

Significant Factors Affecting the Mode of Rice Processing in Igbemo-Ekiti, Nigeria

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ABSTRACT

In Nigeria, Igbemo-Ekiti is synonymous with a popular local rice which, nevertheless, is characterized with contaminations. Efforts of Government through the Agricultural Development Project (ADP) to improve rice quality in the state, have failed to yield the desired results. This study, therefore, reports the peculiar factors influencing the processing of rice in Igbemo-a major local producing town in Ekiti State, Nigeria. 72 respondents were interviewed, which was a census of the rice processors in 21 residential quarters of the town. Using the multiple linear regression models for analysis, the study discovered that; (i) status of the processors, (ii) expenditure on processing (iii) training acquired before commencing work, and (iv) storage facilities are crucial factors impacting rice processing activities in the town. The paper canvasses for policy measures based on research findings.

Keywords: Rice, Processing, Quality, Igbemo-Ekiti, Nigeria

1. Introduction

Food processing technology, commands at this period of Nigeria's industrial development, an interest greater than any developmental issue. Today, the major problem facing the country is how to guarantee food security for a rapidly growing population (Ogwu [16]). Food insecurity is a sensitive problem that affects many nations, espe-

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cially the Developing Countries (DCs) due to their ever increasing population (Ajake [1]). Esu [7], while highlighting a report by United Nations Research Institute for Social Development (UNRISD), describes the concept of food security as sustained and assured access by all social groups and individuals to food adequacy in quantity and quality to meet nutritional needs.

Of the 90 million people added each year to the world population, 84 million live in the Third World (Brown and Kane [4]). Nigeria, the most populous country in Africa, having over 140 million people, constitutes about a quarter of Africa's total population (NISER [14]). Apparently, from the 1970s-the Nigerian food sector has been characterized by excess demand over supply, due primarily to high population growth rates of about 3 percent per annum, high rates of urbanization (2.8% per annum) and rising per capita income which has been stimulated by huge oil export earnings.

Rice constitutes the principal food of half of human race. It is a staple food in many developing countries (Hauser [10]). Available record shows that the average Nigerian consumes 21 kilogram of rice per year (WARDA [21]). However, increase in the demand for rice in recent times has not been accompanied with corresponding rise in production in Nigeria (Okpiliya [17]). Some reasons are responsible for the increase in consumption. First, cooking rice for food is relatively stress-free, hence, its consumption is favoured by city dwellers. Second, it is a common food among vendors in both rural and urban areas. More importantly, it is a major source of calories for the urban poor, from which the poorest third of urban households obtain 33% of their cereal-based calories (NISER [14]). In reality, the local rice is cheaper than the imported rice and it is demanded more in the urban than rural areas where there are more people. To the urban household, however, quality of the rice is a priority with the increasing awareness of standard hygiene.

Nigerians, prefer local rice varieties because of an agreeable taste and smell. Farmers are quick to add that improved hygienic processing of local rice may make it compete favourably with imported rice (Longtau [11]). The noticeable qualitative problems of the local rice are presence of pebbles and chaffs which most consumers attribute to rudimentary processing methods. Igbemo rice has gained very wide recognition despite its low quality. Remarkably, the processing activities in the town are of small-scale in which specific skills and technologies are lacking. If many buyers or consumers of rice in the urban centres are to switch to the local product, efforts must

be made to improve the existing processing techniques to match the quality of the foreign rice.

2. The Rationale for the Study

Rice is so significant to the economy of many regions in the world. It is important to the economy of the United States (the largest exporter of rice in the world) and Southern Europe—two regions that make substantial contributions to the total world production. It is a staple diet in Japan and the principal crop in India where annual rice yields exceed 40 million metric tons. Thailand also depends considerably on its rice production as the second largest exporter of rice in the world. Vietnam considers it as the mainstay of its economy, where the tropical climate supports two rice seasons per year (Encarta [6]). Rice is a staple crop throughout West Africa, especially in Cote d'Ivoire, the Gambia, Guinea, Guinea Bissau, Liberia, Burkina Faso, Senegal and Sierra Leone (NISER [14]). Specifically, the production from Guinea-Bissau, Sierra Leone, the Gambia, Senegal and Nigeria accounts for one-tenth of all rice production in Africa.

In Nigeria, Ekiti State remains one of the regions where rice is increasingly cultivated among majority of the farmers (70 percent) who are actively engaged in its production (NISER [11]). Igbemo town produces higher tonnage of the rice consumed in most parts of the State. Rice, therefore, is seen as a potential wage earner in Igbemo that pulls labour and market to it in a regional context. Processing activities, often promote rice marketing in the town, where groups of entrepreneurs are primary processors. With significant improvement in the rice quality, Igbemo as a major production centre, can become a more productive region from where development impulses radiate to the surrounding area. Igbemo-Ekiti is the target of this study because of its national reputation for producing peculiarly tasty local rice. Obviously, the issue of pebble and chaff contaminations is a serious problem the production process must address, if the final product will be acceptable internationally.

Globally, import prices have risen with most pronounced effect on cereal crops. Consequently, consumers in most parts of Africa have started turning to locally grown cereals (Fleshman [9]). The Federal Government recently released N18 million (\$150,000) to set up small and medium processing industries in the rice growing communities of

the country to ensure availability of high quality rice that could meet the needs of her population (Oguntola [15]). The decision followed the realization of the challenges of adopting poor technology in the operations of the processors. Some critical research questions are examined. They are: (i) what are the current methods used by the rice processors in the town? (ii) is the deficiency in rice quality a product of factors rooted in processor's technical skill and finance?

Apparently, rice production which dominates the economic base of this area has not facilitated enough entrepreneurial activities in marketing to a level that is required. A research into rice processing, therefore, in the present era of food security is desirable with the specific objective of identifying the key production factors which have affected the industry in Igbemo Ekiti for policy recommendations on value enhancement.

3. Research Materials and Method

3.1 The Research Locale

Igbemo lies on the rain-fed upland environment that conduces to rice cultivation, especially on the Effurun ridge of South-Western Nigeria (Longtua [11]). It locates between longitude 5°23' and 5°24' East of the Greenwich Meridian and latitude 7°41' and 7°42' North of the Equator. It situates in an upland zone rising over 250 metres above sea level. Politically, it situates within Irepodun-Ifelodun Local Government Area (LGA) and Ekiti Central Senatorial District of Ekiti State. Igbemo town has, in recent years, experienced a progressive increase in population aided by immigration from other towns. In the 1991 population census, Igbemo ranked third (with a population of 15,739) of the eleven (11) major settlements in the Local Government Area after Igede (24,607) and Iyin (25,931). The projection to the year 2005 by the Department of Population Activities, Cabinet and Special Service Office of the Ekiti State Governor Ado-Ekiti, puts Igbemo in the third position (23,024) after Igede (35,996) and Iyin (37,931) out of the total projected population figure of 161,1286 for the Local Government Area.

3.2 Sampling Design Issues

A structured questionnaire was prepared and administered on the 72 rice proc-

processors in Igbemo, which is the target population for this study. Residential buildings and mills where rice processing activities take place were focused in the twenty one (21) residential quarters of the town. A residential quarter in Igbemo, is coterminous with the Independent National Electoral Commission (INEC) political ward which constitutes a well-defined Data Delineation Area (DDA) for this study. The Disproportionate Stratified Random Sampling Technique was employed in selecting the study sample. In each ward, an identified processor, of age 18 and above was interviewed. Out of the total seventy two (72) rice processors interviewed, 10 were millers and 62 were parboilers and dryers.

The variables employed in the analysis are: status of the processor (STATUS), the respondent's income (INCOME), training acquired before commencing work (TRAIN), type of processing activity carried out (TYPE), the expenditure on processing (EXPDT), institutional assistance enjoyed (ASSIST) and availability of storage facilities (STORE). These variables have been selected because of their likelihood to impact the mode of operation of the rice processors (MODE). Cross sectional data were collected from sampled rice processors with the aid of interview schedule, considered appropriate, since majority of the processors were illiterates. The data generated was subjected to different statistical analyses, using descriptive measures such as frequency counts and percentages. A regression analysis to determine the resource use efficiency of rice processors in the area was also carried out.

4. Analysis of Results and Discussion

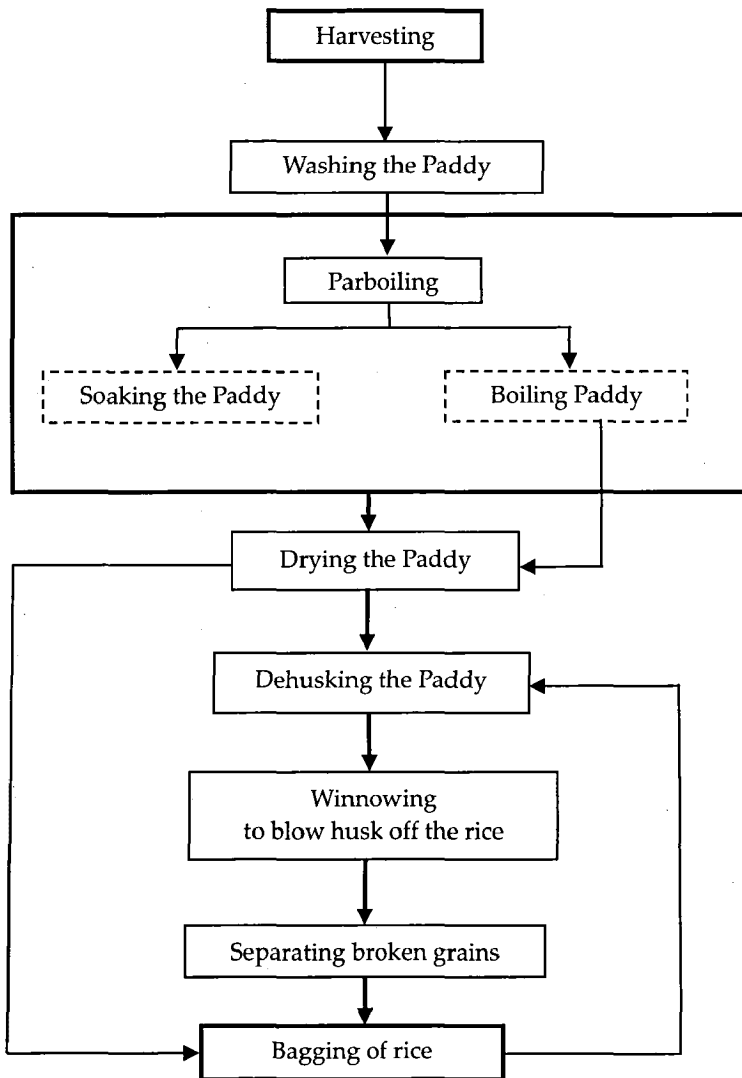
4.1 The Rice processing Chain

Rice processing in the study area is in eight distinct stages. The first stage is harvesting during which the paddy is moved from the farms to homes where actual processing begins. Stage two consists of washing the paddy in preparation for parboiling at the third stage. Parboiling is pre-cooking of rice prior to milling (Baksh [3]). In the town, parboilers use one-to-three days to soak the paddy in drums after which it is steamed for about 20 to 25 minutes at a temperature range of 80~100 °C. Stage four comprises of grain drying on concrete platforms, nylons or road sides for two to three days to prevent the growth of fungi and bacteria in case of preliminary bagging

for sale to millers or rice agents.

In Igbemo, milling takes place in small rice mills, usually in the form of cubicles which exist at every 100-metre radius in the residential areas. These mills combine processing activities such as dehiscing of the rice, winnowing and separation of broken grains from the rice at the fifth, sixth and seventh stages respectively. The eight and final stage involves bagging of the finished product for storage and later for sale to traders and ultimate consumers.

Flow-Chart Illustration of Rice Processing in Igbemo-Ekiti



4.2 Respondents' Profile

Traditionally, rice is processed in Igbemo by parboiling, drying and milling. More females (59.7%) engage in processing activities than males (40.3%); 90.3% of which are married with 5.6% and 4.2% as single and widows respectively. Many of them are of age 46~59 years (61.4%) and are predominantly of low- level education (17.1% literacy). About 86.1% of them parboil and dry rice, while 13.9% engage in the milling, which correspond with the manual (86.1%) and mechanical (13.9%) mode of operation of the processors. In the town, small mills and the local method of parboiling and drying are popular because of the minimal capital investment. In effect, the highest annual expenditure on labour and maintenance of machine are N24,000 or \$200 (27.8%) and N36,000 or \$300 (27.8%) respectively. Those who spend N12, 000 (\$100) and below are 9.7% and 8.3% respectively.

Majority (55.6%) of the processors earn below N80, 000 (\$667.0) annually. Most of the small mills are operated on single proprietorship, often managed by family members in personal residential compounds (95.8%). About 62.5% claimed to have been involved in rice processing for over 10 years; 26.1% for 7~10 years, 10.2% for 3~6 years and 1.1% under 3 years. Unfortunately, virtually all the processors (95.8%) lack modern processing skill, with little training before engaging in processing. Notably, all the respondents consider processing as an adjunct activity to their major occupations of farming (54.2%) and trading (45.8%). Important processing problems are low funding (94.4%), lack of storage facilities (73.6%) as well as institutional support (96.9%).

4.3 Definition of Research Variables

S/N	Variable code	Definition of Variable	Measurement scale	Freq.	%	Mean
1.	MODE	Mode of Operation	1 = Purely manual	62	86.1	
			2 = Partly manual and and mechanical	-	-	
			3 = Purely mechanical	10	13.9	
			TOTAL	72	100.0	1.14
2.	STATUS	Marital Status	1 = Widowed	3	4.2	
			2 = Divorced	-	-	
			3 = Single	4	5.6	

		4 = Married	65	90.3
		TOTAL	72	100.0 3.82
3.	INCOME	Annual Income		
		1 = < N50,000	2	2.8
		2 = N50,001~60,000	3	4.2
		3 = 60,001~70,000	9	12.5
		4 = N70,001~80,000	26	36.1
		5 = > N80,000	32	44.4
		TOTAL	72	100.0 4.15
4.	TYPE	Type of Rice Processing Activity		
		1 = Soaking only	-	-
		2 = Parboiling only	-	-
		3 = Parboiling and Drying	62	86.1
		4 = Milling	10	13.9
		TOTAL	72	100.0 3.14
5.	TRAIN	Attainment of Training before work		
		1 = No Training	69	95.8
		2 = Local Training	3	4.2
		3 = Formal Training	-	-
		TOTAL	72	100.0 1.04
6.	STORE	Storage Capacity		
		1 = None	53	73.6
		2 = 1~2000Kg	9	12.5
		3 = 2001~4000Kg	10	13.9
		4 = 4001~6000Kg	-	-
		5 = Above 6000Kg	-	-
		TOTAL	72	100.0 1.40
7.	EXPDT	Average Annual Expenditure on Processing		
		1 = < N12,000	6	8.3
		2 = N12,000	7	9.7
		3 = N24,000	20	27.8
		4 = N36,000	20	27.8
		5 = > N36,000	19	26.4
		TOTAL	72	100.0 3.54

8. ASSIST	Form of Assistance on Rice Processing	1 = None	70	96.9	
		2 = Credit facility (loan)	2	3.1	
		3 = Training	-	-	
		4 = Materials/machines	-	-	
		5 = Free labour	-	-	
		TOTAL	72	100.0	1.02

4.4 Rationale for Inclusion of Research Variables

Processing is regarded as a major determining factor of the local rice quality in this study. Mode of processing (MODE), therefore, becomes a key variable, as the deficiency in quality of most local food products often has close linkage with the processing techniques. Fellows [8], observes that, in Developing Nations specifically, after harvest, farm products such as nuts, grains among others, are dried on earthen or concrete slabs, roofs and road sides. The drying techniques facilitate contaminations by insects, dirt, animal excreta etc. Grain shattering is also a problem during milling due to over-heating (Baksh [3]). All these prompted investigations into status of processor (STATUS) and the type of activity (TYPE). Income of processor (INCOME), the training acquired (TRAIN), availability of storage facilities (STORE), amount expended on processing (EXPDT) and assistance on the job (ASSIST), are basic conditions hypothesized to favour the processors' willingness, ability and desire to explore standard hygiene practice during production.

4.5 Calibration of Model of Analysis

Mode of processing is an important factor among factors affecting operations of the rice processors in the study area. The model adopted, regressed a number of factors (independent) variables on mode in a multiple-linear regression format. The multiple linear regression model chosen is expressed as follows:

$$Y = a + b_1 X_1 + b_2 X_2 + \dots + b_j X_j + e \quad (1)$$

where Y is a dependent variable; a is the intercept value of the regression hyperplane; b_1 - b_j are the partial regression co-efficients, X_1 - X_j are the explanatory variables and e is the error term.

The choice of this model lies in its ability to facilitate interpretation of the regression coefficients and predict mode of operation of the rice processors in the study area. Willis [22], for instance, employed the regression model in determining overcrowding and house conditions in Ghanaian housing market. Olotuah and Ajayi [19], adopted the same model to assess the relationship between selected factors of housing needs of low-income earners in Ado-Ekiti, Nigeria.

The goal of the present study is to reveal the significant factors affecting the mode of operation of rice processors in a rice producing community in Ekiti State, Nigeria. The motivation for this study derives from the desire to see if the model that had been used in various contexts can yield comparable results in the study where the socio-economic characteristics of the rice producers are different.

4.6 Regression Estimates

Before the regression analysis, all the variables earlier identified, were subjected to correlation tests to ascertain level of relationships between them and determine the probability values of the correlation coefficients. From table 1, training acquired before commencing work (TRAIN) has the strongest association with assistance on processing (ASSIST), followed by the high correlation between mode of operation (MODE) and the status of the processor (STATUS). However, these variables (STATUS, TRAIN and ASSIST) show negative linkages with MODE, indicating possible inverse relationships in operation.

From the regression results, only four (4) variables (STATUS, EXPDT, TRAIN, and STORE) significantly affect mode of processing rice in Igbemo. These variables were introduced step-wise into the model to obtain the best regression equation. The equation of best regression applying the least square algorithm was:

$$Y = 2.080 - 0.399 \text{ STATUS} + 0.148 \text{ EXPDT} - 0.446 \text{ TRAIN} + 0.161 \text{ STORE}$$

This equation can thus be used to predict the dependent variable (mode of rice processing). The variable, STATUS, has the highest absolute value of beta coefficient Table 2. It is, thus, the most important variable contributing most to the prediction of the dependent variable. Analysis in Table 2 shows that mode of processing (MODE) will depreciate by 50.4% if the current STATUS increases by 100%. This is rather a

Table 1. Correlation Coefficient Matrix of Rice Processors' Variables in Igbemo-Ekiti

Variable code	MODE	STATUS	INCOME	TRAIN	TYPE	EXPDT	ASSIST	STORE
MODE	1.000	-0.536**	0.212*	-0.446**	0.125	0.348**	-0.309**	0.291**
p-value		0.000	0.047	0.000	0.245	0.001	0.001	0.006
STATUS		1.000	-0.320**	0.239*	-0.016	-0.333**	0.165	-0.024
p-value			0.002	0.025	0.884	0.002	0.141	0.827
INCOME			1.000	-0.202	-0.148	0.493**	-0.142	-0.010
p-value				0.059	0.169	0.000	0.205	0.923
TRAIN				1.000	-0.031	-0.264*	0.698**	-0.130
p-value					0.771	0.013	0.000	0.228
TYPE					1.000	0.008	0.086	-0.036
p-value						0.939	0.443	0.736
EXPDT						1.000	-0.197	-0.064
p-value							0.078	0.554
ASSIST							1.000	-0.097
p-value								0.388
STORE								1.000

Note: * Correlation is significant at the 0.05 level (2- tailed).

** Correlation is significant at the 0.01 level (2- tailed).

Source: Authors' Computation, 2008.

Table 2. Stepwise Variable Selection for Mode of Processing Rice in Igbemo-Ekiti

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1. (Constant)	1.850	0.117		15.786	.000
STATUS	-0.425	0.072	-0.536	-5.888	.000
2. (Constant)	1.497	0.117		12.808	.000
STATUS	-0.452	0.062	-0.570	-7.334	.000
EXPDT	0.181	0.031	0.450	5.793	.000
3. (Constant)	2.398	0.297		8.064	.000
STATUS	-0.401	0.060	-0.506	-6.636	.000
EXPDT	0.160	0.030	0.400	5.309	.000
TRAIN	-0.478	0.147	-0.252	-3.264	.002
4. (Constant)	2.080	0.317		6.564	.000
STATUS	-0.399	0.059	-0.504	-6.796	.000
EXPDT	0.148	0.030	0.369	4.969	.000
TRAIN	-0.446	0.143	-0.235	-3.120	.002
STORE	0.161	0.066	0.179	2.450	.016

Source: Authors' Computation, 2008.

counter-intuitive finding showing that marriage will lead to decline in productivity. Marriage should lead to combined efforts to enhance processing and not the opposite. It may be that as more people get married, the families loose interest in rice processing as an insufficient source of income.

Expenditure on processing (EXPDT) has significant influence on mode of processing with a coefficient estimate of 0.369. This implies improvement in MODE by 36.9% as expenditure on processing increases by 100%. Labour-intensive techniques dominate the rice processing enterprises. Currently, the average processor expends about \$243.84 annually. The major limitation to expenditure is poverty. The poor in the region is characterized by low income, unstable employment, low status of job, absence of savings and constant struggle for survival (Onibokun and Kumuyi [20], Olarewaju [18]). Increase in expenditure may result in the enlargement of the present size of enterprise and changing from the tedious manual processing methods to mechanized techniques. In this way, efficiency and improved productivity can be realized which will consequently increase their income (Daramola [5]).

There is a strong indication that MODE will deteriorate by 23.5% as the dominant number of untrained processors (TRAIN) doubles. Reasons for this are obvious. Virtually all processing activities in Igbemo are run in personal residential compounds, where the recruitment of workers is usually without any selection criteria. With poor training, the processors will find it difficult to comprehend the complexities and technicalities required for quality production. They may, as well, fail to show a high commitment to the job which is considered as part-time activity that should be combined with either trading or farming. In Nigeria, most women get married before their twentieth birthday (Makinwa-Adebusoye [12])-a situation that may hinder their training.

Provision of storage facility (STORE), impacts significantly with MODE. The regression result suggests that the operational efficiency of the processor will increase by 17.9% as efforts are made to double the provision of store for the enterprise. About 70.9% of the processors make use of workers ranging from 1 to 4. Yet, 73.6% of them lack storage facilities. This unit is required to package the goods that are processed (Akinsanya [2]) and preserve them for further distributions. More importantly, it has the capability to expand the effective supply base of the processor and combat the frequent problem of contamination.

5. Policy Issues and Conclusion

This study has identified some major factors impacting production in a rice-growing town in Nigeria. The analytical framework for the study has also proved efficacious in identifying some variables that influence mode of rice processing (MODE) in Igbemo-Ekiti. The findings call for planning policies that are capable of enhancing rice production in the town as all analytical parameters combine to predict 75.5% change in the mode of processing. Of special interest to the policy maker in this regard are factors like; status of the rice processors (STATUS), expenditure on processing (EXPDT), training (TRAIN), and provision of store (STORE).

A noticeable trend in the town is the distinct pattern of marriage-based division of labour in rice processing which has negative effect on production. If efficiency of operation must be guaranteed, the Ekiti State Agricultural Development Project (ESADP) should promote employment of more singles (boys and girls) with the zeal and strong agitations, of coping with new techniques of production capable of mechanizing operations. Further efforts of ESADP will help to fabricate processing machines locally with some imported components. This will further accelerate the production efficiency and enhance the value of the final product.

Self-financing option is prominent in rice processing in the study area. That bulk of the processors are often constrained by capital, suggests a limitation to their operational expenses and productivity. Granting of soft loans to the processors by the State Government can be of tremendous help. Alternatively, the State Ministry of Commerce in collaboration with the Local Government can organize 'Cooperative Associations' (CAs) to access loans from Micro-finance Banks and other government credit facilities in the state.

The rice processor in Igbemo, at best, possesses a primary school leaving certificate, hence, lacks necessary knowledge of food hygiene. The State government must collaborate with all stakeholders and ensure that public enlightenment and training programmes (workshops, seminar etc) on standards and regulations are conducted regularly to educate the processors on food safety and quality. By this, the processing operations will be free from deficiencies particularly, the technical know-how necessary to meet the modern challenges of food processing.

In spite of the apparently favourable market for the local rice, the evidence of grossly inadequate storage facilities by the processors calls for urgent attention. Mar-

keting operations are often delayed till market days when traders rush and subject the products to contamination, especially at the rice mills. On this note, it is imperative that the Ekiti State Ministry of Commerce and Irepodun/Ifelodun LGA establish an efficient Rice Marketing Depot (RMD) in Igbemo, where milled rice can be released into regional markets.

In a further effort of the State government to boost the rice quality, the Department for International Development (DFID) and notable Marketing Companies should be encouraged to support processing with modern milling facilities at the RMD to polish and package the rice products in satchels with sweet flavour for exportation. This will promote added value that promises capacity building to the processors. In this way, the local rice will gain more prominence and appeal amongst elites in major cities in the state and even beyond.

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Appendix

