.017467(4.29)
Hospital	0.032629(6.4)	0.025892(6.52)	0.03523(6.56)	0.027507(6.43)	0.033481(6.46)	0.026421(6.49)
Market	0.029062(5.7)	0.025099(6.32)	0.03523(6.56)	0.025745(6.02)	0.031083(5.99)	0.025311(6.22)
Road	0.029723(5.83)	0.025826(6.51)	0.032249(6.00)	0.025068(5.83)	0.030551(5.89)	0.025577(6.28)
Transportation	0.029326(5.76)	0.025892(6.52)	0.024797(4.62)	0.019377(4.53)	0.027842(5.37)	0.023757(5.84)
Assets	0.03974(7.8)	0.032571(8.21)	0.029596(5.51)	0.025965(6.07)	0.036416(7.02)	0.030406(7.47)
Social network	0.038943(7.64)	0.033013(8.32)	0.027236(5.07)	0.025057(5.85)	0.035107(6.77)	0.030406(7.47)
Decision	0.038678(7.59)	0.031951(8.05)	0.026509(4.94)	0.024512(5.73)	0.03469(6.69)	0.029513(7.25)
MPI	**0.509454(100)**	**0.396896(100)**	**0.537016(100)**	**0.427894(100)**	**0.518487(100)**	**0.407054(100)**

Source: Field survey, 2022

Note: Values in parentheses are %

3.3. Livelihood Capital Access of the Processors

A perusal of Table 8 showed that except the natural capital asset of the par-boiler whose access is 'not good', on the average access to all the livelihood assets across the studied groups are moderate. Therefore, in a nutshell it can be concluded that the respondents are moderately endowed with the possession of most of the capital assets. For the human capital vis-à-vis the par-boiler, millers and the overall group, on the average, the highest indicator score index was farming knowledge with a score within 60%. The score index implies that the respondents have a 'good' access to the foregoing indicator. Generally, farming knowledge is acquired through both formal and informal means; the informal is gained through inheritance from parents and the host local communities and it transits many generations. The formal is acquired mostly through change agents that come as innovation and mostly subject to doubt in a typical agrarian local setting.Through mentoring and training organized by the change agents, knowledge and skills are acquired, thus becoming an experience for the respondents. Coupled with access to good health, knowledge becomes a perfect fit for the actors in the rice value chain. DFID (2000) as reported by Illu *et at*.(2021) posited that livelihood strategies have a relationship with talent, experience and health. Therefore, it can be inferred that the respondents' access to these three indicators for farming arestronger and effective than their access to skills and experience in other business activities *viz*. non-farm and off-farm activities. In other words, the access to skill and experience for other businesses is not strong, thus less effective. For the natural capital, firm production; firm location alongside water source; and, firm location alongside firm production are the strongest indicators for the par-boilers, millers and the pooled respectively. Besides, access to this natural capital is moderate across the target groups. The weakest indicator been water source (poor access) for the par-boilers is attributed to challenges in the availability of clean water as they mostly relies on hard water sourced from streams and borehole especially during the peak period of rice processing activities that occurred during the off-season.Besides, the challenges of epileptic power supply and price hike in fossil fuel due to scarcity affected firm efficiency, thus the reason for firm production been weak for millers. However, the millers' access to this indicator is moderate.

For the social capital, as rural and peri-urban communities, they are still bonded with social wealth such as community organization and trust as evident by the social capital indicators of par-boilers and millers. Access to the former is moderate among the par-boilers and the pooled group while that of the latter is good among the millers. Therefore, it can be inferred that the existing social capital pooling is very strong. For the financial capital, income had the highest indicator score for the par-boilers; while savings had the highest indicator score for the millers, likewise for the pooled group. Generally, access to these indicators is moderate across the target groups. The implication is that the par-boilers been resource poor, i.e. lack security for credit relied on income to fund their activity in the rice value chain. However, access to adequate turnover ratio which enlarged income, thus stimulates savings given the economic power makes the millers to rely on savings to fund their activity in the value chain. The moderate access attributed to indicators *viz*. assistance/subsidies, individual credit and credit from financial institutions based on their score values revealed low access to credit and mild subsidies available to these actors. The weak indicator score associated with remittance implies little or no access to remittance from able-bodied household members that are engaged in white collar jobs. For the physical capital, the production facilities indicator recorded the highest score index for the par-boiler; while accessibility to transportation and ICT is the highest indicator for the millers, likewise the pooled group. Generally, access to these indicators across the target groups are moderate based on their respective score values. The implication is that the par-boilers and the millers-pooled groups access to production facilities and good road-ICT link respectively are moderate.

Table 8. Indicator and dimension-wise average of livelihood capital assets

Assets	Par-boiler	Miller	Pool
Human capital			
Farming knowledge	67.62857	65.45522	66.9005
Farming skills	59.19699	59.59403	59.33
Farming experience	51.91624	29.25373	44.3243
Health	59.89398	55.23209	58.33225
Household size	42.01684	57.74627	47.2862
Other business skills	30.57789	53.3597	38.2098
Other business experiences	29.12737	41.56119	33.2927
Mean	**48.62256**	**51.74318**	**49.66796**
Natural capital			
Firm location	39.35714	55.72836	44.8415
Water source	36.31398	55.53134	42.7518
Climate suitability	37.08947	46.65851	40.2951
Firm production	43.95113	46.61731	44.8443
Mean	**39.17793**	**51.13388**	**43.18318**
Social capital			
Community Organizations	46.14286	40.91701	44.3922
Social Networking	38.41353	43.21433	40.0218
Mutual cooperation	34.36511	38.94328	35.8988
Trust	43.46767	64.49672	50.5124
Mean	**40.59729**	**46.89284**	**42.7063**
Financial capital			
Income	54.75263	39.96269	49.798
Savings	50.10376	56.0203	52.0858
Assistance / Subsidies	42.28872	42.36119	42.313
Individual Credit	44.21053	40.8597	43.088
Credit from Credit Institutions	47.8991	43.30537	46.3602
Remittances	33.17053	30.7597	32.3629
Mean	**45.40421**	**42.21149**	**44.33465**
Physical capital			
Access to transportation and ICT	44.57895	48.93433	46.038
Production facilities	46.33083	45.39552	46.0175
Infrastructures	43.4009	43.23582	43.3456
Working equipment	42.17444	42.62239	42.3245
Mean	**44.12128**	**45.04701**	**44.4314**

Source: Field survey, 2022

Generally, the pentagon-wise distribution showed that the millers are more endowed in natural, human and social capital assets, thus enhancing their access to physical and financial capital assets (Figure 3). The par-boilers are more endowed with human and financial capital assets, thus stimulating their access to physical capital. The moderate access to the financial capital asset of the par-boilers consequently led to the poor utilization of social capital endowment. Access to credit sources majorly funded by government with security for credit advancement mostly being on promissory note downplay the effective utilization of social capital among the par-boilers who are expected to rely on social power as they are mostly resource-poor with no economic capital. However, it can be inferred that the micro-finance intervention to some extent had effect on the livelihood of the par-boilers in the short-run but the poor utilization of the social capital asset will likely jeopardized the livelihood sustainability of this actor in the long-run, thus disrupting the rice value chain. The poor access to natural capital endowment of the par-boilers did not come as a surprise given that most of the agents in this category are resource-poor. In addition, the chain activity- par-boiling is less capital intensive compare to that of milling.

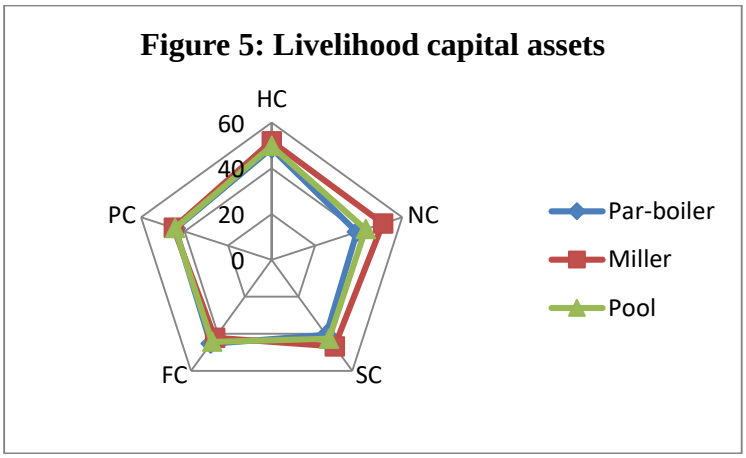


Figure 5. Livelihood capital assets

3.4.Livelihood Strategy of the Processors

A cursory review of Table 9 shows different livelihood strategies adopted by the processing value chain actors. The empirical evidences show the major adopted livelihood strategy to be survival strategy and it permeates across the par-boilers, millers and the pooled group viz. 71.4, 55.2 and 66% respectively. These players have limited control over their means of subsistence. The household persistence to survive through multiple livelihood pursuits is a feature of this technique. They frequently struggle to provide for themselves and their families. They are less prone to devote their minds and bodies to business endeavors. While they may have an entrepreneurial mentality, they lack the resources to operate effectively as value chain entrepreneurs. Household food security is the primary goal, with little or no emphasis on commercial surplus. The actors in this group rely exclusively on social capital pooling, savings through limiting/reducing home consumption for food consumption, and the purchase of consumptive commodities that may cause welfare issues. Food consumption is restricted by reducing the number of daily meals and limiting the variety of foods ingested. Apart from that, restrictions apply to the purchase of other consumable things such as clothing, electronic equipment, and other utilities. Furthermore, they rely on government social intervention aid programs to ensure good of their survival.

The consolidation strategy accounts for 26.3, 34.3 and 29% respectively among the par-boilers, millers and the overall group. The majority of the value chain participants who fall under the consolidation

approach are middle-class households who have met their daily demands. They have more opportunities to produce than just survive to some extent. These prospects are presently restricted, but they can be extended by modifying their resource mix and addressing access and risk constraints. To address their demands, they had little economic power that was bolstered by substantial social capital. From the management of their livelihood resources, the actors in this group prioritize security and income stability. They are seen as pre-entrepreneurial and in need of assistance to advance into more self-sufficient positions. The actors in this category utilized minor diversification strategies, such as livestock raising and farming; credit utilization; social networking; and household resource optimization, particularly labor and remittances. Given that this consolidation technique is an intermediate approach, the actors who employ it have a variety of possibilities. If the gradual implementation is successful, they will be able to use the accumulation approach, but if it fails or a complicated threat/vulnerability occurs, they will be forced to use the survival strategy. They are not 'entrepreneurs' in the traditional sense, nor are they truly market-oriented at this level. They understand the market better and have expanded their survival business to incorporate certain economic activities. They're only getting started on the road to creating profit-driven non-farm enterprises. Long-term investment isn't prioritized.

The accumulation strategy is slim among the value chain actors and accounts for 2.3, 10.4 and 5% *viz*. the par-boilers, milers and the pooled group respectively. Few value chain actors have embraced a thorough diversification strategy into additional income-generating enterprises, including farm, non-farm, and off-farm activities. Furthermore, business expansion is possible through savings and loans. Actors with adequate economic power employ this method. These players are completely market-driven, with the primary purpose of making a profit. For the few actors who already have assets and can meet their needs, this method represents a new strategic choice. The assets under their control are not only utilized to meet their requirements, but they can also be used to raise capital (investment) over time to grow their income.

Table 9. Livelihood strategy of the processors

Strategy	**Par-boilers**	**Millers**	**Pooled**
Survival	95(71.4)	37(55.2)	132(66.0)
Consolidation	35(26.3)	23(34.3)	58(29.0)
Accumulation	3(2.3)	7(10.4)	10(5.0)
Total	133(100)	67(100)	200(100)

Field survey, 2022

The schematic review of Figure 6 shows the livelihood strategy across the targets to be tilted most towards the survival strategy; hand-fully towards the consolidation strategy; then marginally towards the accumulation strategy. The negligible proportion of the actors in the accumulation strategy didn’t puzzled the researchers as most of the actors are low-middle income earners that engaged in rice agro-processing enterprise in the studied area.

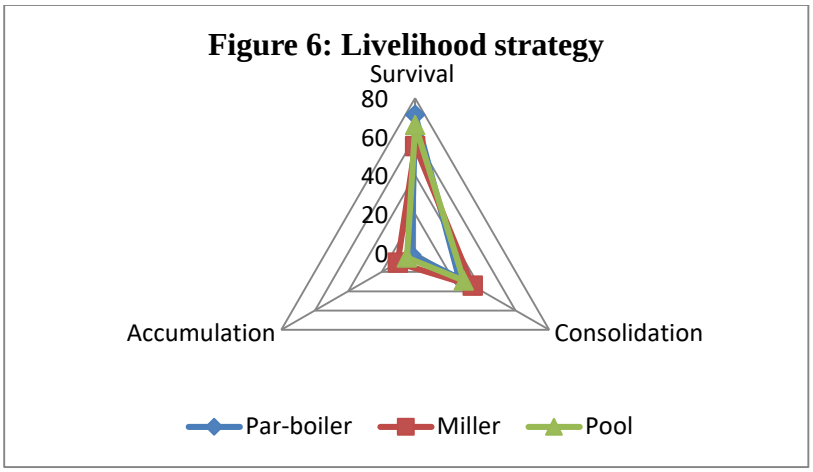


Figure 6. Livelihood strategy

3.5. Determinants of MPI, Food Security and Livelihood Status of Processors

The non-significant of the inverse Mill's ratio coefficient at 10% error gap indicates absence of selection bias resulting from the use of non-zero outcome values (Table 10). This implies the reliability in the use of the second stage OLS in explaining the factors that determined the depth of multidimensional poverty, food security and livelihood among the rice processors in the study area. Besides, there is absence of interdependency of the explanatory variables as evident from the variance inflation factor (VIF) of the respective variables that are less than the threshold value of 10 (Table 10b). These ample evidences vindicate the validity of the chosen model-Heckman's model for the specified equation.

The identified significant variables that influenced multidimensional poverty status, food security status and livelihood status of the rice processors in the decision model are age and income; marital status, household size, education and value chain activity-processing type; and, age, marital status and household size respectively. In the outcome model, the significant variables that influenced the depth of multidimensional poverty status, food security status and livelihood status are credit acquisition ratio and population pressure; household size, threshold poverty level (k=30) and severe poverty level (k=50); and, age and population pressure respectively.

The positive significant of age coefficient in the decision model for livelihood and poverty statuses implies that youthful-middle-aged people have a favourable livelihood status; likewise are likely not to be multidimensional poor compared to the old-aged processors. The possible reason is attributed to their entrepreneurship quest which is market-profit-driven. Therefore, the probability of a processor having favourable livelihood status and being multidimensional non-poor for a unit increase in age will be 0.005 and 0.007% respectively. While, the elasticity implication of a processor having a favourable livelihood status and being multidimensional non-poor for a unit increase in age will be 42.39 and 34.81% respectively. Besides, the negative significant of the age coefficient in the outcome model showed the consequence of the capital consumption quest of the youth-middle-aged processors against capital investment in drifting their livelihood consolidation-accumulation strategy towards survival strategy. However, this addition to the existing consumption decreases the multidimensional poverty depth of the youth-middle-aged processors as income in the short-run is a function of consumption. The marginal implication of a unit increase in age will decrease the livelihood asset accumulation and poverty depth of a processor by 0.09 and 0.07% respectively.

Poor access to pooled capital status associated with matrimony makes most of the non-married processors to have unfavourable livelihood status and food unsecure as evident by the negative significant of the marital status coefficient in their respective decision model. Therefore, the probability of non-

married processors drifting into unfavourable livelihood status and food unsecure against their married counterparts will be 0.051 and 0.018% respectively. The elasticity implication of non-married processors drifting into the fold of unfavourable livelihood status will be 10.99%.

Processors with large household size have unfavourable livelihood status vice versa been food secured as evident by the negative and positive significant respectively of the household coefficient in the decision models. The possible reason may be attributed to the pressing need to meet-up with households' consumption, thus affected deferred payments- savings: livestock and dead stock assets accumulation. Therefore, the likelihood of processors with a large household been poor in livelihood status compared to their counterparts with small-sizeable household size will be 0.008% alongside an elasticity implication of 12.38%. On the other hand, having a large household size will increase the tendency of being food secured by 0.006% against processors with small household size. Furthermore, liquidation of some deferred assets to meet-up with expenditure needs among the large households decreases their food insecurity depth as evident by the negative significant of the household coefficient in the selection model of food security. Therefore, the probability of food security decreasing among processors with large household size for a unit increase in family size will decrease food security depth by 0.118%.

The consciousness attached to the importance of food security among the most educated processors make them to be food secured compared to their counterparts that have little or no education as evident by the positive significant of the education coefficient in the food security decision model. Therefore, a year increase in the level of education will increase the probability of an educated processor being food secured by 0.002%.

In the decision model of MPI, it is observed that processors with large income stream are susceptible to multidimensional poverty as evident by the negative significant of the annual income coefficient. The possible reason may be associated with their penchant concentration on capital consumption over capital investment that guarantees enlarged consumption over a long period of time. Therefore, the likelihood of processors with large income being multidimensional poor over their counterparts with sizeable income will be 0.066%; while the elasticity implication is 141.29%, an elastic situation in response to income change.

In the decision model of the food security, the empirical evidence established that the par-boilers are more food secured compared to millers as evident by the positive significant of the estimated coefficient for the type of processing activity. This may be attributed to their pre-entrepreneurial characteristic, i.e. they are not entrepreneurs in true sense neither are they truly market-oriented with much focus on household food security, thus striving between survival and consolidation strategies. Therefore, the chances of par-boilers being food secured compared to the millers will be 0.035%.

Inspite of the incongruent of the credit requirements of the processors, the credit advanced reduced the depth of multidimensional poverty as indicated by the negative significant of credit ratio coefficient in the outcome model of multidimensional poverty. This implies that the credit advanced to the processors is channeled into the agro-processing, a capital investment and not diverted into capital consumption. Therefore, the tendency of poverty depth declining for a unit increase in credit advancement to the processors will be 0.38%. Pressure of household's population on available resources especially among processors with large family size affected their livelihood asset's accumulation as indicated by the negative significant of population pressure coefficient in the outcome model of the livelihood status. However, the pressure of household's population on the available resources forced able-bodied member of the household to seek for additional income sources so as to meet up with the household's expenditure, thus plummeted the depth of multidimensional poverty as evident by the negative significant of the population pressure coefficient in the selection model of multidimensional poverty. Therefore,a unit increase in household's population pressure will decreases livelihood status and multidimensional poverty by 58.16 and 65.26% respectively.

Table 10: Elasticity and multicolineairty (VIF)

Variable	MPI	FSS	LVS	VIF
Age	0.3481	-	0.4239	1.914
Gender	-0.0086	-	0.0361	3.421
Marital status	0.0324	-	0.1099	1.126
HHS	-0.0589	-	-0.1238	1.421
Education	-0.0083	-	0.0166	1.150
Experience	-0.0073	-	0.0124	1.585
M. Association	-0.0125	-	0.0002	1.071
Income	-1.4129	-	-0.6686	1.579
Activity type	-0.0467	-	-0.0310	3.465

At poverty threshold level (k=30), the food security status of the food unsecured processors is not badas indicated by the positive significant of the poverty threshold coefficient in the food security outcome model. However, at a higher MPI cutoff point i.e. the severe poverty level (k=50), the food security situation of the food unsecured processors worsen as indicated by the negative significant of the severe poverty coefficient in the food security outcome model. The implication is that as deprivation shift to the extreme point, food insecurity of the processors becomes severe-alarming. Therefore, at the threshold poverty level, the food security depth of the food unsecured processors will improved by 1.46 while at the severe poverty level the food security depth of the unsecured processors will declined by 0.93.

4- Conclusion and Recommendations

Based on the empirical evidences, it was established that food insecurity is high among the par-boilers while just barely above half of the sampled millers are food unsecured. Besides, incidence of poverty is very high across the target value chain actors and mostly multidimensional deprived in more 50% of the dimensions. Furthermore, livelihood status was not impressive as most adopted survival strategy to stay afloat in keeping the body and the soul together. Nonetheless, the processors' livelihood is affected by large family size, thus aggravates pressure on the available resources. Therefore, the study recommends the need for provision of consumption credit alongside augmenting credit facilities so as to enhance the productivity of the resources deployed by the processors in the rice value chain. In addition, there is need to sensitize the processors on the importance of having a manageable household size for a better standard of living.

Table 10a: Determinants of MPI, food security and livelihood status of the processors

Variable	MPI (k=30)		Food security status (FSS)		Livelihood status (LVS)	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
	Decision model					
Constant	1.3111(0.32904)	3.985***	−0.0038(0.1177)	0.032^{NS}	0.5308(0.2491)	2.131**
Age	0.0067(0.0020)	3.304***	9.79e-5(0.0007)	0.134^{NS}	0.0049(0.0022)	2.176**
Gender	−0.0123(0.0459)	0.269^{NS}	0.0053(0.0136)	0.394^{NS}	0.0340(0.0405)	0.840^{NS}
Marital status	0.0254(0.0309)	0.822^{NS}	−0.0179(0.0101)	1.779*	−0.0507(0.0238)	2.130**
HHS	−0.0061(0.0050)	1.217^{NS}	0.0057(0.0028)	1.983**	−0.0076(0.0045)	1.682*
Education	−0.0009(0.0026)	0.355^{NS}	0.0019(0.0009)	2.185**	0.0012(0.0021)	0.573^{NS}
Experience	−0.0006(0.0029)	0.195^{NS}	0.0003(0.0010)	0.311^{NS}	0.0006(0.0023)	0.260^{NS}
M. Association	−0.0251(0.0279)	0.896^{NS}	0.0064(0.0092)	0.696^{NS}	0.0002(0.0241)	0.008^{NS}
Income	−0.0662(0.0257)	2.568**	−0.0101(0.0090)	1.124^{NS}	−0.0191(0.0183)	1.044^{NS}
Activity type	−0.0423(0.0469)	0.902^{NS}	0.0352(0.0144)	2.433**	−0.0165(0.0417)	0.397^{NS}
Lambda	−0.0845(0.0548)	1.543^{NS}	−0.0255(0.0359)	0.709NS	−0.0458(0.0836)	0.548^{NS}
	Outcome model					
Constant	6.2041(2.3839)	2.602***	2.4607(2.1595)	1.139^{NS}	4.3386(2.3489)	1.847*
Age	−0.0715(0.0353)	2.021**	−0.0268(0.0335)	0.799^{NS}	−0.0919(0.0395)	2.324**
HHS	0.0013(0.0457)	0.028^{NS}	−0.1183(0.0384)	3.078***	0.0458(0.0380)	1.205^{NS}
CR	−0.3815(0.2025)	1.884*	−0.1133(0.2004)	0.565^{NS}	−0.0863(0.2249)	0.383^{NS}
CU	−0.3606(0.6568)	0.549^{NS}	0.4675(0.4791)	0.975^{NS}	−0.2512(0.4579)	0.548^{NS}
POP	−65.255(31.427)	2.076**	−36.441(30.493)	1.195^{NS}	−58.156(32.356)	1.797*
k=30	-	-	1.4617(0.7301)	2.002**	-	-
k=50	-	-	−0.9286(0.5531)	1.679*	-	-
Wald Chi^2	11.61[0.0169]*		20.80[0.007]***		8.76[0.0362]**	

Source: Field survey, 2022

Note: Values in ( ) and [ ] are standard error and probability level respectively. ***, **, * & NS are significant at 1, 5, 10% and non-significant respectively

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