Study On The Level Of Mechanization Of Rice Processing In Kano State, Nigeria

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ABSTRACT

Research into the level of mechanization of post harvest activities of rice in some rice production/processing areas of Kano State was conducted; with interest on studying the level of mechanization for each of the various processing stages involve in rice processing from harvesting to storage before the produce is taken to the market place. The Investigative Survey Research Approach (ISRA) was used, thus structured questionnaire was administered to rice processors in 4 major rice processing centres in Kano state through personal interview. The result of this study shows low level of mechanization of post harvest activities for all of the processing stages except de-husking which has 100% level of mechanization while other processing stages like harvesting, parboiling, and drying were seen to be at 0%, and threshing, winnowing and bagging at 8.14% level of mechanization with a stage like polishing being skip by majority. The result of the study can be utilize to conceptualize appropriate approach to improving post harvest activities of rice processors by focusing on the processing stages with low level of mechanization.

KEY WORDS

Mechanization, Manual, Rice Processors

INTRODUCTION

Rice is an increasingly important crop in Nigeria, It is relatively easy to produce and it is grown for sale and for home consumption. The Nigerian rice sector has seen some remarkable developments over the last quarter-century. Both rice production and consumption in Nigeria have vastly increased during the aforementioned period. Notwithstanding, the production increase was insufficient to match the consumption increase –with rice imports making up the shortfall. The annual domestic output of rice in Nigeria hovers around 3.0 million metric tons, leaving the huge gap of about 3 million metric tons annually (Biyi D. 2005), and a situation, which has continued to encourage dependence on importation. Some of the reasons for the gap are connected with the improper production methods, scarcity and high cost of inputs, rudimentary post - harvest and processing methods, inefficient milling techniques and poor marketing standards particularly in terms of polishing and packaging. Also poor or low mechanization on rice farms means heavy reliance on manual labour to carry out all farm operations (Biyi D. 2005).

Agricultural mechanization implies the use of various power sources and improved farm tools and equipments, with a view to reduce the drudgery of the human beings and draught animals, enhance the cropping intensity, reduce the losses at different stages of crop production and increase farm workers' productivity (Verma S. R 1991). The end objective of farm mechanization is to enhance the overall farmers' productivity and production at the lowest cost possible. Agricultural mechanization was enable by advancement in technological innovation that crated value in agricultural production practices through the more efficient use of labour, the timeliness of operation and more efficient input management with focus on sustainable, high productivity system and

making it possible for a farmer to manage an increasingly large areas of land. Mechanization of farming activities helps in increasing the quality and quantity of agricultural produce. It helps in post harvest activities among other ways to reduce post harvest loses, reduce processing time, improve the quality of produce and also reduce manual labour requirement thereby making crop processing more convenient and profiting.

Rice is now a structural component of the Nigerian diet and it imports making up an important share of Nigerian agricultural imports, this brings a considerable political interest in increasing local rice production. With the desire of both the federal and the state government to increase rice production in Nigeria, it is imperative to look into every possible factor(s) inhibiting the actualization of this goal. However, past policies have not been successful in securing the market share for local rice producers, (Frederic Lançon et al, 2003). The knowledge of the current level of Mechanization in rice production in the country is an important step in formulating strategy for improving both the quality and quantity output of rice farmers/processor.

STEPS IN RICE PROCESSING

This is an overview of the various post harvest activities that majority of rice processors in the selected areas of Kano State undergoes before their produce are taken for storage or to the market places. This processing step is according to the information made available by The Secretary, Bukure Rice Processors Cooperative Society.

1. Harvesting of the crop is done when the crop is seen to have matured.
2. The produce is then piled up in the farm for drying
3. Threshing/winnowing is done afterwards to separate the paddy rice from its chaff
4. The produce is then bagged for transportation to the processing centre
5. Parboiling of the paddy rice is the first step in the processing centre
6. Drying of the per-boiled rice is done afterwards
7. De-husking of the rice is done after it has dried properly

8. Winnowing/cleaning is then carried out on the de-husk rice

9. Some processor polish and dry their rice before bagging for storage or transportation to the market, while majority don't, they just bag directly after winnowing/cleaning.

METHODOLOGY

This research which was carried out between the 23rd of January to 4th of February 2012, had field survey that includes oral interview and questionnaire administration to 86 rice processors in their various processing centres in selected major rice producing/processing areas namely; Kwanar Dawaki, Bukure, Kura and Dawanu all in Kano State. The primary data were collected with the use of a structured questionnaire for information on processing method employed by rice processor; either mechanical or manual. The secondary data were obtained by orally interviewing and following the processing activities of the processors.

A multi-stage sampling technique was used in this study; the first stage involved the use of purpose sampling to determine which area of the state and the processing centres to be used for questionnaire administration while the second stage involve the use of simple random sampling to determine the rice processor that were orally interviewed. Participants were asked how they processed their produce by breaking down 'rice processing' into the various stages involved and addressing each stage individually. A preliminary survey was conducted to investigate which area of the state produce/process rice and the processing method generally adopted in these areas. The sample survey had a total of 85 processors in the selected areas of the state that were directly administered with questionnaire personally interviewed using the Investigative Survey Research Approach.

The data collected will be analysis to get:

I. The percentage level of mechanization for each stage of rice processing. Percentage Mechanization level = (No of Processors operating Mechanical x 100)/Total no of processors.

II.   The percentage purity = (weight of impurity x 100)/ total weight of rice sample.

III.   The percentage mechanical damage = (weight of Damage rice x 100)/total weight of Rice sample.

IV.   Daily output and appearance of the grain.

RESULT

The result of the survey is presented in table 1 below

Table 1: Method of Rice Processing

S/No	Activities	Total Processors Considered	Processors Operating Mechanically	Processors Operating Manually
1	Harvesting	86	0	86
2	Field-drying	86	0	86
3	Threshing /cleaning	86	7	79
4	Parboiling	86	0	86
5	Paddy-drying	86	0	86
6	De-husking	86	86	0
7	Winnowing/cleaning	86	7	79
8	Bagging	86	7	79
9	Polishing	86	7	-

Only 7 out the 86 processors considered in this work polish their rice before bagging.

RESULT DISCUSSION

The percentage level of mechanization for the various processing stage of rice is shown below
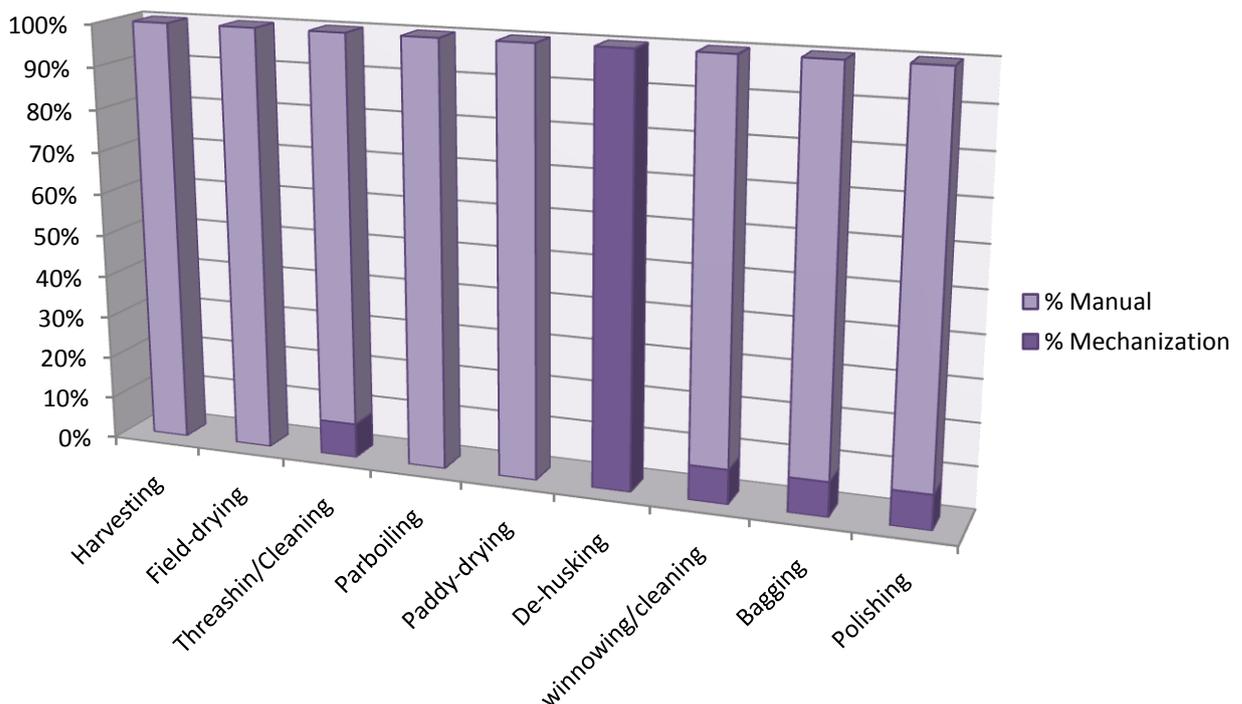
Fig 1: chart showing the percentage mechanization in rice processing

Table 2: Percentage Mechanization of Rice Processing

S/N	Processing Stage	Mechanization Level (%)	Comment
1	Harvesting	0	This is usually done using sickles to cut the crop.
2	Field-drying	0	This is usually done by piling up the harvested rice on the field and drying using open sun drying method. Fig1.
3	Threshing/ Cleaning	8.14	Majority of the farmers thresh by spreading large nylon sheet or rubber sheet on the floor and then take their dried rice in bunch and beat it on the side of a drum. The paddy rice is then separated from the panicle as a result of the impact on the drum. The paddies are then collected on the spread nylon sheet. The few that thresh mechanically use Gravity Stoner, see Fig2.
4	Parboiling	0	All the processors interviewed parboil their rice usually by putting the produce inside a huge oil drum and then fire it using firewood or charcoal. None is seen using any mechanical equipment for parboiling.
5	Paddy-drying	0	After the rice has been parboiled, it is laid out on tarpaulins to dry. It is at this stage that there is a danger of small stones getting mixed up with the rice grains, reducing its marketability.
6	De-husking	100	Although two types of Machine were seen to be in use for this stage but all the Processors interviewed/questioned indicate de-husking mechanically, for the two machines in use, see Fig 4. Much of the milling is done by co-operatives
7	Winnowing	8.14	The few that were seen to winnow and clean mechanically uses a machine called 'Blower Rice Polisher, see Fig 6. Majority winnow manually by pouring the rice on a tarpaulin at an height from the ground and allowing the wind to separate the chaff from the rice, see Fig. 5
8	Bagging	8.14	Majority bagged manually; hand-filling the bags and sealing it using needle and thread, see Fig 3. The few that bag mechanically uses a machine called 'Gravity Stoner see Fig 2.
9	Polishing	8.14	Only 8.14% polish their rice before bagging, but those that polish do so mechanically using Blower Rice Polisher, see Fig 6. This is so because majority of the processors do not have the machinery needed for polishing.

Little variations were observed;

i.   In the choice of equipments, mechanization level and processing method among the rice processor interviewed, this brought about the grouping of the farmers/processors into two groups.

ii. The processing method for 'Tuwo-rice" is slightly different; parboiling is skipped to have rice use for 'Tuwo Shinkafa' (Tuwo-rice). This report is not considering this variation because it is not relevant to our findings

The result of this survey brought about categorizing the rice processors considered into two groups according to their processing method. Group1 is less mechanised in its operation compare to group2 and this was seen to affect their productivity both in terms of quantity and quality of output. The differences in level of mechanization between group1 and 2 are shown in Table 2 below.

Table 2: Difference in Mechanization Level between Group1 and 2

Stages in Processing	Harvesting	Field Drying	*Threshing / Cleaning	Par-boiling	Drying	De-husking	*Winnowing /Cleaning	*Bagging	*Polishing
Group 1	Manual	Manual	Manual	Manual	Manual	Mech	Manual	Manual	Skip
Group 2	Manual	Manual	Mech	Manual	Manual	Mech	Mech	Mech	Mech

Indicators: [Mech] – Operate Mechanically,   [Manual] – Operate Manual,
                 [Skip] – Stage not done
Group1: consist 79 processors which represent 91.86% of the rice processors interviewed
Group2: consist 7 processors which represent 8.14% of the rice processors interviewed
* – indicate processing stages where there is difference

Comparison of Output (Quality and Quantity) of the Two Groups

- Percentage Mechanical Damage

Mechanical damage occurs during milling and was observed that gropu1 and 2 uses different milling machine with group 2 using a more sophisticate one. Mechanical damage to grains (Macro and Micro) decreases it biological value, therefore, it is often taken as a criterion of evaluation of the quality of threshing and separating set. For this reason qualitative and quantitative evaluation of damage occurring during milling are of great importance.

Sample was randomly taken from the rice produced from both groups to check for Macro Mechanical Damage.

For Group 1

Weight of Sample collected = 69g, Weight of damage Rice = 24.1g

Percentage Macro Damage = 24.1 x 100/69 = 34.91%

For Group 2

Weight of Sample collected = 83g, Weight of damage Rice = 4.44g

Percentage Macro Damage = 4.44 x 100/83 = 5.35%

- Percentage Purity

The level of neatness of the rice from the two groups was measure by calculating the percentage purity = (pure mass/total mass) x 100. From the randomly taken rice samples from both groups, percentage purity is calculated thus

For Group1

Total weight of sample collected (impure mass) = 69g, Weight of Pure Mass = 64.56g

Percentage Purity = (64.56/69) x 100 = 93.56%

For Group2

Total weight of sample collected (impure mass) = 83g, Weight of Pure Mass = 82.25g

Percentage Purity = (82.25/83) x 100 = 99.10%

- Daily Output (de-husking Machine)

  It was observed that the two groups are using different type of de-husking machine because of financial considerations. The daily out for each and the cost of processing was noted

  Group 1:   18 bags/10hrs working day with ₦200/bag processing cost

  Group 2:   45-50 bags/10hrs working day with ₦650/bag processing cost

It was observed that the overall productivity of 'group2' is better than that of 'group1'; this is as a result of group2 been more mechanized in their operation than group1.

The alternative to manual labour, which is mechanization, is expensive and processors cannot afford it in their processing centres. With scarcity of labour, it becomes difficult to

cope with processing when the targeted production of large hectares of rice farming is achieved.

CONCLUSION

The result of this study shows general low level of mechanization of post harvest activities in rice processing except de-husking which has 100% level of mechanization. Other processing stages like harvesting, parboiling, and drying were seen to be at 0%, and threshing, winnowing and bagging at 8.14% level of mechanization with a stage like polishing being skip by majority due to lack of machinery.

RECOMMENDATIONS

- Agric Engineers across the country should look into this area for machinery development by designing and fabricating low-cost equipments/machinery for each processing stages of the post harvest activities of rice to enhance the productivity of processors.

- Due to the 'small-scale' level at which majority of processors are operating, it will be difficult for individual processor to completely mechanize his/her activities, firstly because of financial constraint to purchase the various equipments/machines needed and then secondly the running cost. The processors are advised to form cooperative societies if they haven't done that yet. This will make it easier for them to collaborate with various agric agencies both private and government and also create a platform to work with financial institution to asses fund. The kind of partnership had been seen to be successful in the creation of the present processing centres which targets de-husking and made it to attained 100% mechanization should be extended to cover other stages in the processing of rice.

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APPENDIX I

Fig 1: Drying by spreading in open-sun

Fig 2: Gravity Stoner (side and back view)

Fig 3: Manual Bagging

Fig 4: The Two De-Husking Machine in Use in the Areas Visited

Fig 5: Manual Winnowing method   **Fig 6: Blower Rice Polisher**