Katalyst Publishing Group

Research Article

Journal of Current Trends in Agriculture, Environment and Sustainability

Assessment of the Constraints Associated with the Processing of Paddy Rice: A Case Study of Smallholder Farmers in Gwagwalada, Abuja

Sennuga Samson Olayemi*, Adeniran Blessing Temitope and Olorunniyi Abraham Ayo

Samson Olayemi Sennuga - School of Agriculture, Food and Environment, Royal Agricultural University

***Corresponding author:** Samson Olayemi Sennuga - School of Agriculture, Food and Environment, Royal Agricultural University; E-mail: dr.yemisennuga@yahoo.co.uk

Received Date: 09 August, 2021
Accepted Date: 17 August, 2021
Published Date: 23 August, 2021

Citation: Sennuga Samson Olayemi, Adeniran Blessing Temitope, Olorunniyi Abraham Ayo (2021) Assessment of the Constraints Associated with the Processing of Paddy Rice: A Case Study of Smallholder Farmers in Gwagwalada, Abuja. Cur Tre Agri Envi Sust 2(1): 1- 7.

Abstract

Rice (Oryza sativa) is the most economically important food crop in many developing countries and has also become a major crop in many developed countries where its consumption has increased considerably. It has been noted that the demand for rice is not matched with the supply of rice, due to the fact that rice is mostly produced by smallholder framers and processed by the rural farmers using crude or local method. This research is based on assessment of the constraints associated with the processing of paddy rice. This will be carried out using a well structured questionnaire and data will be collected from a primary source and analyzed using descriptive statistics. Analysis from this study shows that agricultural financing constitutes the greatest challenge that affects rice processing. Therefore, this work provides basic information about the challenges of rice processing and focuses on the challenges faced by the small-scale rice processors and reasons for continuous rice importation with a view to guiding decision-making to be self-sufficient in rice production, thereby making some improvement in Nigerian economy.

Keywords: Smallholders, Adoption, Paddy Rice, Oryza Sativa, Agriculture

Introduction

Rice (Oryza sativa) is a cereal belonging to the Gramineae, a large monocotyledonous family of some 600 genera and around 10,000 species (Akande, 2003). It is valued as most important staple food for over half the population and third after wheat and maize in production on world basis [1]. More than half of the world's population depends on rice as the major source of calories (FOA, 2003). Two species have emerged as our most popular cultivated rice which are Oryza sativa and Oryza glaberima. Rice is the world's most important staple food crop consumed by more than half of the world population and Central to the food security of same population [2]. Demand for rice in Nigeria has been increasing in recent years and it has now become a food security and cash commodity crop. Rice features regularly on the daily menus of almost all Nigerians, and currently consumption is estimated at about 5 million tons annually [3].

Rice being a typical cereal crop as it is has moved from ceremonial to a staple food for both young and adults in Nigeria homes, it is now an everyday menu and its demand and consumption has been increasing in recent years [3]. However, rice production in Nigeria has not been able to match with the quality begin consumed, despite the country's great potential for rice production in terms of land availability, human resources and good climate [4]. Although the country produces over 2 million tons of rice each year, representing about half it's rice requirement, research reports indicate that the rice is of poorer quality and grade than imported rice owing to the presence of broken and damaged grains, stones and other impurities. This has led to low consumer demand for home grown rice.

Rice production started in Nigeria in 1500BC with the low yielding indigenous red grain species Oryza glaberimaste and then widely grown in the Niger Delta area. WARDA reported about the high yielding white grain Oryza sativa L introduced in 1890, and by 1960 it accounted for more than 60 percent of the rice grown in the country. In Nigeria the demand for rice has been increasing at a much faster rate than the mid-1970s with estimated annual milled rice demand for Nigeria is 5 million tonnes [5]. In 2016, National rice demand was estimated at 6.3 million metric tons while domestic supply was put at 2.3 million metric tons. The deficit of 4 million metric ton was expected to be filled by import. Importation of rice is detrimental to Nigerian's economy because it portends a serious danger in terms of foreign exchange (Forex) earning reserve. The Nigeria Government spent a whopping $2.41 billion on rice importation between January 2012 and May 2015.

In order to bridge the gap between supply and the ever-growing demand, the federal government of Nigeria, at one time or the other has initiated policies and incentive for farmers to increase rice production locally.

Rice processing involves several steps and these include removal of the husk, milling the shelled rice to remove the bran layers destoning and additional whitening steps to meet market expectations for appearance of the rice kernels. Nigeria has the potential to be self-sufficient in rice production both for food and industrial raw material needs and for export purpose. However, a number of constraints have been identified as limiting factors to rice processing. These include problem with milling, dehusking, destoning. Therefore, the aim of this paper is to review the causes of the challenges facing rice processing in Nigeria and provide guide to overcome these problems.

Paddy rice becomes rice after the removal of the husk. Therefore, paddy is rice with husk. Field where paddy is cultivated is called paddy field. Before paddy rice is made available to the consumers it must undergo processing which involves remover of the stone, husk, bran and other impurities. There are different stages in rice processing but each of these processes have constraints which prevent producing the best quality of rice. In Nigeria due to the local method and level of education of small-scale farmers there have been a great deal of constraints as framers are not able to produce rice that meet the consumers need and even the market demand of rice and as it is known that total food production is been carried out by small scale farmers. In order to increase the consumption of home grown rice these constraints has to be dealt with. Rice is the most commonly consumed staple food after maize and wheat [6]. In Nigeria today the production of rice locally is not equal the demand and consumption of rice due to different constraints in the processing of rice. Among the various challenge causing this demand- supply gap in rice sector, the issue of having the right technical skills and agribusiness orientation is Paramount.

In Nigeria, rice consumption has risen tremendously at about 10% per annum due to changing consumer preference (Akande, 2003). However, Ebuehi and Ojewole discovered that most Nigerians prefer to consume imported rice brands as compared to local rice varieties [7]. The reason is that most Nigerian rice processors lack adequate technology of rice processing to meet international standard. The problem facing rice processing are production of short grain rice, improper removal of stone and husk and undesirable coloration, smell of the rice and taste of the rice. The important aspect of rice processing that requires attention is the issue of technological advancement in rice processing, since it has been observed that most of the processes utilized by the rural rice farmers and her level of technology, the farmer will be able to achieve a higher volume of yield with the best quality of product that will enhance consumer preference for locally processed rice.

Application of modern technology in the processing will further guarantee a better packaging of local or home grown rice to make it more appealing to consumers and will attract more buyers of the product. The use of modern processing machinery suitable to our own ecology will further enhanced the standard of the rice processing by reducing the rate of breaking and eliminating contamination by stone and shafts. Kareem, has pointed out that the major obstacle facing the attainment of the potential benefits of agricultural production in many African countries is inadequate science and technological advancement [8].

Constraints in Rice Processing

Financial Constraints

The challenge encountered by farmers in rice processing cut across the value chain. However the most outstanding challenge is finance for rice processing. In every segment of rice processing it has been observed that finance played a significant role in the development of rice processing. The cost of getting machine for rice processes like the thresher, destoner are high and cannot be afforded by these small scale or rural processor.

Limited Modern Processing Machines

This modern processing machine involves the use of equipment such as modern milling machine to remove the shaves from the paddy rice, winnowing machine that will facilitate the removal and blowing of the chaffs from the milled rice and destoning machine for complete removal of stone from the processed rice. Also instead of sun drying the parboiled rice which takes considerable length of time especially during the rainy season, framers can employ the use of modern machine called drier that dry the grain within a shorter period of time.

Skills and Technical Know How

Even with the help of Government who has provided few of the processing machine, the processors still lack the ability to put this machines into use because most of this machines are a little complex and difficult to operate.

Limited Access to Information and Innovation

In ability to get timely information about new innovations by rice processors is also a constraint to processing of Rice, because processors are not up to date about the newest and latest method of processing and this could be because the extension agent do not get to them fast enough or never even go to train the processor at all.

Rice Production Economy in Nigeria

Despite the fact that rice is cultivated in almost all the round corners of the ecological zones of Nigeria, yet its sustainability to mankind still remains small. In 2000, out of about 25million hectares of land cultivated to various crops, about 6.37% was allocated to rice production [9]. Godwin, Federic and Olaf, were of the opinion that most of the producing zones have experienced a decrease in their cropped area between 1995 and 2000. From 20% to 40%, one was being recorded in Imo and Kano states [10]. Only 6 states, Osun, Kogi, Cross River, Borno, Adamawa and Kastina have increased their rice cropped areas during the last five years. A great variation also exists between the states in terms of yield, the average national rice yield during the dry season (3.05 tons/ha) was higher than that of the wet season: 1.85 tons/ha. This could be a confirmation of the higher yield acclaimed to be associated with irrigated rice production system. During the wet season there is a considerable variation between states. States with relatively high yields include Enugu (3 tons/ha), Imo (2.7 tons/ha), and Ebonyi (2.5tons/ha). For the dry season, Benue (3.6 tons/ha) and Adamawa (3.3 tons/ha) had yield higher than the national average. As already noted, the negatively higher yield during the dry season could be partly due to irrigation. On a zonal basis, during the wet season, the yield of rice was highest in South East (2.4 ton/ha). This was followed by the North East (2.0ton/ha) and the central zone (1.8tons/ha) while the South West had the least (1.4 tons/ha). For the dry season, it was observed that yield was highest in the central zone (3.6 ton/ha) but lowest in the North West (1.74 tons/ha). According to Godwin, Federic and Olaf in Udemezue, rice output oscillated in the 1960s with no clear- cut pattern, output growth increased in the early 1970s but declined

in the 1977 [9,10]. Between 1981 and 1983, growth in output declined and remained at a zero growth rate till 1984. With respect to rice production in Nigeria, there is a great disparity between the states of the Federation in rice production output and yield. In 2000, Kaduna State was the largest rice producer, accounting for about 22% of the country's rice out. Niger state accounted 16%, Benue State (10%) and Taraba State 7% respectively. In dry season, Benue State accounted for the highest output (61%). On a geographical zone basis, central zone was the largest producer of rice in Nigerian, accounting for 44% of total rice output in 2000. North West was the second (29%) while the south west was the least (4%).

In 1967, production of paddy rice in Nigeria experienced an increment when output stood at 385 thousand tons. At this period, 262 thousand hectares were brought under cultivation with average national yield of 1.47 tons per hectare [10]. Although, paddy rice production rose from 134,000 to 344,000 tons in 1970 and area cultivated was 156,000 to 25000 ha [11]. Paddy rice production has since been on the tremendous increase in the area planted. Output and productivity in paddy rice production were achieved over the last two decades and now stand at (66000 ha, 1.09 million tons and 2.07 ton/ ha respectively. Nigeria became the largest rice producing country in West Africa and the third largest in Africa after Egypt and Madagascar since 1980 [12]. In 1990, the country produced about 3.4 million tons of rice from about 1.2 million ha. This production capacity would have been sustained but was later decreased due to unsteady government policy on rice import. Thus, increased production over the last two decades could be attributed to the ban imposed on rice imports in 1985 and if this restriction had been maintained, Nigerian rice farmers would have risen to the challenge of meeting the domestic demand for the commodity [11].

According to Godwin, Federic and Olaf in Udemezue, rice output oscillated in the 1960s with no clear- cut pattern, output growth increased in the early 1970s but declined in the 1977 [9,10]. Between 1981 and 1983, growth in output declined and remained at a zero growth rate till 1984. With respect to rice production in Nigeria, there is a great disparity between the states of the Federation in rice production output and yield. In 2000, Kaduna State was the largest rice producer, accounting for about 22% of the country's rice out. Niger state accounted 16%, Benue State (10%) and Taraba State 7% respectively. In dry season, Benue State accounted for the highest output (61%). On a geographical zone basis, central zone was the largest producer of rice in Nigerian, accounting for 44% of total rice output in 2000. North West was the second (29%) while the south west was the least 4%.

Godwin, Federic and Olaf, were of the opinion that most of the producing zones have experienced a decrease in their cropped area between 1995 and 2000. From 20% to 40%, one was being recorded in Imo and Kano states [10]. Only 6 states, Osun, Kogi, Cross River, Borno, Adamawa and Kastina have increased their rice cropped areas during the last five years. A great variation also exists between the states in terms of yield, the average national rice yield during the dry season (3.05 tons/ha) was higher than that of the wet season: 1.85 tons/ha. This could be a confirmation of the higher yield acclaimed to be associated with irrigated rice production system. During the wet season there is a considerable variation between states. States with relatively high yields include Enugu (3 tons/ha), Imo (2.7 tons/ha), and Ebonyi (2.5tons/ha). For the dry season, Benue (3.6 tons/ha) and Adamawa (3.3 tons/ha) had yield higher than the national average. As already noted, the negatively higher yield during the dry season could be partly due to irrigation. On a zonal basis, during the wet season, the yield of rice was highest in South East (2.4 ton/ha). This was followed by the North East (2.0ton/ha) and the central zone (1.8tons/ha) while the South West had the least (1.4 tons/ha). For the dry season, it was observed that yield was highest in the central zone (3.6ton/ ha) but lowest in the North West (1.74 tons/ha).

Materials and Methods

The study was conducted in Gwagwalada Area Council of Federal Capital Territory Abuja, Nigeria. It is located at the extreme South west near the flood plain of River Gurara which transverses the territory from North to South at an elevation of 70m above sea level. The area lies between latitude 070.57'N and longitude 070.7'E. The vegetation combines the best features of the southern tropical rain forest and guinea savanna of the North. This reflects the full transitional nature of the area as between the Southern forest and Northern grassland which have the woods and shrubs respectively. The soil is reddish with isolated hills filled by plains and well drained sandy clay loams which supports farming of the major crops such as sorghum, millet, melon, yam, soybean, benniseed, cassava and rice cultivation [13]. The duration of sunshine ranges from 8 to 10 hours per day. The average rainfall per annum is 163.2mm. The original settlers are Gwari, Koro, Bassa, Gade and the Hausa Fulani as well as immigrant's population of other Nigerians and expatriates. The Area Council has a population of about 50,000 people.

Sampling Techniques and Sample Size

The primary data for this study was collected from the rice processors through the use of questionnaire. This research as earlier stated was conducted in Gwagwalada area council (FCT). Questionnaires were given out to rice processors at different in the areas council. Three urban wards namely Dobi, Paiko and Gwako were purposively selected for the study. 20 households were randomly selected from each ward. Therefore, a total of 60 respondents were used for the study.

Method of Data Collection

Primary data were used for the study; the data was collected with the aid of well-structured questionnaire which will be administered to the local processor, three per household. Data were collected on household on their methods and constraints of rice processing.

Method of Analysis

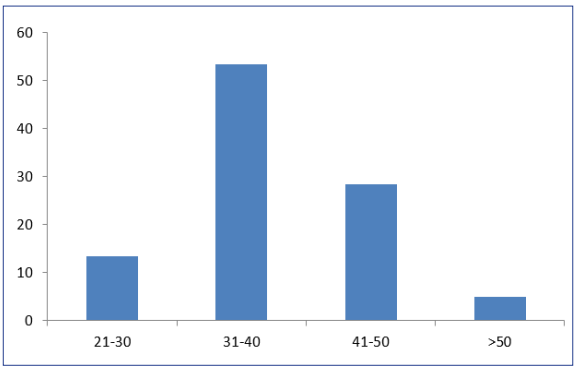
The data collected for the study was analyzed using descriptive statistics (frequency, percentage). With aid of Statistical Package for Social Science (SPSS) version 24 the data were analyzed and the descriptive statistics were used to present the results. Descriptive statistic is used to summarize data in an organized manner by describing the relationship between variable in a sample or population.

Results and Discussion

Socio-Economic Characteristics of the Respondents

Age Distribution

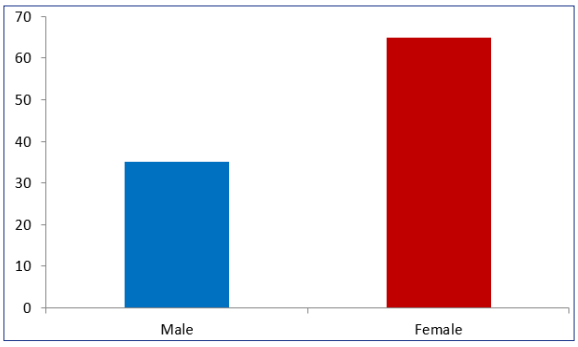
Figure 1.1 shows that 13.3% of respondents are between the age 21 – 30, 53.3% of the respondent are between the age 31-40, 28.3% of the respondents are between the age of 41-50, 5% of the respondent are 50 years and above. This suggests that rice processing is mostly carried out by people between the 31-50 the most because they are still full of live and energy.



Source: Field Survey, 2021.

Gender Distribution

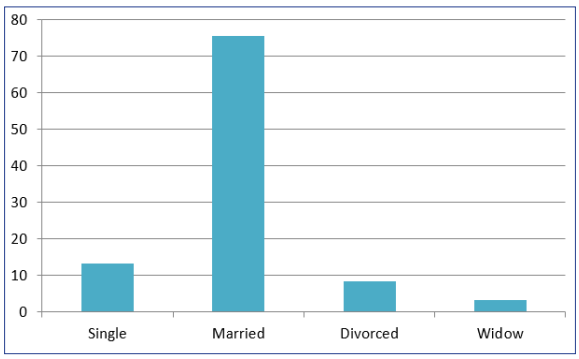
Figure 1.2 below shows that 35.0% of the respondents were observed to be males while 65.0% were observed to be females. This suggests that majority 39 of the rice processors (65.0%) were females. This doesn't necessarily imply that there are more female processors, but the result could be due to the accessibility to the female processors during the survey compared to the male. The females are known to be more involved in processing of farm products and same goes for rice processing.



Source: Field Survey, 2021. n=60

Marital Status

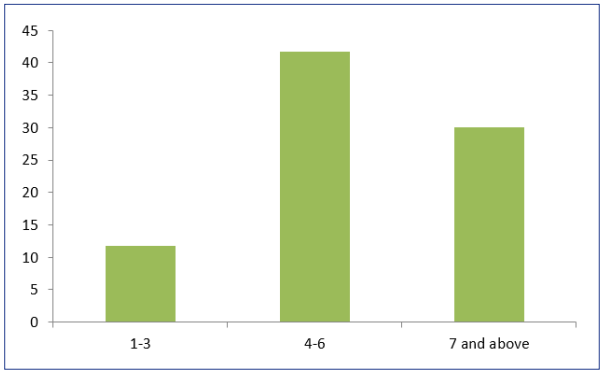
Figure 1.3 shows that 13.3% of the rice processors were single, 75.0% were married, 8.3% of the observed respondents has divorced while 3.3% of the respondents were widow. This suggests that the rice processing is carried out mostly (45) by married people because they have more hands to help in processing from their kids and relatives. And rarely carried out by widows.



Source: Field Survey, 2021. n=60

Household Size

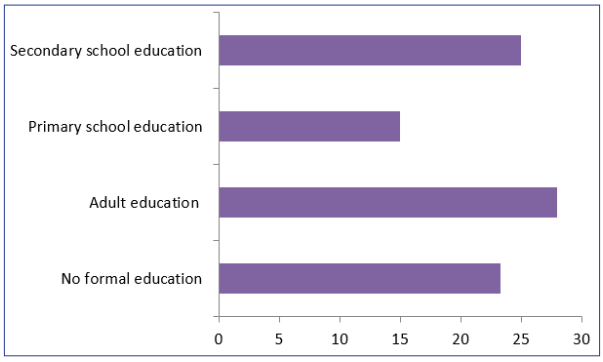
Figure 1.4 shows that the family size of the household in the study area ranged between 1-11. 11.7% of the processors had their household size between 1-3, 40.0% had their household size between 4-6, 30% of the consumers had their household size between 7-9 while 16.7% of them had their household size to be between 9-11. The study revealed that most (25) of the processor household size in the study area were average.



Source: Field Survey, 2021. n=60

Educational Status of the Processors

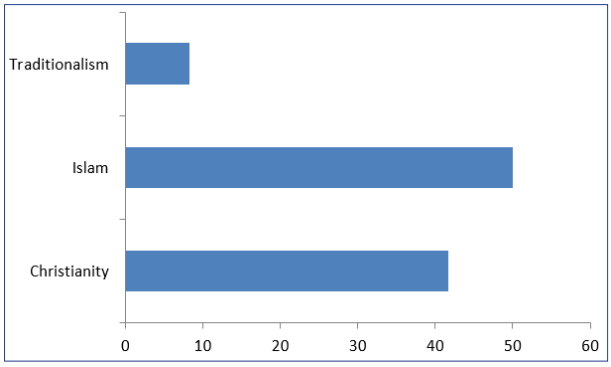
Figure 1.5 shows that 23.3% of the processor had no formal education, 28.3% of them had received adult education, 15.0% of the processor had primary education, 25.0% of them had secondary education, 8.3% of the processor had tertiary education. This suggests that processors are unable to adequate process paddy rice because of their level of education which limits their general knowledge about proper way of processing rice.



Source: Field Survey, 2021. n=60

Religion of Processors

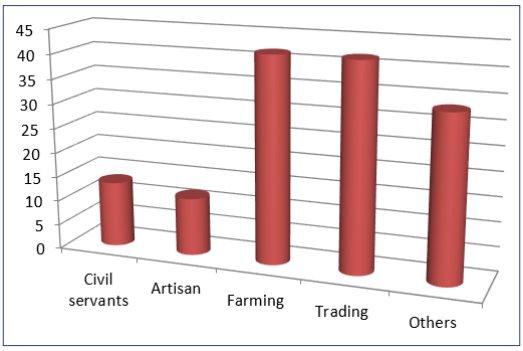
The figure below reveals that majority (30) of the processors in the study area were observed to be Islam with a percentage of 50.0%, while a total of 41.7% were found to be practicing Christianity, 8.3% were Traditionalists.



Source: Field Survey, 2021. n=60

Occupation of Processors

The figure below shows that 13.3% of the processors were Civil servants, 11.7% were Artisan, 41.7% of the respondents were Farmers, 33.3% of the respondents were Traders. This suggests that since the majority (25) are farmers this makes them unable to get timely information because the live in a rural area which doesn't make it easy for them to access information and also funds.

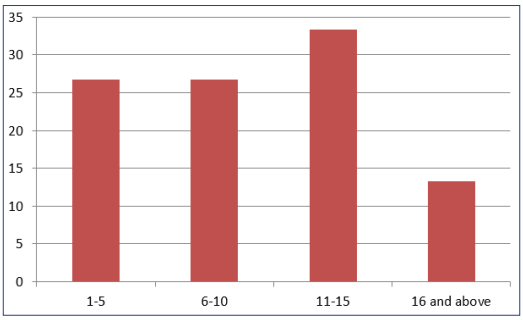


Source: Field Survey, 2021. n=60

Constraints of Paddy Rice Processing

Years of Processing Paddy Rice

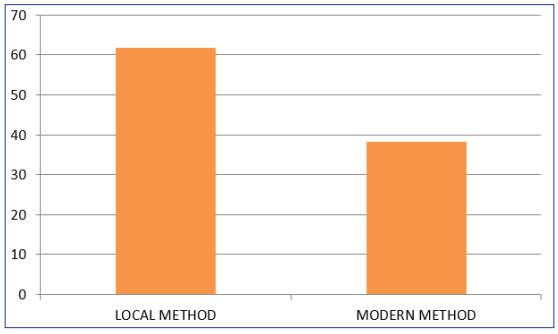
The figure below shows that 26.7% of the processors have spent 1-5 years in rice processing, 26.7% have spent 6-10 years, 33.3% have spent 11-15 years, 13.3% have spent 16 years and above in processing of paddy rice. This suggests that majority of the processor have spent more than 15 years in rice processing which has made them use to their primitive method of rice processing which leads to production of rice that is not desired by the consumers.



Source: Field Survey, 2021. n=60

Method of Rice Processing Adopted

The figure below show that 61.7% adopted local method of rice processing and 38.3% adopted modern method of rice processing. This shows that most (37) of the rice processors in the study area engage in local method of rice processing and this suggests the production of rice which is substandard and not desired by the consumers.

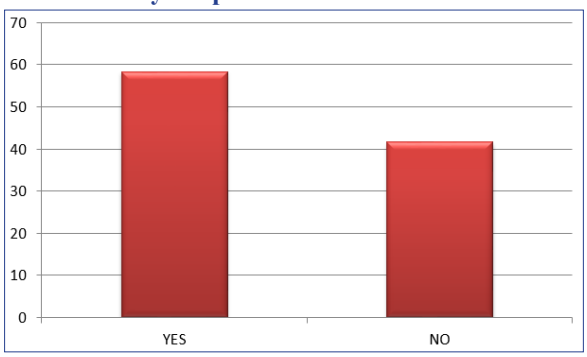


Source: Field Survey, 2021. n=60

Use of Machine

The figure below shows that 58.3% have used a machine before and 41.7% have not used a machine before. This shows that majority (35) of the processors have in one time or another been opportune to use a processing machine. This suggests that most of the respondent have had access to machine but did not continue in the use of the machine so have forgotten how to use the machine.

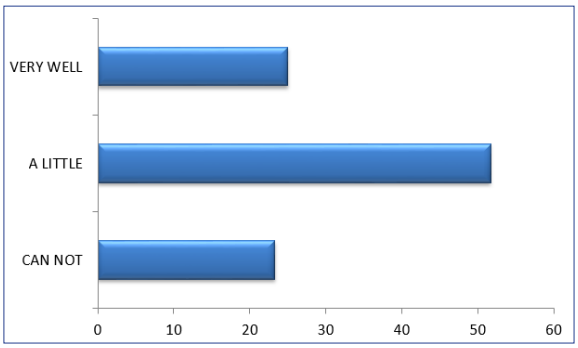
Use of Machine by Respondents



Source: Field Survey, 2021. n=60

How well the Respondents Can Use a Machine

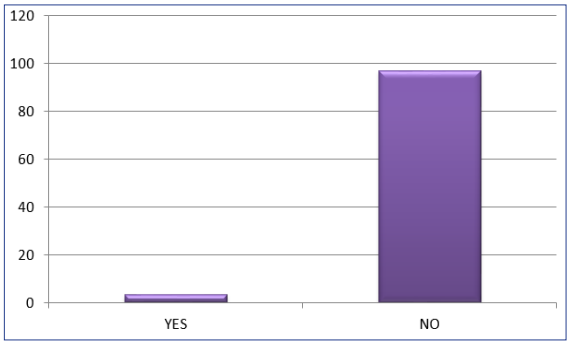
The figure below shows that 23.3% cannot use a machine, 51.7% can use a machine a little, 25.0% can use a machine very well. Most (31) of the processors have little idea on how to operate machines. As stated earlier that majority of the respondent have in one time or another learnt how to use machine but due to discontinuation have forgotten how to use the machine well and this leads to production of substandard rice production.



Source: Field Survey, 2021. n=60

Do You Have Processing Machine

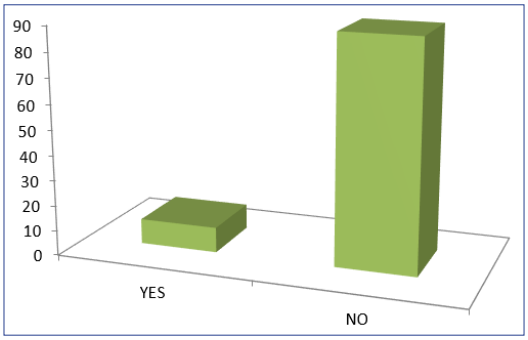
The figure below shows that 3.3% have a processing machine, 96.7% do not have a processing machine. Majority (58) of the processors does not own a processing machine; this is due to their financial inability to purchase a machine. This with result in inadequate processing of paddy rice.



Source: Field Survey, 2021. n=60

Ability to Afford a Processing Machine

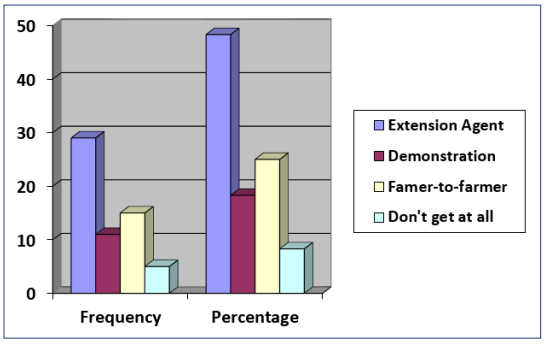
The figure below shows that 10.0% can afford a processing machine, 90.0% cannot afford a processing machine. This is say that majority (54) of the farmer are unable to afford a processing machine on their own and this is due to the fact that most of the respondent are farmers and trader.



Source: Field Survey, 2021. n=60

Source of Information

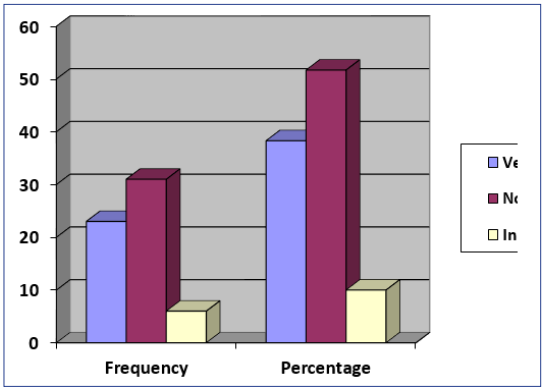
The diagram below shows that 48.3% of the respondents get their information from extension agent, 18.3% get their information from demonstration, 25% get their information from farmer-to-farmer while 8.3% do not get information at all. This suggests the majority of (29) the respondents gets their information from and extension agent which means extension agent have been up and doing in bringing and making it easy for the processors to produce rice with better quality.



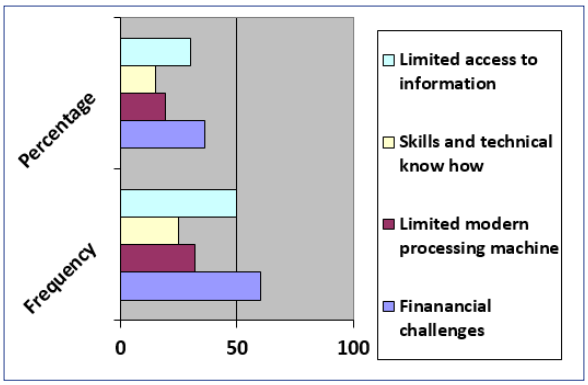
Source: Field Survey, 2021. n=60

Timeliness of Information

The diagram below shows 38.3% of the respondent get their information timely, 51.7% do not get their information on time and 10.0% are indifferent. This is to say that majority of (31) the processors don't get information on time. And this suggests the processors inability to produce quality rice.



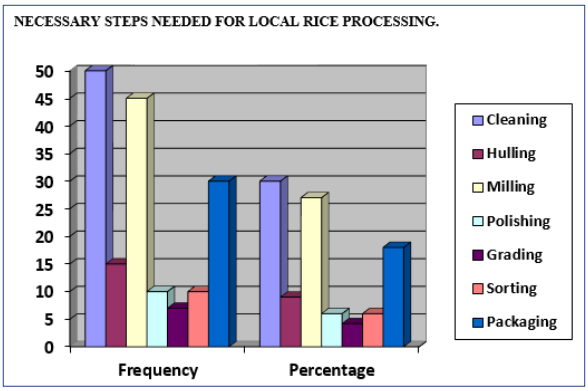
Source: Field Survey, 2021



* Means multiple choices Source: Field survey, 2021.

Challenges Face in Local Rice Processing

The chart above shows that 36.0% of the respondents faces financial challenge/ constraints in paddy rice processing which account for inability to produce rice that are good enough for the consumers. 19.2% of the respondents also face inadequate or limited access to modern processing machine which will have made the work less stressful and time saving, inadequate processing machine also account for inefficiency in paddy rice production that meets the consumer's taste. 15.0% of the respondents face lack of skills and technical know-how in operating the available machines which had leads to use of crude method of rice processing which in turn leads to produce of rice with undesirable quality. 30.0% of the respondents face limited access to information with makes unable to move with the trend in rice processing, like learning about new varieties and how to process it.



*Means multiple choices
Source: Field survey, 2021.

The diagram above shows that 30.0% of the respondents engage in paddy cleaning during the process of local rice processing to remove dirty from the field. 9.0% of the respondents carry out hulling during the process of local rice processing which is the removal of the paddy (outer covering). 27.0% of the respondents mill their rice in order to remove the paddy. 6.0% of the respondents carry out polishing in order make the rice grains white in colour. 4.2% of the respondents carry out grain grading this is to help pick out grains that are not up to standard. 6.0% carryout sorting of the grains and 18.0% of the respondents carry out packing before the sell the processed rice to either the final consumers or the marketing agent.

Conclusion

Nigeria has a good climate for rice production and it has favourable market to absorb the production. There is need to improve the quality of indigenous rice to compete with foreign rice through

selection and adaptation of modern rice technologies to ease labour in production and enhance nutritional qualities in rice processing and production. Government has role to play in forming strong policies that will favour production of local rice as it is being practiced in the advanced world. The statistics of rice production in Nigeria clearly shows that the country needs 5million metric tons for its demand. Nigeria is capable to supply only 49% of domestic demand. However, rice production in Nigeria keeps growing but it will not be enough to supply the domestic demand of the whole country in the next several years. In the light of this, the paper recommends that both private and public sectors should intensify more efforts towards domestic rice production just to meet demands of the citizens.

Recommendation

There is need for putting in place policies and programmes that will make rice farmers to be proactive in rice processing to meet it's demand and desire of the consumers. Generally, encouraging local production or adding value to agricultural produce and processing is one of the good things that can happen to this country because the policy will generate more employment opportunities and put more food on the tables.

i. Majority of the processor are between the age 31-50, more youth under the age of 30 should be encouraged to go into rice processing because the older farmers with time may not have enough energy and capacity to meet the gap between rice processing, production and demand.

ii. For subsequent successful agricultural programmes and information on rice processing and production in FCT, Abuja. Government and non-governmental organizational should channel the awareness of such programmes through the extension agencies, farmer's cooperative groups, farmer's forum and radio.

iii. More individuals are being encouraged to invest in this sector. Here is how you can venture into the rice processing and packaging business. Investors can go into rice farming and rice processing or rice milling plant. Rice milling projects will best be sited in these areas where rice is grown in order to reduce the cost of transportation of the paddy.

iv. Extension agent should enable to train processors on how to use the available processing machine in other to reduce stress and to increase the willingness of the processor to continue processing and to help produce rice with good, desirable and palatable quality

v. The government and non-governmental organizational should sensitize all farmers to belong to farmer's co-operative groups and where they are in existence, effort should be made to strengthen them for easy access to credit, farm inputs, machines and insurance for their agricultural products.

References

1. Agric News, Rice is Life. International Year of Rice (2004) Declaration, vol.1,no.2,Bayelsa State Ministry of Agriculture & Natural Resources.

2. Hedge S and Hedge V (2013) Assessment of Global Rice Production and Export Opportunity for Economic Development in Ethiopia. International Journal of Science and Research (IJSR) 2: 257-260.

3. Ogunbiyi MO and Furuichi S (2013) Improvement of rice parboiling tank in Lafia, Nasarawa State under RIPMAPP, Nigeria. In: Idu, E.E., Ochigbo, A.A, Jolaoso, M.A., Onwualu, A.P., Hassan, A., Onjuwu, S.S.& Sheriff-Musa, M.(Ed's). Rice for Food Market and Development. 2nd International Conference on Rice for Food Market and Development 41.

4. Merem EC, Wumasi YT, Wesley J, Isokpehi P, Shenge M, et al. (2017) Analyzing Rice Production Issues in the Niger State Area of Nigeria's Middle Belt. Food and Public Health 7: 7-22.

5. FAOSTAT (2013) Available at: http://faostat.fao.org (accessed 20 June 2021).

6. FAO, Food and Agriculture Organization (2003) Sustainable Rice Based Production and People's Livelihood, International Rice Commission Newsletter (Special Edition) International Rice Commission, FAO, Rome, Italy 52.

7. Ebuehi and Ojewole (2009) Toward a green revolution in Africa: what would it achieve, and what would it require? Agricultural Economics 39: 539-550.

8. Kareem OI (2016) European Union's Standards and Food Exports from Africa: Implications of the Comprehensive Africa Agricultural Development Programme for Coffee and Fish. Journal of African Development 18: 83-97.

9. Udemezue JC (2014) Adoption of FARO- 44 Rice production and Processing Technology by farmers in Anambra State. Post Graduate thesis, Department of Agricultural Extension University of Nigeria, Nsukka 1-55.

10. Godwin A Federic L, Olaf E (2001) The Nigerian Rice Economy in a Competitive World: Constraints, Opportunities and Strategic Choice. West Africa Rice Development and Association 1-55.

11. Imolehin ED, Wada AC (2000) Meeting the Rice Production and Consumption Demand of Nigeria with improved Technologies. National Cereal Res Inst, Badaggi, Niger State, Nigeria, 1-11.

12. West African Rice Development Association (WARDA) (1996) Rice Trends in Sub-Saharan African 2nd (edn). WARDA, Bouake.

13. Abuja, ADP (2004) Federal capital territory. Agricultural Development Project. 2004 Annual Report.