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Prospects of Rice Milling Cottage Industry in Niger State of Nigeria

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Abstract: The study determined the prospect of the rice milling cottage industry in Nigeria's Niger State using cross-sectional data. The data were collected with the aid of a well-structured questionnaire complemented with an interview scheduled from fifty-five (55) active millers chosen through a multi-stage sampling technique. Both descriptive and inferential statistics were used for data analysis. Based on the findings, it can be suggested that the potential of rice milling enterprise in the study area has not been fully explored despite its profitability turnover ratio. The industry is exclusively men enterprise with the majority been low-income earners. Potentials alongside challenges still exist in the rice milling industry as evident by the overwhelming influences of weakness and threat. Millers' age was observed to be the major inducing factor that increases income inequality among the processors. In lieu of the foregoing, the study advised the millers to adopt a defensive strategy to remain afloat in the industry. In addition, there is a need for capacity building enhancement *viz*. acquisitions of innovative milling skills by the millers, thus enhancing their managerial efficiency.

Keywords: Prospect, rice, milling industry, swot, Nigeria

1. Introduction

Through its rice Transformation Action Plan under the Agricultural Transformation Agenda, the Nigerian government has made concerted efforts to facilitate the production and processing of rice. The rice transformation action plan, according to Adesina (2012), had the aim of making Nigeria self-sufficient in the development of rice by 2015. For the intention of ending the ₦356 billion annual import bills spent on this product, the government banned rice imports in 2015.

To encourage local production, new fiscal initiatives such as an increase in the Brown Rice Tariff and a levy on imported finished rice have been implemented by the government to further promote the production of rice. In Nigeria, rice milling still occurs by individual small-scale processors and their cooperative societies at the cottage stage. The activities of the cottage industry varied since it depends on the ability of milling, methods of operation (buying and selling), and the variety of manufacturing operations carried out, and so on. In many production areas in Nigeria, powered paddy processing is still limited (Anonymous, 2002), with most small rice mills in the country operating at about one ton per hour due to lack of adequate paddy available for processing.

Considering the focus put on the mass production of rice by the federal government and some non-governmental organizations, recent economic crisis, population explosion and the ban placed on the importation of rice, organizations continue to create programs that reimburse and provide sufficient information for farmers and investors to go into mass production of rice.

Several studies on the production, processing, and even marketing of rice have been performed, but very little work has been done on the prospect of the rice processing industry. Rice is a popular food eaten by the wider population and yet the manufacturing company is a fascinating business for just a few individuals. Despite the population boom, the recent economic crisis, and the ban on the importation of rice, there has been a rise in continuous demand for rice, hence the need for investment by people and investors in the production and processing of rice.

Small capital and financial constraints have consistently frustrated the drive towards commercial agriculture in Nigeria (Abiodun, 2011). Small-scale processors belong to the poorest segment of the population of Nigeria and are thus unable to make a substantial investment in agro-processing /agribusiness/agriprenuer. Rice milling in Nigeria mostly involved small-scale operators and the majority did not engage in producing trade, i.e. buying paddy and selling rice, but only processing paddy for others (producers, traders, or consumers) on a fee basis. The limited number of millers involved in the paddy and rice trade is due to the associated high risks that can result in financial losses from the marketing of both goods.

The dissociation of different processing tasks among different operators gives the post-harvest segment of the rice commodity chain greater flexibility and thus increases its resilience under very unstable and risky market conditions. However, as millers alone have no incentive to improve the quality of their production, this system does not provide the expected mechanism for increasing the quality of milled rice. Another common feature of the rice milling industry is that it has not completely exploited its technological potential ability, and this is due to the seasonal concentration and spatial distribution of paddy production coupled with the presence of a variety of different processing units competing in supplying facilities with each other. As these small mills usually do not buy and store paddy on their own, their operations appear to be confined to the paddy marketing season, and during the rest of the year, their installed capacity remained underutilized.

The high profitability of the rice milling business and the low entry barrier encourage the rapid growth of the small-scale rice milling business, and to this effect, the rapid increase in the number of rice mills, particularly in newly emerging rice-growing areas continues to occur. Therefore, the need for this research to assess the prospects of the rice processing business as it will assist interested investors with key information relating to the prospect of the cottage rice milling industry in the state and the country in general. In the same vein, for miller-traders, the survey showed that it is worth investing in improved technology under the current price level for imported rice to increase the appearance and cleanliness of the local rice to meet the standards of imported rice.

2. Materials and Methods

Niger state is located in the middle-belt of Nigeria and lies between latitudes 8°20'N and 11°30'N of the equator and longitudes 3°30'E and 7°20'E of the Greenwich Meridian time. The state is characterized by guinea savannah vegetation and experienced both spring and winter annually. The major occupations of the inhabitants are crop farming, livestock rearing, fishing activities, and hunting. In addition, these are complemented with artisanal, public service, petty trading, *Ayurveda* medicines etc. A multi-stage sampling technique was used to arrive at the representative sample size for the study. The Niger State Agricultural Development Project (NSADP) stratification of the state into three agricultural zones *viz*. Bida (Zone A), Shiroro (Zone B), and Kontagora (Zone C) were adopted. Subsequently, one agricultural zone *viz*. Bida was purposively selected because of its comparative advantage in rice production. Thereafter, one Local Government Area (LGA) *viz.* Mokwa was conveniently chosen due to cost constraints. Because of the small size of the respondents engaged in the rice milling industry in the study area, the sampling frame was adopted as the sample size. Thus, a total of fifty-five millers involved in the milling enterprise formed the representative sample size for the study. Objectives 1 and 3 were achieved using descriptive statistics; objective 2 was achieved using pseudo-profit function; objective 4 was achieved using Strength, Weakness, Opportunity and Threat (SWOT) Analysis, and exploratory factor analysis; and, objective 5 was achieved using Gini coefficient, Tobit regression model and Shapley's decomposition model.

2.1. Empirical model

Cost concepts and income measures: Simple cost concepts and income measures used in estimating profitability ratios are given as follows (Sadiq, 2014). The measures are given in Equations 1-4.

$$GM = TR - TVC \quad (1)$$

$$NI = TR - TC \quad (2)$$

$$ROI = GM/TVC \quad (3)$$

$$RORCI = NI/TC \quad (4)$$

Where, TVC, Total variable cost; TC, Total cost (sum of variable and fixed costs); GM, Gross margin; NI, Net income; ROI, Return on Naira invested (short-run); and ROCI, Return on capital invested.

SWOT analysis: A SWOT strategy is a tool for assessing a business working environment. It is an instrument of business market evaluation used by companies and analysts to consider the dynamics of an industry. It allows them to understand what is going on in an industry, i.e. demand-supply statistics, the level of competition within the industry, the state of competition between the industry and other emerging industries, the potential prospects of the industry, taking into account technological advances, the credit system within the industry, and the effect on the industry of external factors. This approach allows an entrepreneur to understand his status relative to other business participants. It helps them identify both the possibilities and risks that come their way and gives them a good idea of the industry's current and potential scenario. The secret to thriving in this ever-changing market environment is to consider and take full advantage of the gaps between one's company and its rivals in the industry. This is the most applicable tool of business assessment in comparison to Porker's 5 forces (Ease of entry, power of suppliers, power of buyers, Availability of substitutes and Competitors) and PEST (Political, Economic, Social, and Technology) analyses. A detailed summary of the SWOT analysis is presented in Table 1 and 2.

Normalization of values and scaling using PCA: The normalization method is given in Equation 5.

$$Y_{ij} = b * \frac{X_{ij} - \min(X_{ij})}{max(X_{ij}) - min(X_{ij})} \quad (5)$$

Where, Y_{ij} is the normalized value; X_{ij} is the actual value of the indicator; and, $max(X_{ij})\ and\ min(X_{ij})$ are the maximum and minimum actual values respectively.

Very less important= 0-< 1
Less important= < 2
Moderately important= < 3
Important= < 4
Most important= ≤ 5

Gini coefficient: The Gini index is defined as a ratio of the areas on the Lorenz curve. The model demonstrates the level of equity of unevenness of any set of numbers, ranging from 0 and 1. A Gini coefficient of 0 and 1 imply equal and unequal distribution of incomes, respectively. In this way, lower Gini coefficients show the more fair circulation of income among the families, while higher Gini coefficients imply that income is packed in the hands of individuals. Following Sadiq and Samuel (2016); Sadiq et al. (2018a) the formula is given in Equation 6.

$$G = A/0.5 = 2A = 1 - 2B \quad (6)$$

Censored model: Following Sadiq et al. (2018a), the original Tobit model developed by James Tobin a Nobel laureate economist (Tobin, 1958) is given in Equation 7.

$$Y_i^* = \alpha + X\beta + \varepsilon_i \quad (7)$$

Where Y_i^* is censored variable.

Now, $Y_i = 0\ if\ Y_i^* \leq 0$

$= Y_i^*\ if\ Y_i^* > 0$

The explicit form is given in Equation 8.

$$lnY_i^* = \alpha_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \varepsilon_i \quad (8)$$

Where, Y_i^*= Income (₦) of i[th] miller; X_2= Marital status (married =1, otherwise = 0); X_3= Age (year); X_4= Household size (number); X_5= Educational level (year); X_6= Experience (year); X_7= Co-operative membership (Yes= 1, No= 0); X_9= Type of miller machine (diesel= 1, electricity= 0); α= intercept; β_{1-n}= estimated coefficients; and, ε_i= error term

Shapley decomposition model: Following Gunatilaka and Chotikapanich (2006), an estimated income-generated model is the first step of the decomposition model. Using Equation (8), the predicted income is given in Equation 9.

$$ln\hat{Y}_i = \hat{\alpha}_0 + \hat{\beta}_1 X_1 + \hat{\beta}_2 X_2 + \hat{\beta}_3 X_3 + \hat{\beta}_4 X_4 + \hat{\beta}_5 X_5 + \hat{\beta}_6 X_6 + \hat{\beta}_7 X_7 \quad (9)$$

$\ln\hat{Y}_i$ was used to calculate $\hat{G}_{TOT}$ which is the total income inequality as determined by the Gini index. This is inturn determined by the distribution of incomes attributable to the explanatory variables.

Kuznet's ratio: It is the ratio of income received by the top 20% to that received by the bottom 20 and 40%. It is given in Equation 10 (Akin-Olagunju and Omonona, 2013).

$$Kuznet's\ ratio = \frac{Top\ 20\%}{Bottom\ (20\%+40\%)} \quad (10)$$

Table 1. Summary of SWOT

Strengths	Weaknesses	Opportunities	Threats
Large consumer base (S1)	High cost of machinery and equipment (W1)	Training support (O1)	Smuggling (T1)
Availability of rice paddy (S2)	Local means of production (W2)	Large local market (O2)	Government protection (T2)
Pool of available technical and indigenous knowledge on rice milling (S3)	Limitation in the access to information (W3)	Quality improvement (O3)	Climate change reduces the quality of paddy (T3)
Advanced tools for planning, targeting, and scaling (S4)	Low profitability (W4)	Alternative uses of other sources of energy like gas, coal is emerging (O4)	Migration of youth to urban areas is a threat to the milling enterprise (T4)
Innovation to support the growth of rice milling industry (S5)	Inadequate accesses to financial services (W5)	Availability of export market that can motivate millers to improve production/productivity (O5)	Poor support from other institutions to "enable" impact (T5)
Readily available market for the milled product (S6)	Financial instability (donor dependents) (W6)	Support from research institutes (O6)	Non-supportive marketing policy for grains (T6)
Productivity-based technologies (S7)	Less utilization of appropriate technologies (W7)	Skilled manpower (O7)	Problem of insurgency (T7)
Stable income generation (S8)	Limited capital (W8)	Adequate provision of credit (O8)	Poor road network (T8)
Improved standard of living (S9)	Poor market for milled rice (W9)	Consumer awareness (nutrition, standards, labels,) (O9)	Seasonal unavailability of paddy (T9)
Access to credit facilities (S10)	Unstable market prices (W10)	Demand for processed rice products (O10)	Unplanned urbanization drives farmers to marginal areas (T10)
Remunerative milling price (S11)	Low price offer on paddy rice milling (W11)	Good government policies (O11)	Adulteration of paddy in the market (T11)
Conducive business environment (S12)	Low-quality product (W12)	Growing rice markets (national and regional) (O12)	Epileptic power supply/ erratic power supply (T12)
High profitability (S13)	No legal safeguard in place (W13)	Price subsidies (tax exemption) on inputs, e.g., agro-machineries (O13)	Excessive taxes (T13)
Value addition (S14)	Sharp market practices (W14)	Rice milling enterprise bring about youth empowerment (O14)	High tax rate (T14)
Low labor cost (S15)	High cost of fuel, diesel etc (W15)	Public private partnerships for rice milling investment: general economic growth (O15)	
Low transportation cost (S16)	High cost of the initial investment (W16)	Reduced time, labor and costs of processing rice modern machinery (O16)	
WEAKNESSES	High cost of labor (W17)	Regional collaboration for innovation in the processing industry (O17)	
	High cost of transportation (W18)	Import ban on foreign rice (O18)	
	Weak branding (W19)	Favorable competition (O19)	
		Adequate labor supply (O20)	
		Intensification in the production of rice (O21)	
		Maintenance of buffer stock by the government to avoid glut (O22)	
		Relatively stable price (O23)	
		Insurance (O24)	
		Political stability (O25)	
		Good road network (O26)	
		Adequate power supply (O27)	
		Co-operative milling (O28)	
		Contract marketing (O29)	
		Formidable co-operative organization (O30)	

Table 2. SWOT matrix of rice milling industry (Hosseini et al., 2019)

	Strength	Weakness
Opportunity	S-O strategies [a] (Aggressive)	W-O strategies [b] (Conservative)
Threat	S-T strategies [c] (Competitive)	W-T strategies [d] (Defensive)

a: What strengths do the business have and how can it use them to take advantage of new or existing opportunities?, b: What strategies are needed to overcome weaknesses so that the business can take advantage of opportunities?, c: What Strengths can be used to minimize Threats?, d: What strategies will minimize weaknesses and help the business to cope with Threats?

3. Results and Discussion

3.1. Socio-economic profile of the millers

A perusal of Table 3 showed that the milling industry is exclusively men business as evident from the proportion index which is 1.00. The reason for the sole control of the business empire by the male gender may be connected with the inability of the women to have access and control over productive resources as the business is capital intensive. Likewise, the business is too strenuous as the plant is semi-mechanized, thus making the drudgery nature of the business not compatible with women's statues. Also, the culture sees traditional milling as the confine of women and not the mechanized system, thus affecting women's participation in the study area. It was evident that most of the processors are married people (0.89), thus an indication of being in the business for households' livelihood sustenance. In addition, the twin benefit of social and economic capitals played a vital role in enabling the married processors to venture into this enterprise, as the business is capital intensive. If adequate support is given by the stakeholders, this is a sustainable business in the rice supply chain that will alleviate poverty and create job opportunities for the teeming population in the studied area. It was observed that the business was undertaken by able-bodied men (43.96 ± 8.53) who fall within the age category recommended by FAO as active and productive. Sequel to this it can be suggested that the milling population in the studied area is productive and active which at all times will be responsive to rice innovative changes that will be introduced in the studied area. This is an indication of efficiency in the supply chain of rice in the studied area in as much as the procurement aspect of the chain will not lag. However, the mean value in relation to the standard deviation value showed an aging population which needs to be replaced so as not to jeopardize the rice food security of the downstream supply chain. The reason for the dominance of the advanced youthful age may be connected to rural-urban migration by the post-teen age category for white-collar jobs which are limited in the studied area. Averagely, most of the processors have a large household size (9.85 ± 6.03 persons) which on one hand will give them access to labor at no cost, thus a reduction in the cost of production; while on the other hand, it will affect the going concern of the business due to excessive households' expenditure which characterized large family size especially where the dependency ratio is high. However, even with the low dependency ratio of households in the study area, the ills outweigh the advantages owing to limited opportunities and high inflation rate at two digits which affect remittances from able-bodied households' members. On average, the education qualification of most of the processors is beyond the first primary school leaving certificate. However, they didn't exceed the junior secondary certificate level. The implication is that processing innovation will have reception but with skepticism as a low level of education is a characteristic of the early majority adoption category. The mean year of experience been 9.55 implies that most of the processors have been in the milling business for quite some time, thus have adequate experience required for managerial efficiency. Thus, having adequate experience will enable them to become rational in resource allocation for optimum profit turnover that will guarantee firm sustainability. It was observed that majority utilized social capital for business pecuniary advantages as evidenced by the co-operative index of 0.67. This did not come as a surprise given that small-scale firm operators rely mostly on social capital as they lack potential economic capital. Small-scale operators using aggregation as a medium of link with the market stands to benefit from economies of scale *viz*. bargaining power, bulk discount for input purchase, access to credit: kind or in cash. In addition, the aggregation has been an important instrument used to address the problem of fragmentation in supply chain in advanced developing economies. The result showed that all the processors (1.00) have adequate access to market information on price, demand, and supply of paddy and milled rice prevailing in the near and far markets. It can be suggested that the millers take an informed decision as they are kept abreast with market information updates, thus a barometer for business profit turnover. The result showed that few of the processors relied on fossil fuel-diesel as a source of power for their plant while the majority relied on the national electricity grid to power their plant. It is cheaper to use electricity sourced from the national grid because of subsidy as compared to diesel which has little or no subsidy. Thus, this will enable the

processors to benefit from profit margin rise as compared to the milling plant which runs on diesel due to a higher cost of production. In the long-run, plants been run on diesel are likely to close shop due to high production costs, thus affecting the business revenue turnover. However, milling plants which run on electricity from the national grid are contained with a frequent power outage, thus affect the supply chain of milled rice. Therefore, power has been the major obstacle in this industry as it makes the processors contain with the decision of whether to remain or leave the business. The proportion index of access to credit been 0.00, means that none of the processors has access to credit. This may be connected to the poor economic capital of the millers, thus the inability to provide security for credit advancement. Also, there is the issue of policy mismatch which pays little or no attention to the primary processing unit as evidenced by largely skewed credit provision towards the primary production process, thus affecting the supply chain of rice. Poor access to extension service delivery did not puzzle the researchers as extension services is mainly concerned with the backward linkage and not forward linkage in the rice supply chain.

Table 3. Socio-economic profile of the millers

Variables	Mean	SD	CV
Gender	1.0000	0.0000	0.0000
Marital status	0.89091	0.31463	0.35315
Age	43.96	8.5309	0.19404
Household size	9.8545	6.0351	0.61242
Educational level	8.2545	4.4231	0.53584
Business experience	9.5455	6.9063	0.72352
Co-operative membership	0.67273	0.47354	0.70391
Market information	1.0000	0.0000	0.0000
Type of miller machine	0.25455	0.43962	1.7271
Access to credit	0.0000	0.0000	0.0000
Extension contact	0.054545	0.22918	4.2017

SD: Standard deviation, CV: Coefficient of variation

3.2. Profitability estimates of the milling industry

The overall firm cost and returns structure showed a milling firm that break-even and makes a profit per plant (Table 4). It was observed that during both the rainy and dry seasons a plant records a gross margin cum net income of ₦230,835.60 and ₦174,085.20; ₦537,005.60 and ₦462,014.60, respectively. Furthermore, returns on naira invested cum capital invested were 5.15 and 1.71; and, 3.44 and 1.99 in respect of rainy and drying seasons per plant. This implies that in addition to recouping the amount invested, the millers earned in the short and long-runs 4.15 kobo and 71 kobo, respectively; and 2.44 kobo and 99 kobo during the rainy and drying seasons, respectively. Generally, for credit policy, the financial institutions are advised to advance any term of SME credit for industrial development at a realistic interest rate to these millers, as they will be able to defray it without hindrance to their business going concern *ceteris paribus*. The profitability ratios of the drying season been higher than that of the rainy season are due to the availability of raw material at low cost due to the glut which characterized the boom period. From the cost component, depreciation on capital items had the highest cost proportion during the rainy season while diesel cost accounted for the highest proportion in the cost items during the off-season.

Table 4. Costs and return structure

Items	Unit cost (₦)	Rainy season	Dry season	Pooled
Diesel	₦200 per litre	3978.21(3.91)	72753.85(31.40)	65138.60(33.74)
Electricity	₦16 per Kwh	2416.67(2.38)	2416.67(1.04)	2416.67(1.25)
MR&M		6407.18(6.30)	12173.87(5.25)	9030.25(4.68)
Firewood		5972.17(5.87)	16000.00(6.91)	11392.76(5.90)
Hired labor		9141.67(8.89)	9141.67(3.95)	9141.67(4.74)
Sack		14598.33(14.34)	39333.33(17.00)	28003.87(14.51)
Miscellaneous		2283.50(2.24)	4425.00(1.91)	3268.06(1.69)
TVC		44797.72(44.02)	156244.40(67.44)	125123.80(64.81)
Tax		241.53(0.24)	241.53(0.10)	241.53(0.13)
IWC	₦34375.27[₦107476.1]	3437.53(3.38)	10747.61(4.64)	7667.14(3.97)
DCI	20%	48819.93(47.96)	48819.93(21.07)	48819.93(25.29)
Managerial cost	10% of VC	4251.42(4.40)	15181.94(6.74)	10925.89(5.81)
TFC		56978.76(55.98)	75433.51(32.56)	67654.49(35.19)
TC		101776.50	231677.90	192778.30
Income	₦1100 per bag	275633.30	693250.00	622258.30
Gross margin		230835.6	537005.6	497128.9
Net income		173856.9	461572.1	429176.5
ROI		5.152843	3.43696	3.972917
RORCI		1.708222	1.992301	2.222769

₦: Naira, IWC: Interest on working capital, MRM: Machine repairs & maintenance, DCI: Depreciation on capital items, Values in ( ) are percentages.

The high cost of diesel during the drying season is related to epileptic power supply due to a decrease in the water level of the hydroelectricity generating earth structures in the state. However, for both periods, tax cost had the least contribution in the cost structure. On average, the enterprise is profitable as evidenced by the profitability margins and ratios which were positive and greater than one respectively. Therefore, it can be inferred that the enterprise is profitable in the study area.

3.3. Millers' perceptions on SWOT of the industry

The results of the adopted Likert scale assessment for the SWOT analysis presented in Table 5 showed that the processors perceived twelve factors out of sixteen to be the "most important" strengthens of the milling industry. While factors *viz*. advanced tools for planning, targeting, and scaling (S4), innovation to support the growth of rice milling industry (S5), and low transportation cost (S16); and access to credit facilities (S10) were perceived as "important" and "moderate" strengthens respectively for the milling industry. Kendall's ranking identified a large consumer base (S1) and access to credit facilities (S10) to be the "most" and "least" important perceived strengthens of the milling industry, respectively. Furthermore, Kendall's coefficient of concordance (KCC) being 0.150, implies poor agreement among the respondents with respect to these rankings.

The processors perceived twelve factors out of nineteen to be the "most important" weaknesses of the milling industry while the seven outstanding factors *viz*. local means of production (W2), limitation in the access to information (W3), low profitability (W4), the poor market for milled rice (W9), low-quality product (W12), high cost of labor (W17) and weak branding (W19) to be "important" weaknesses of the milling industry. The perceived "most" and "least" weaknesses of the milling industry are no legal safeguard in place (W13) and the poor market for milled rice (W9) respectively, as evident by Kendall's ranking. The KCC been 0.61, implies that there is moderate concordance among the respondents with regard to these rankings.

For the external factors, the processors perceived large local market (O2); quality improvement (O3); consumer awareness on nutrition, standards, and labels (O9); demand for processed rice products (O10); growing rice markets (national and regional) (O12); rice milling enterprise brings about youth empowerment (O14); favorable competition (O19); and intensification in the production of rice (O21) to be the 'most important' opportunities of the milling industry. However, six factors *viz*. adequate provision of credit (O8); good government policies (O11); maintenance of buffer stock by government (O22), insurance (O24); political stability (O25); and, good road network (O26) were perceived as the "least important" opportunities of the milling industry. The remaining sixteen factors were perceived as 'moderately important' opportunities of the milling industry by the processors. Kendall's ranking showed 'rice milling enterprise brings about youth empowerment (O14) to be the most important opportunity while insurance (O24) is the least opportunity of the milling industry. Furthermore, it was observed that there is a weak agreement with respect to these rankings as evident by the KCC which is 0.293.

With the exception of the poor road network (T8) which was perceived as the "least important" threat, all the remaining factors were perceived as "most important" threats to the milling industry by the processors. Adulteration of paddy in the market (T11) and government protection (T2) was ranked as the "most" and "least" important threats respectively of the milling industry as shown by Kendall's ranking. The KCC been 0.276 mean that there is a weak concordance among the respondents with respect to these rankings.

The relative weight sum score for each indicator *viz*. strength, weakness, opportunity, and threat were 6.057, 6.205, 5.242, and 6.321, respectively. The internal factor score is -0.148 (6.057-6.205), while the external factor score is -1.079 (5.242-6.321). The negative coefficient of the internal factor score implies that weaknesses affecting the milling industry were higher than strengthens influencing the industry. Likewise, the negative coefficient of the external factor score implies that the threats affecting the milling industry outweighed the opportunities in the milling industry. Based on the internal factor evaluation (IFE) and external factor evaluation (EFE), weaknesses and threats were achieved respectively. Thus, for the development of the rice milling industry in the study area, a defensive mechanism strategy is suggested.

3.4. SWOT determinants

Principal factor analysis with Varimax rotation matrix was used to reduce the number of variables for the SWOT to an interpretable set of factors. A perusal of the table showed the KMO coefficients for strength, weakness, opportunity, and threat dimensions to be 0.704, 0.730, 0.730, and 0.628, respectively (Table 6). Given that the reduced set of variables for the SWOT meet the necessary threshold of 0.50 recommended by Kaiser (1974),

Table 5. Millers' perceptions on SWOT (Descriptive- Likert)

Internal Factor Evaluation (IFE)								External Factor Evaluation (EFE)							
Strengths				Weaknesses				Opportunities				Threats			
	Mean	MR	RW		Mean	MR	RW		Mean	MR	RW		Mean	MR	RW
S1	6.60	10.75	0.413	W1	6.727	12.27	0.354	O1	4.982	14.34	0.1661	T1	6.69	8.55	0.478
S2	6.309	8.97	0.394	W2	5.818	8.71	0.306	O2	6.527	21.78	0.218	T2	2.71	2.23	0.194
S3	6.218	8.82	0.389	W3	5.746	8.51	0.302	O3	6.2	19.41	0.207	T3	6.75	8.45	0.482
S4	5.709	7.57	0.357	W4	5.709	7.85	0.301	O4	5.455	15.47	0.182	T4	6.45	7.02	0.461
S5	5.946	8.27	0.372	W5	6.418	11.15	0.338	O5	5.382	15.30	0.179	T5	6.51	7.55	0.465
S6	6.418	9.70	0.401	W6	6.127	9.14	0.323	O6	4.455	12.38	0.149	T6	6.64	7.75	0.474
S7	6.036	8.20	0.377	W7	6.236	9.80	0.328	O7	5.982	17.94	0.199	T7	6.60	7.92	0.4714
S8	6.182	8.13	0.386	W8	6.691	12.59	0.352	O8	3.709	9.47	0.124	T8	6.71	8.35	0.479
S9	6.273	8.88	0.392	W9	5.236	6.35	0.276	O9	6.255	19.91	0.209	T9	6.65	8.19	0.475
S10	4.091	3.92	0.256	W10	6.4	10.47	0.337	O10	6.436	21.41	0.215	T10	6.78	8.73	0.484
S11	6.182	8.34	0.386	W11	6.073	9.39	0.320	O11	3.964	10.59	0.132	T11	6.80	8.86	0.486
S12	6.418	9.78	0.401	W12	5.873	7.94	0.309	O12	6.436	21.48	0.215	T12	6.60	8.02	0.471
S13	6.436	9.83	0.402	W13	6.909	13.80	0.364	O13	5.055	14.56	0.169	T13	6.35	6.94	0.453
S14	6.218	8.50	0.389	W14	6.309	9.67	0.332	O14	6.527	22.31	0.218	T14	6.25	6.44	0.447
S15	6.127	8.33	0.383	W15	6.473	11.62	0.341	O15	5.618	15.84	0.187				
S16	5.746	8.01	0.359	W16	6.855	13.35	0.361	O16	5.982	17.21	0.199				
				W17	5.964	8.51	0.314	O17	5.055	14.65	0.169				
				W18	6.436	10.95	0.339	O18	5.291	17.34	0.176				
				W19	5.891	7.93	0.310	O19	6.091	19.43	0.203				
								O20	5.964	18.55	0.199				
								O21	6.346	21.45	0.212				
								O22	3.763	8.81	0.126				
								O23	5.655	18.15	0.189				
								O24	3.655	8.57	0.122				
								O25	3.8	9.60	0.127				
								O26	3.8	9.42	0.127				
								O27	4.236	10.27	0.141				
								O28	4.364	11.08	0.146				
								O29	4.655	12.48	0.155				
								O30	5.618	15.80	0.187				
Mean	6.057		6.057		6.205		6.205		5.242		5.242		6.321		6.321
Difference				-0.148							-1.079				
KCC		0.150				0.61				0.293				0.276	
Chi^2		123.7*				183.6*				467.5*				197.3*	

MR: Mean rank, RW: Relative weight, KCC: Kendall's coefficient of concordance, *: 1% probability level, < 4 = less important; 4 to <5= moderately important; 5 to < 6=important; => 6 = most important

Table 6. SWOT determinants

Items	Strengths					Items	Weaknesses					Items	Threats				
	Value addition	Market access	Profitability	Standard of living	Raw material		Product price	Capital paucity	Incentives	adulteration	branding		Infrastructure	Institutional	Security and power	Tax	Protectionist
S4	.883					W2	.854					T11	.850				
S5	.869					W9	.848					T8	.794				
S7	.735					W4	.834					T10	.755				
S10	.685					W3	.814					T6	.582				
S14	.426					W6	.799					T5		.793			
S1		.803				W15	.688					T4		.726			
S12		.720				W12	.620					T3		.690			
S6		.716				W11	.601					T1			.855		
S15			.821			W17	.557					T7			.831		
S16			.718			W18		.810				T12			.625		
S13			.588			W7		.783				T13				.964	
S9				.803		W8		.604				T14				.945	
S8				.744		W5		.488				T2					.831
S11				.645		W13			.756			T9					.651
S2					.826	W16			.643								
S3					.671	W10			.612								
						W1				-.579							
						W14				.553							
						W19					.897						
EV	4.997	2.552	1.612	1.214	1.150		6.546	2.273	1.858	1.527	1.213		3.856	2.315	1.960	1.179	1.131
% V	31.23	15.95	10.08	7.59	7.19		34.45	11.96	9.78	8.04	6.38		27.55	16..54	4.00	8.42	8.08
CA	.792	.733	.724	.847	.706		.913	.707	.735	.810	.734						
KMO			.704						.730						.628		
BS			415.4*						595.6*						355.5*		

EV: Mean Eigen-value, V: Variance, CA: Cronbach's Alpha, KMO: Kaiser-Meyer-Olkin test, BS: Bartlett's Test of Sphericity (χ^2), *: Significant at 1%

Table 6. (Continued)

Items	Opportunities								
	Subsidy and technical support	Infrastructure and political stability	Private-public partnership	Skilled manpower and available demand	Innovation	Large local market	Production intensification	Job creation	Labor supply
O18	.892								
O1	.881								
O17	.872								
O29	.812								
O28	.788								
O6	.783								
O13	.736								
O22	.679								
O24	.660								
O23	.614								
O27		.877							
O25		.867							
O26		.821							
O11		.551							
O15			.758						
O30			.725						
O4			.713						
O5			.700						
O9				.884					
O10				.836					
O7				.757					
O16					.803				
O19					.596				
O2						.858			
O3						.753			
O21							.908		
O12								.814	
O14								.771	
O8								-.415	
O20									.909
EV	10.181	3.315	2.698	2.360	1.517	1.333	1.311	1.131	1.049
% V	33.94	11.05	8.99	7.87	5.06	4.44	4.37	3.77	3.50
CA	.949	.867	.855	.821	.885	.898	.743	.821	.751
KMO	.730								
BS	1375.3*								

EV: Eigen-value, V: Variance, CA: Cronbach's Alpha, KMO: Kaiser-Meyer-Olkin test, BS: Bartlett's Test of Sphericity (χ^2), *: Significant at 1%

this shows that the samplings are adequate, and the factors were suitable for factor analysis. The KMO value of threat falls within the range of mediocre while that of the remaining indicators fall within the range termed as middling. The high values of each indicator KMO imply that the degree of common variables in each indicator is very large. This means that if PCA is applied, the components will account for fair variance. Bartlett's test of Sphericity for each of the indicators were significant at 1% probability level, thus indicating that the correlation matrix for each indicator is not an identity matrix-zero matrix: there is a significant relationship or suitable inter-correlations between the variables rotated in the PCA.

Furthermore, in each of the dimensions *viz.* SWOT, any principal component with an Eigen value greater than one was retained for further analysis. For "Strengthen", "Weakness" and "Threat" dimensions, five principal components each were identified while for the "Opportunity" dimension, ten principal components were retained. Following Sadiq et al. (2017a, 2017b), and Sadiq et al. (2018b, 2018c), loading with a value less than 0.40 in each of the factor loadings (principal components) were excluded. Also, for the principal component with two-factor loadings, the factor load with the highest score is used as the label.

For the "Strengthen", 72.04% of the total variation in the sixteen variables was explained by five factors. The five extracted factors were labeled as value addition, market accessibility, profitability, the standard of living and raw material. Factor 1 labeled "value addition", accounted for 31.23% variation, was highly loaded from advanced tools for planning, targeting and scaling (S4); innovation support (S5); productivity-based technologies (S7); access to credit facilities (S10); and, value addition (S14). This factor explained how concerned the millers are about value addition to milled rice. Factor 2 labeled "market accessibility", highly loaded from large consumer base (S1), readily available market for the milled product (S12), and conducive business environment (S6) accounted for 15.95% of the total variation. The factor showed processors concern on the readily available market for their milled rice. Factor 3 labeled "profitability" and loaded from high profitability (S13), low labor cost (S15), and low transportation cost (S16) accounted for 10.08% of the total variation. This factor showed producers concern on how to minimize costs and optimize profit in their enterprises. Factor 4 which is labeled "standard of living"; highly loaded from stable income generation (S8), improved standard of living (S9), and remunerative milling price (S11); accounted for 7.59% of the total variation showed processors concern on obtaining sustainable livelihood from rice milling business. Factor 5 labeled "raw material"; highly loaded from the availability of rice paddy (S2) and a pool of available technical and indigenous knowledge on rice milling (S3); accounted for 7.19% of the total variation showed processors concern on availability of the raw material for the industry and their capacity building enhancement. Empirical evidence showed internal consistency i.e. inter-correlation among the loadings for each of the principal components as evident by their respective Cronbach's Alpha values which were equal or greater than the acceptable reliability estimate range of 0.70 recommended for social sciences by Nunnally and Bernstein (1994). According to Malhotra (2009), for reliability test, a value of less than 0.70 generally indicates unsatisfactory internal consistency.

For the "Weakness", five factors out of the nineteen variables accounted for 70.26% of the total variation. These extracted factors were labeled product price, capital paucity, incentives, adulteration, and branding. The first factor labeled "product price" accounted for 34.45% of the total variation and consists of nine loadings *viz*. local means of production (W2); limited access to information (W3); low profitability (W4); financial instability (donor dependents) (W6); poor market for milled rice (W9); low price offer on paddy rice milling (W11); low-quality product (W12); high cost of fuel, diesel, etc (W15); and, high cost of labor (W17).This principal component showed that the millers were concerned about poor remunerative price for their products, thus affecting the business going concerned. The second factor labeled "capital paucity"; highly loaded from inadequate accesses to financial services (W5), less utilization of appropriate technologies (W7), limited capital (W8), and high cost of transportation (W18) accounted for 11.96% of the total variation. This factor revealed millers concern on the effect of capital paucity on their investment going concerned. The third factor labeled "incentives"; highly loaded from unstable market prices (W10), no legal safeguard in place (W13), and high cost of the initial investment (W16); and accounted for 9.78% of the total variation, showed millers concern on poor policy incentives which affect the development of rice value chain. The fourth factor labeled "adulteration"; highly loaded from the high cost of machinery and equipment (W1), and, sharp market practices (W14); and accounted for 8.04%, revealed that the processors are worried about product adulteration in the market, thus affecting their business turnover. The fifth factor accounted for 6.38%, labeled "branding" and highly loaded from weak branding (W19) revealed that the millers

are worrisome over the inability to adopt branding practices for business reputation.

All the five extracted principal components had internal consistency among their respective factor loadings as evident by their respective Cronbach's Alpha coefficients which fall within the range of 0.70 and above.

The results showed that 82.98% variation in the "opportunity" dimension was explained by nine out of the thirty variables captured in the analysis. The extracted principal components were labeled subsidy and technical support, infrastructure and political stability, private-public partnership, skilled manpower, and available demand, innovation, large local market, production intensification, job creation, and labor supply. It was observed that there is internal consistency among the factor loadings in each of the principal components as evident by their respective Cronbach's Alpha coefficient which is not less than 0.70. The first factor labeled subsidy and technical support; accounted for 33.94% of the total variation; is highly loaded from training support (O1), support from research institutes (O6), price subsidies (tax exemption) on inputs (O13), regional collaboration for innovation in the processing industry (O17), import ban on foreign rice (O18), maintenance of buffer stock by the government to avoid glut (O22), relative stable price (O23), insurance (O24), co-operative milling (O28) and contract marketing (O29). This factor explained that the millers are concerned about the window of subsidy and technical support in their perception of the opportunities that prevailed in the business environment. The second factor labeled infrastructure and political stability; accounted for 11.05% of the total variation; consists of adequate provision of credit (O8), good government policies (O11), political stability (O25), good road network (O26), and adequate power supply (O27). This factor explained that the millers are concerned about the opportunities on the availability of infrastructure and political stability in the business environment. The third factor labeled private-public partnerships; accounted for 8.99% of the total variation; is loaded from alternative uses of other sources of energy (O4), availability of export market (O5), public-private partnerships for rice milling investment (O15), and formidable co-operative organization (O30). This factor explained that the millers are concerned about the public-private partnership opportunities that will enhance the industry. The fourth factor labeled skilled manpower and available demand; accounted for 7.88% of the total variation; is loaded from skilled manpower (O7), consumer awareness (O9), and demand for locally processed rice products (O10). This factor showed that the millers are concerned about the availability of skilled manpower and consumer demand opportunities that are needed for a sustainable business. The fifth factor labeled innovation; consists of reduced time, labor, and costs of processing rice modern machinery (O16), and favorable competition (O19); accounted for 5.06% of the total variation. This factor explained that the millers while perceiving the opportunities they showed concerns over the availability of innovations that will give them a competitive advantage in the market. The sixth factor labeled large local market; accounted for 4.44%; is highly loaded from the large local market (O2) and quality improvement (O3). This factor explains that the millers are concerned about the wide spatiality in the spread of their products in the studied area. The seventh factor labeled production intensification; highly loaded from intensification in the production of rice (O21); accounted for 4.37% of the total variation. This factor explained that the millers while perceiving the opportunities in the industry are concerned about large-scale rice production to ensure the availability of paddy for their industry. The eight-factor labeled "job creation"; loaded from growing rice markets (national and regional) (O12) and rice milling enterprise brings about youth empowerment (O14); accounted for 3.77% of the total variation. This factor explained that the millers in perceiving the opportunities are concerned over the possibility of the industry creating job opportunities for the jobless teeming youths in the processing supply chain. The last factor labeled labor supply; accounted for 3.50%; is highly loaded from only adequate labor supply (O20). This factor showed that the processors while perceiving the opportunities in the industry are concerned about availability of adequate labor supply due to rural-urban migration as the industry is labor intensive.

For the "Threat", five factors were extracted as the principal components as evident by their respective Eigen values which were higher than 1. In addition, the extracted factors accounted for 74.57% of the total variation out of the fourteen variables rotated. The extracted factors were labeled infrastructure threat, institutional threat, security and power threats, tax threat, and protectionist threat. Factor 1 labeled infrastructure threat; accounted for 27.55% of the total variation; is highly loaded from non-supportive marketing policy for grains (T6), poor road network (T8), unplanned urbanization drives farmers to marginal areas (T10) and adulteration of paddy in the market (T11). This factor showed that the millers while perceiving the threats affecting the industry are worried over poor infrastructure policy in the study area. Factor 2 labeled institutional threat; accounted

for 16.54%; consists of factor loadings *viz*. climate change reduces the quality of paddy (T3), migration of youth to urban areas (T4), and poor support from other institutions (T5). This factor explained that the millers while perceiving the threats to the industry are concerned about poor support from institutions mandated with tackling environmental and social challenges affecting the industry in the study area. Factor 3 labeled security and power threat; highly loaded from smuggling (T1), the problem of insurgency (T7), and epileptic power supply (T12); accounted for 14%. This factor explained that the millers are worried over insecurity and erratic power supply which plagued the industry. Factor 4 labeled tax threat; accounted for 8.42%; is highly loaded from excessive taxes (T13) and high tax rate (T14). This factor explained that the processors while perceiving the threats affecting the industry, they were concerned about indiscriminate tax regimes and charges. Factor 5 labeled protectionist threat; accounted for 8.08% of the total variation; is highly loaded from government protection (T2) and seasonal unavailability of paddy (T9). This factor explains that the millers while perceiving the threats affecting the industry were worried over weak fiscal policy on rice *viz*. tariffs, export substitution, zero-tariff for imported machinery, etc; and fluctuation in the availability of paddy. The results showed the presence of internal consistency in each of the extracted principal components as indicated by their respective Cronbach's Alpha coefficients which were not below 0.70.

Using the PCA to determine the extent of the perception on SWOT, the results showed strengthen perceived to be the "most important" to be "innovation to support the growth of rice milling industry (S5)" while "value addition (S14)" is perceived to be the 'least most important' strengthen (Table 7). The weaknesses perceived to be of the "most and least importance" are limited capital (W8) and sharp market prices (W14) respectively. The results showed "intensification in the production of rice (O21)" and "adequate credit provision (O8)" to be the "most and least important" perceived opportunities respectively, in the industry. Also, "smuggling (T1)" and "government protection (T2)" were the "most and least important" threats respectively, perceived in the industry.

On average, most of the respondents have neutral perceptions on strengthens, weaknesses and opportunities in the industry as indicated by the average coefficient value of 2.55. While for the threat, most of the millers have negative perceptions of the threats in the industry (Table 7). Generally, the difference between the average coefficients of strengthen and weakness; and opportunity and threat are -0.16 (2.55-2.71) and -0.49 (2.55-3.04) respectively. The implication of the negative signs means that weaknesses outweighed strengthens in the industry; likewise, the threats are greater than the opportunities in the industry. Thus, using the foregoing information, based on the internal and external factor evaluations, weaknesses and threats were achieved. Therefore, using the space matrix, the implication is that the millers should adopt a defensive strategy for the development of the small-scale rice milling industry in the study area.

The individual-wise results showed that most of the respondents have high perceptions about the strengths, opportunities, and threats; while very high perception was observed for weakness (Table 8). Overall, the respondent's perception that trailed the SWOT was observed to be high, thus the need to overhaul the supportive environment for competitive rice enterprise in the study area.

3.5. Income distribution among the millers

The Gini index of 0.25 as exemplified by the Lorenze curve that is not farther from the line of equality implies a low inequality in income distribution among the millers (Figure 1). Therefore, it can be inferred that the milling industry is dominated by low-income small-scale millers with little variation in their income level. This indicates little variation in the livelihood status of rice millers in the study area. Therefore, policies aimed at income redistribution should be made effective in the study area to bridge the income gap.

3.6. Income distribution by size among the millers

A cursory review of the quintile distribution of income showed that the lowest income category received 9.23% of the total income while the highest income category received 31.77% of the total income (Table 9). The top 40% received 56.87% of the total income while the bottom 40% received 23.59%. Furthermore, the bottom 60% received 43.13% of the total income compared to the top 20 and 40% that received 31.77 and 56.87%, respectively, of the total annual income. This indicates a low unequal distribution in the annual income. The extent of the inequality in the income distribution was observed to be low as evident by the Kuznets ratio value of 1.347 (Table 9), thus implying low inequality in income distribution.

3.7. Income determinants among the millers

The LR Chi^2 been within the plausible margin of 10% degree of freedom implies that the Tobit regression model is fit for the specified equation (Table 10). In addition, it shows that the

Table 7. Millers' perceptions on SWOT (inferential-PCA)

Internal Factor Evaluation (IFE)						External Factor Evaluation (EFE)					
Strengths			Weaknesses			Opportunities			Threats		
	RW	Rank		RW	Rank		RW	Rank		RW	Rank
S1	0.4818	2.409	W1	0.421091	2.105455	O1	0.584664	2.923318	T1	0.810955	4.054773
S2	0.540655	2.703273	W2	0.685788	3.428939	O2	0.6552	3.276	T2	0.236709	1.183545
S3	0.4087	2.0435	W3	0.60976	3.0488	O3	0.4518	2.259	T3	0.514364	2.571818
S4	0.693021	3.465106	W4	0.564845	2.824227	O4	0.529348	2.646742	T4	0.627	3.135
S5	0.716267	3.581333	W5	0.431215	2.156073	O5	0.511212	2.556061	T5	0.695677	3.478386
S6	0.507709	2.538545	W6	0.624673	3.123364	O6	0.450818	2.254091	T6	0.476182	2.380909
S7	0.593345	2.966727	W7	0.633518	3.167591	O7	0.564309	2.821545	T7	0.7479	3.7395
S8	0.439636	2.198182	W8	0.510655	2.553273	O8	0.187379	0.936894	T8	0.678509	3.392545
S9	0.511	2.555	W9	0.548887	2.744436	O9	0.719255	3.596273	T9	0.538555	2.692773
S10	0.352879	1.764394	W10	0.4284	2.142	O10	0.7182	3.591	T10	0.672636	3.363182
S11	0.513068	2.565341	W11	0.461677	2.308386	O11	0.272161	1.360803	T11	0.765	3.825
S12	0.510545	2.552727	W12	0.445273	2.226364	O12	0.5846	2.923	T12	0.5	2.5
S13	0.422291	2.111455	W13	0.687273	3.436364	O13	0.497358	2.486788	T13	0.648509	3.242545
S14	0.259473	1.297364	W14	0.361964	1.809818	O14	0.588764	2.943818	T14	0.592773	2.963864
S15	0.641873	3.209364	W15	0.567079	2.835394	O15	0.58343	2.917152			
S16	0.567873	2.839364	W16	0.549473	2.747364	O16	0.3942	1.971			
			W17	0.412686	2.063432	O17	0.589261	2.946303			
			W18	0.695864	3.479318	O18	0.637915	3.189576			
			W19	0.648286	3.241432	O19	0.460545	2.302727			
						O20	0.673486	3.367432			
						O21	0.808945	4.044727			
						O22	0.312752	1.563758			
						O23	0.476315	2.381576			
						O24	0.292	1.46			
						O25	0.4046	2.023			
						O26	0.383133	1.915667			
						O27	0.473048	2.365242			
						O28	0.441758	2.208788			
						O29	0.494582	2.472909			
						O30	0.55803	2.790152			
Mean	0.510008	2.550042		0.541495	2.707475		0.509969	2.549845		0.607483	3.037417
Difference			-0.15743						-0.48757		

RW: Means Relative weight

Table 8. Individual-wise SWOT

Firm	Strength	Weakness	Opportunity	Threat	SWOT
FM1	2.770996	2.385045	2.464924	3.366003	2.801586
FM2	3.573436	2.00446	2.457796	3.35992	2.985689
FM3	3.568394	2.663381	2.558593	4.145015	3.36416
FM4	3.50625	2.921027	2.562103	4.335521	3.464545
FM5	4.328678	2.689905	1.716993	3.182611	3.254392
FM6	3.59017	2.560845	1.75661	3.728998	3.110184
FM7	2.08555	3.751118	2.383193	4.09888	3.303859
FM8	1.098894	3.549157	2.183624	4.196658	3.194173
FM9	1.607919	3.635114	2.335978	4.001905	3.183296
FM10	3.156126	3.592835	3.814274	3.896667	3.637244
FM11	3.011206	4.511244	3.500919	3.649238	3.748111
FM12	2.690866	3.932909	1.910266	3.092178	3.079839
FM13	3.573436	2.145952	2.457796	3.35992	3.002687
FM14	4.075202	4.331397	3.046101	2.551414	3.64564
FM15	4.351991	4.676068	3.69933	3.833089	4.177499
FM16	3.030836	3.583983	3.585508	2.399927	3.222006
FM17	3.237936	4.788812	2.725329	4.246351	3.918008
FM18	3.852048	4.44832	3.073706	3.994675	3.903761
FM19	3.166781	4.36087	3.463672	3.805775	3.752536
FM20	3.39251	4.173838	3.684659	3.630417	3.742242
FM21	4.155976	4.481053	3.376062	3.696061	3.972375
FM22	4.209073	3.816429	3.576644	4.279976	3.991185
FM23	3.234181	4.431915	3.245199	3.777543	3.738254
FM24	3.380281	4.443216	3.806766	4.121029	3.9764
FM25	4.769194	4.664693	3.208802	4.745685	4.439081
FM26	3.316599	4.064868	3.705969	4.563441	3.966272
FM27	2.997762	4.508664	3.776212	3.518867	3.779833
FM28	3.173575	4.101162	3.356507	4.160622	3.749072
FM29	3.233359	3.476505	3.20967	3.171479	3.27718
FM30	2.778862	4.612444	4.034935	3.213712	3.794112
FM31	3.793086	3.063831	2.657329	1.273412	2.964041
FM32	4.804056	4.594472	4.410737	3.557083	4.391108
FM33	3.829414	4.295583	3.313651	3.627433	3.800265
FM34	3.536428	3.872664	2.999338	3.947622	3.62671
FM35	3.327291	3.754579	3.149521	4.224201	3.661678
FM36	3.100382	3.504323	3.772775	4.745685	3.878742
FM37	3.389041	3.719734	3.793072	4.682106	3.9558
FM38	2.947024	4.155141	3.657741	4.158327	3.792412
FM39	3.448718	4.200075	3.744085	4.618527	4.051988
FM40	4.207536	3.696527	3.340244	4.650317	4.035266
FM41	2.920707	3.775556	4.039006	4.100487	3.765543
FM42	3.505034	4.782984	3.773607	4.618527	4.239229
FM43	4.259025	4.484933	3.22691	3.342132	3.906155
FM44	3.105137	4.140898	4.23246	4.596493	4.091018
FM45	4.755607	4.052649	4.706056	4.735701	4.581019
FM46	2.998119	2.829891	3.910947	3.730031	3.429389
FM47	3.202645	3.273513	1.851872	3.656353	3.134273
FM48	3.961212	3.841992	4.152068	3.186054	3.818956
FM49	3.549551	3.579223	3.029964	4.866416	3.879967
FM50	4.322778	4.46428	3.857961	3.943491	4.162557
FM51	4.874782	4.759302	4.334089	4.618527	4.655374
FM52	3.237936	3.553961	4.314733	3.88083	3.789141
FM53	4.144712	4.005685	4.219037	4.792967	4.311921
FM54	4.156619	4.368522	3.892043	4.498026	4.241142
FM55	4.276688	4.01478	3.604177	4.553112	4.141505
Average	3.501302	3.856224	3.321119	3.904135	3.736008
Difference	-0.07098		-0.1166		

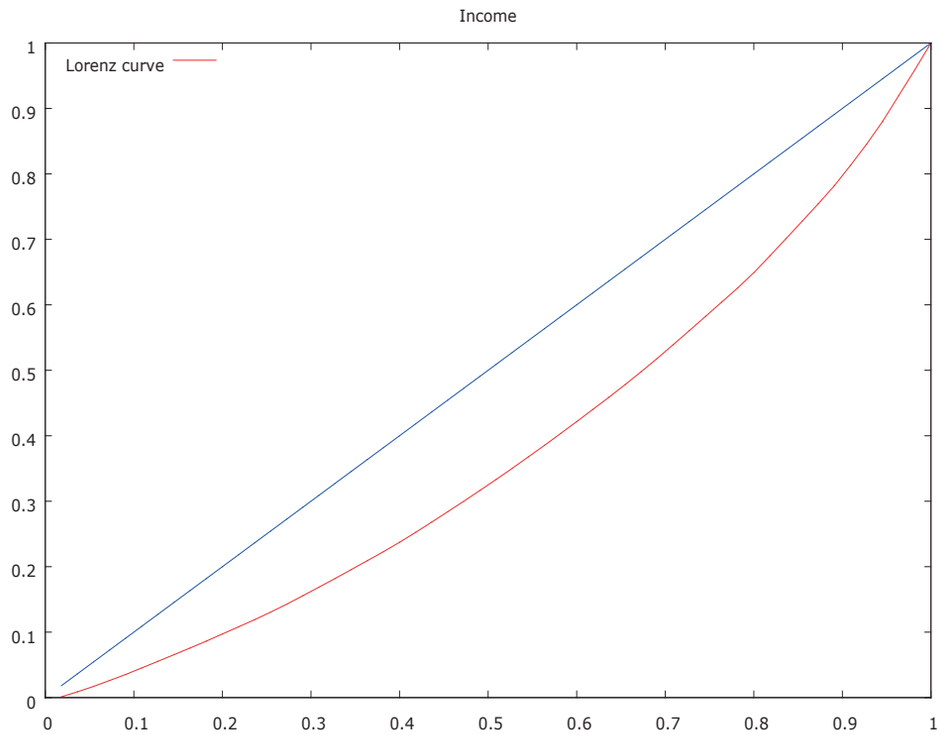

Figure 1. Income distribution of rice processors

Sample Gini coefficient= 0.25159, Estimate of population value= 0.256249

Table 9. Quintile distribution of Income

Quintile	Mean	Share in total income (%)
First	736904.8	9.228655
Second	1147059	14.36524
Third	1560000	19.53672
Fourth	2004333	25.10135
Fifth	2536667	31.76804
Kuznet's ratio		1.346452

predictor variables captured by the model are different from zero at a 10% probability level. The diagnostic test *viz*. variance inflation factor (VIF) showed an absence of multicollinearity as evidenced by the VIF values of the predictor variables which were below the margin of 10.0. However, the residual of the model was non-normally skewed as shown by the Chi^2 test statistic which is different from zero at 10%. Though, the non-normality of a residual is not considered a serious problem as most data in their natural form do not follow a normally skewed pattern.

The results showed annual income to be influenced by age, education, co-operative membership, and type of miller machine as indicated by their respective parameter estimates which were within the acceptable margin of 10% probability level. The positive significance of the age coefficient points to labor productivity efficiency of the youth engaged in the business, thus an increase in income. The marginal and elasticity implications of an increase in age by a year will lead to an increase in income by 0.015 and 0.046%

Table 10. Income determinants among the millers

Variables	Coefficient	Standard error	t-stat	Elasticity	VIF
Intercept	12.9433	0.36945	35.03^{***}	-	
Marital status	−0.137665	0.19775	-0.69^{NS}	-.0082863	1.790
Age	0.01525	0.008427	1.81^{*}	.0456988	4.354
Household size	0.01429	0.01517	0.94^{NS}	.0106773	3.655
Educational	0.03805	0.012097	3.15^{***}	.0233004	1.324
Experience	0.002754	0.009777	0.282^{NS}	.0019374	2.109
Co-operative membership	−0.12718	0.075257	1.69^{*}	-.0056665	1.244
Machine type	0.12645	0.073608	1.718^{*}	.0025175	1.380
LR Chi^2	$26.81(0.0003)^{***}$				
Normality test	$11.86(0.002)^{***}$				

LR: Likelihood ratio, VIF: Variance inflation factor

respectively. In the same line, the positive significance of the education coefficient points to the effect of managerial efficiency of the processors, thus enhancing the return that accrued to the business. The marginal and elasticity implications of an increase in educational level by a year will lead to an increase in annual income by 0.039 and 0.023% respectively. The positive coefficient of the machine type showed that millers who used diesel-powered plants generated a higher income margin against their counterparts who used electricity-powered plants. This is due to the erratic power supply which affected even processing operation, thus affected the income inflow of the electric-powered plant millers. Therefore, the marginal and elasticity implications of using diesel-powered plant will make the income inflow of the diesel-powered plant millers to be higher than that of their counterparts that use electricity-powered plant by 0.139 and 0.003%, respectively. The negative coefficient of co-operative membership shows that millers that did not belong to social organizations have less income in comparison to their counterparts who benefited from social capital. Thus, the marginal and elasticity implications of not being a member of a social organization will lead to a decrease in a miller's income by 0.117 and 0.006% respectively, in comparison to their counterparts who belong to co-operative associations.

3.8. Determinants of income inequality among the millers

The results of Shapley's decomposition on the determinants of income inequality are shown in Table 11. The empirical evidence showed that approximately 54.56% of the total inequality which amounts to a Gini index of 0.137 was explained by the predictor variables while 45.54% was unexplained by the residual. Except for the experience variable, all the remaining idiosyncratic variables had positive Gini coefficient values, thus implying they are income inequality increasing factors. The Gini value of the experience variable been 0, means it is neither an increasing nor decreasing income inequality-factor. Education and marital statuses are the highest (34.92%) and lowest (1.07%) contributing factors respectively that increase income inequality as evident by their respective Gini values of 0.088 and 0.0027. The Gini coefficient values of age, household size, experience, type of milling machine, and co-operative membership were 0.015, 0.010, 0.00, 0.0111 and 0.009, respectively. In order of the above, their contributions to the overall income inequality are 6.28, 4.03, 0, 4.42, and 3.74% respectively. Therefore, except for income flow from experience, it can be inferred that income flow from all the explanatory variables contributed positively to the increase in income inequality among the millers.

Table 11. Factor contribution to the level of inequality

Variables	Gini value	%
Marital status	0.00269	1.069076
Age	0.015805	6.282036
Household size	0.010126	4.024828
Educational level	0.087864	34.92355
Business experience	0	0
Co-operative membership	0.011122	4.420872
Type of miller machine	0.009399	3.735692
Gini index (Estimated)	0.137006	54.45606
Residual	0.114584	45.54394
Gini index (Actual)	0.25159	100

The educational level been an income inequality increasing factor implies that millers with low educational level are challenged by managerial inefficiency which has a negative consequence on rational allocation of productive resources, thus yielding low income when compared to their counterpart with high level of education. Age being an inequality increasing factor implies that labor efficiency of productive and active youths involved in the industry enable them to earn a higher income than their counterparts who are relatively old. The relative high return turn-over by plants that runs on diesel owes to even processing, thus makes their income to be higher than that of their counterparts who used electric powered machine. The co-operative membership been associated with increasing income inequality showed that the benefits of pecuniary advantages that accrued to millers that belong to social associations made their income to be higher than that of their counterparts who did not belong to co-operative associations. The marital status been an income inequality increasing factor points to the fact that married millers apart from the benefits of social and economic capitals inherent in marriage; having a responsibility to carter for will encourage them to work towards a viable and sustainable enterprise, thus gives them higher income than their counterparts who are single.

The household size been an increasing income inequality factor implies that large households are likely to be constrained with lower income, little or no savings, and increased poverty. Coker (1999) as cited by Akin-Olagunju and Omonona (2013) attributed a high level of poverty to household size and reported that the larger the household size, the higher the tendency of a household been in poverty. However, labor productivity could be enhanced, and the market created for milled products, thus the need to work out a lasting balance.

4. Conclusion and Recommendations

Based on the findings it can be inferred that the milling industry is an exclusive men enterprise and is dominated by low-income earners. Furthermore, the empirical evidence showed that the annual income of the millers is influenced by education, age, co-operative membership, and the type of milling machine. Age was found to be the major inducing factor that increased income inequality. Though, except experience, all the remaining idiosyncratic variables are inducing factors that increase income inequality among the millers. The milling industry is not in the comfort zone as the industry has been challenged by weakness and threats as the former and latter outweighed the industrial inherent strengthens and opportunities. In lieu of the foregoing, the millers are advised to adopt a defensive mechanism strategy for the sustainability of the industry. Based on the foregoing, the following recommendations are proffered:

1) Both governmental and non-governmental organizations should assist in empowering women with economic capital to enable them mainstream into this industry as they are active participants in the forward integration of the rice supply chain.

2) There is a need for capacity building program i.e. the millers should acquire skills on how to operate rice mill to increase efficiency and productivity, thus enhancing their managerial efficiency.

3) The millers should be willing and ready to take a risk by adopting innovations in the milling business to increase their production efficiency.

4) Effort should be made to strengthening the existing co-operative association in the study area so that millers can benefit more pecuniary advantages inherent in co-operative society.

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