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Assessment of Rice Processing and Packaging Methods in New-Bussa, Niger State Nigeria

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ABSTRACT: The objective of this paper was to assess rice processing and packaging techniques amongst rice processors in New-Bussa and its environment, Niger State, Nigeria using appropriate standard procedures. Data obtained show that manual threshing method accounted for 62.0% while 71.0% use local parboiling method, 91.0% use mechanical milling. The drying method indicates that 82.0% uses sun drying method while 18.0% uses mechanical drier. The methods of Rice packaging indicates that majority (85.0%) of the respondents uses sack bag for packaging, 10.0% uses polythene bag while 3.0% uses bowl. The major constraints associated with Rice processing and packaging are poor access to institutional credits and inadequacy of modern storage and processing facilities with 29.0% and 22.0% each, followed by scarcity and high cost of inputs with 16.0% while the least constraints was uses of old milling machine (9.0%). The study concludes that rice processors were owned by an individual that could not afford modern machines for the production and processing of Rice in the study area. Therefore, the majority of these Rice processors were still using crude method of Rice processing and packaging.

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Rice (*oryza sativa*) as a main source of nourishment for over half of the world population, rice is by far one of the most important commercial food crops. Its annual yield worldwide is approximately 535 millions tons. Fifty countries produce rice with china and India supporting 50% of total production. During the last two decades, rice has moved from a ceremonial to a staple food in many Nigeria homes. Statistics from the European association of agricultural economics, EAAE (2005) indicates that Nigeria is by far the largest rice importer in West Africa, with an average yearly import of 1.6 million tons of milled rice. Rice (*Oryza sativa*) a cereal belonging to the Gramineae, a large monocotyledonous family of some 600 genera and around 10,000 species (Wibberley, 2009). It is valued as the most important staple food for over half of the world population (AgricNews, 2003) and ranks third after wheat and maize in production on world basis. More than half of the world's population depends on rice as the major source of calories (FAO, 2003). The amount consumed by all these people ranged from 100kg to 240kg per annum in the year 2000 alone (FAO, 2003). Two species have emerged as most

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popular cultivated rice, *Oryza sativa* and *Oryza glaberrima*; of these two species the more widely produced is *Oryza sativa*. Rice processing involves several steps: removal of the husks, milling the shelled rice to remove the bran layer, and an additional whitening step to meet market expectations for appearance of the rice kernels. This process generated several streams of material which include the husks, the bran, and the milled rice kernel (Schramm, 2006). 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 production. These include problems with research, pest and disease management. Addressing at least most of these problems is good first step towards attaining the target of rice self-sufficiency (WARDA, 2004). Harvesting is considered the first step in paddy processing and is a critical operation in deciding the overall rice quality. In some Southeastern Nigeria, Paddy harvesting is performed mainly manually using hand cutting tools such as sickle, knife, scythe, cutters. Almost all of the Rice is harvested using combined harvesters in developed countries. Harvesting timing and method are two critical factors dictating the problem during the harvesting operations. A large amount of losses occurs before or during the harvesting operations if it is not performed at adequate paddy maturity and moisture content. Too early harvesting of Rice at high moisture content increases the drying cost, making it susceptible to mould growth insect infestation and resulting in a high amount of broken grains and low milling yields (Khan, 2010). However, leaving the matured Rice un-harvested results in high shattering losses, exposure to birds and rodents attack, and losses due to natural calamities (rain, hailstorms etc. (Baloch *et al.,* 2010). According to a study conducted in some South Eastern Nigeria, due to high scattering losses, the paddy harvesting losses were found to increase by about 67% (2.5% from 1.5%) by delay in harvesting (Khan, 2010). Another postharvest loss study in India estimated a 10.3% increase (1.74% to 1.92%) in paddy harvesting losses due to delayed harvesting because of a lack of adequate harvesting equipment (Kannan *et al.,* 2013).

In most part of Nigeria, threshing is usually done manually, even though mechanical threshing is used at large irrigated fields (Akande, 2013). The use of combine harvester has been limited by farm, and mixed verifies cropped on the same land. Farmers mainly threshed by beating the harvested straw with a wooden stick or against metal drums or cemented vessels, tree trunks, stones etc. The cleaning process is performed after the threshing to separate whole grains from broken grains and other foreign materials, such as straw, stones, sand, chaff, and weed seed. Winnowing is the most common method used for cleaning in developing countries. Screening/sifting is another common method of cleaning, which can be performed either manually or mechanically. Inadequately cleaned grains can increase insect infestation and mould growth during storage, add unwanted taste and colour and can damage the processing equipment. A large amount of Rice is lost as spillage during this operation, and rice losses during winnowing can be as high as 4% of the total production (Sartar *et al.,* 2019).

In Nigeria, rice consumption has risen tremendously at about 10% per annum due to changing consumer preferences (Akande, 2013). However, Ebuehi and Oyewole (2007) discovered that most Nigerians prefer to consume imported rice brands as compared to local rice varieties. The reason is that most Nigerian rice processors lack adequate technology of rice processing to meet international standard. Therefore the objective of this paper is to assess Rice processing and packaging techniques amongst Rice processors in New-bussa and its environment, Niger State, Nigeria.

MATERIALS AND METHODS

Study Location: Borgu local government lies between latitude 9^0N and 11^0 N and longitude 2^0E and 4^0E. It is bounded to North by Kebbi State, to the South by Kaima and Baruten local government Areas of Kwara State, to the West by Benin Republic, and to the East by River Niger and Magama local government Area of Niger State. Its headquarters are in the town of New Bussa and in 2012 based on the World Bank indicator growth rate the LG has a population of 199,427, consisting of 102,463 males and 96,964 females.

Study Population: The population for this study comprised of selected Rice processor in New bussa and Its environments.

Sampling Technique: Four (4) communities were selected purposively while the Rice processors were selected using simple random sampling techniques.

Method of Data Collection: Questionnaire was personally administered by the researcher and interpreted in local languages to the respondents with the help of an interpreter. The questionnaire contained a series of structured questions which were related to the research work and directed to

respondents with the aim of gaining first-hand information.

Data Analysis: Data obtained was analyzed using descriptive statistics such as frequency tables, percentages and charts.

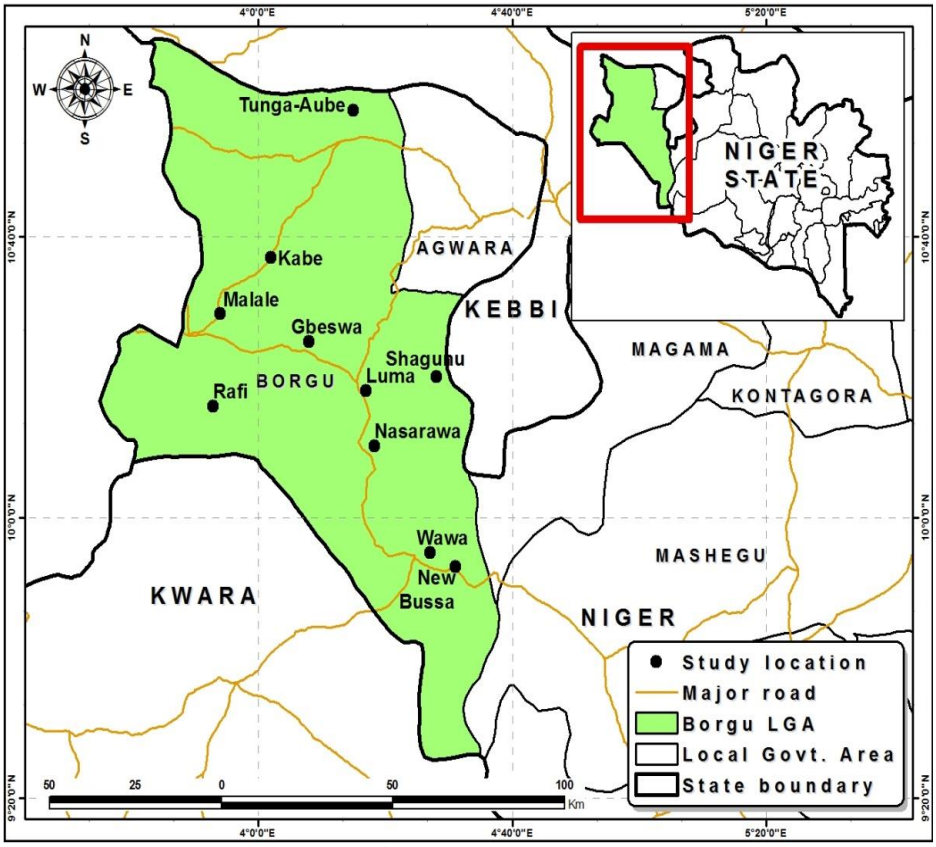

Fig 1: Map of New Bussa and Its Environment

RESULTS AND DISCUSSION

Table 1 shows the Socio-Demographic Characteristics of the Respondents. The result gathered shows that female recorded the highest with 62.0% while male recorded 38.0%. The age group 31-40 years recorded the highest (40.0%), followed by 21-30 years with 30.0% while 15-20 years recorded the least with 9.0%. Majority (81.0%) of the respondents are Muslim while 19.0% are Christians. 74.0% are married while 26.0% are single. The educational level of the respondent revealed that 42.0% had secondary education, 30.0% had OND/NCE while 8.0% had HND/BSc. The household size of the respondents showed that majority (51.0%) of the respondents has an household size of ≤5, followed by 6-10 household with 37.0% while ≥11 household were the least with 12.0%. The types of Rice processing methods adopted in the study area are revealed in table 2, in which majority (62.0%) of the respondents use manual threshing method while 38.0 use mechanical threshing method. 71.0% use local parboiling method while 29.0% uses mechanical parboiling method. The table further revealed that 91.0% use mechanical milling while 9.0% uses traditional milling method. The drying method indicates that 82.0% uses sun drying method while 18.0% uses mechanical drier. Fig 1 showed the methods of Rice packaging in the study area, majority (85.0%) of the respondents uses sack bag for packaging, 10.0% uses polythene bag while 3.0% uses bowl.

The methods of Rice packaging in the study area, majority (85.0%) of the respondents uses sack bag for packaging, 10.0% uses polythene bag while 3.0% uses bowl. Table 3 showed the constraints associated with Rice processing and packaging in the study area, The major constraints are poor access to institutional credits and inadequacy of modern storage and processing facilities with 29.0% and 22.0% each, followed by scarcity and high cost of inputs with 16.0% while the least constraints was uses of old milling machine (9.0%).

Table 1: Demographic characteristic of the respondents

Demographic	Categories	Frequency	Percentage (%)
Sex	Female	62	62.0
	Male	38	38.0
	Total	**100**	**100**
Age	15- 20	9	9.0
	21- 30	30	30.0
	31- 40	40	40.0
	41 above	21	21.0
	Total	**100**	**100**
Religion	Islamic	81	81.0
	Christianity	19	19.0
	Total	**100**	**100**
Marital Status	Single	26	26.0
	Married	74	54.0
	Total	**100**	**100**
Level Of Education	Primary education	6	6.0
	Secondary education	42	42.0
	OND/NCE	30	30.0
	HND/BSc	8	8.0
	No formal education	12	12.0
	Total	**100**	**100**
Household Size	≤5	51	51.0
	6-10	37	37.0
	≥11	12	12.0
	Total	**100**	**100.0**
Years of Experience	≤5	33	33.0
	6-10	48	48.0
	≥11	19	19.0
	Total	**100**	**100.0**

Source: field survey (2024).

Table 2: Types of rice processing methods adopted in the study area

Variables	Processing Method	Frequency	Percentage (%)
Threshing	Manual	62	62.0
	Mechanical	38	38.0
	Total	**100**	**100**
Parboiling	Local parboiling	71	71.0
	Mechanical parboiling	29	29.0
	Total	**100**	**100**
Milling	Traditional	9	9.0
	Mechanical	91	91.0
	Total	**100**	**100**
Drying	Use of mats or tarpaulins (Sun Drying)	82	82.0
	Use of a mechanical drier	18	18.0
	Total	**100**	**100**

Source: field survey (2024)

The result in table 2 indicated the method of threshing Rice. The highest percentage of 62.0%, claimed that they threshed manually by heating a stick on the Rice on the floor. The is in line with Ukwungwu *et al.*, (2009) that reported that 90% of Rice farmers are still threshing there paddy manually. The response from a method of parboiling as shown in table 1, revealed that The highest percentage, which was 71.0%, claimed that they use a local method of parboiling while 29.0% reported using a mechanical method to parboiling. This indicates that most of the Rice processor in the study area are still processing there Rice locally.

The results on method of milling used indicates that highest percentage of 91.0%, used mechanical method of milling while 9.0% used the traditional method of milling. This suggested that traditional method of milling are not mostly used again in the study area.

The result obtained on the method of drying Rice showed that they dry under the natural sun (sun drying). The responses on rice packaging after milling gathered that the highest percentage of 85.0% used sack bags for storage.

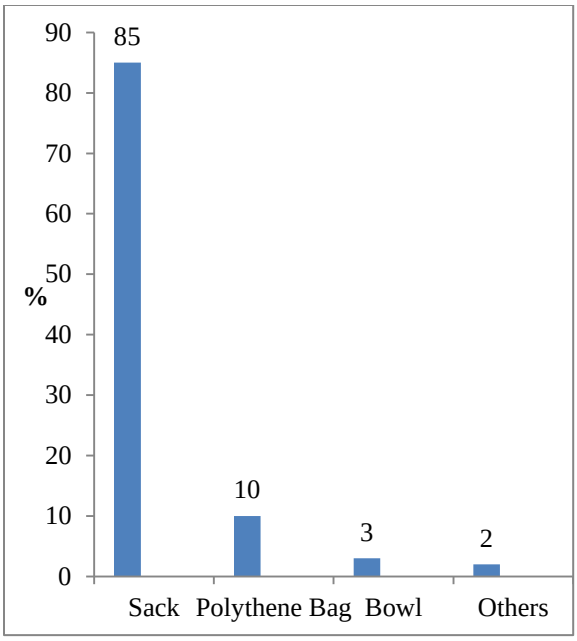

Fig 1: Methods of rice packaging in the study area

Table 3: Constraints associated with rice processing and packaging in the study area

Processing Method	Frequency	Percentage (%)
Scarcity and high cost of inputs	16	16.0
Inadequate extension agent contact	13	13.0
Poor access to institutional credits	29	29.0
Use of old milling machine	9	9.0
Inadequacy of modern storage and processing facilities	22	22.0
Disease and pest infestation on cultivated rice crop	11	11.0

Source: field survey (2024).

The constraints associated with Rice processing and packaging in the study area are poor access to institutional credits, inadequacy of modern storage, processing facilities, scarcity and high cost of inputs etc. This result conforms to Wilfred (2006), he reported that several factors are militating against rice production/processing in Nigeria. Wilfred (2006) reported that the inadequate knowledge on the use of herbicides and pesticide, inadequate fund, processing and marketing, pest and diseases, soil fertility management, irrigation and water, harvesting skills are some of the constraints facing the rice farmers. Agidi (2013) iterated the labour intensity involved such as ploughing, planting, weeding, harvesting, threshing, and transportation being strenuous and laborious; the problem is worsen by lack of appropriate rice farming tools, implementation, and equipment. Besides this, the equipment available is often too expensive for the average farmer.

Conclusion: It was discovered that most rice processors were owned by an individual that could not afford modern machines for the production and processing of Rice in the study area. Therefore, the majority of these Rice processors were still using crude method of Rice processing and packaging. Finally, the study identified poor access to institutional credits, inadequacy of modern storage, processing facilities, scarcity and high cost of inputs etc. as constraints to Rice processing and packaging in the study area. The Rice processors should be encouraged to join agricultural organization.

Declaration of Conflict of Interest: The authors declare no conflict of interest

Data Availability: Data are available upon request from the corresponding author or any of the other authors.

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