Rice Harvesting Technology Required for Improvement by Farmers in Duu - Anambra Rivers Basin of Enugu and Anmbra States

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ABSTRACT

This study was designed to determine the rice harvesting technologies required for improvement by farmers in Duu-Anambra Rivers Basin. In doing this, one research question and one research hypothesis were formulated based on the objectives of the study. Descriptive survey design was adopted. The study covered the three rice production projects in the study area. Data were collected using questionnaire administered to 350 rice farmers in the basin. Data collected were analyzed using mean, standard deviation and independent t-test statistics. It was discovered that rice farmers required improvement in rice harvesting technologies. There was no significant difference in the mean ratings of male and female farmers in 6 out of 10 technologies in rice harvesting. It is therefore recommended that: (1) workshop should be organized for farmers in rice harvesting technologies to enable them acquire innovative technological practices in rice harvesting. (2) There should be agricultural education programme in the media and this should be employed to educate farmers on the identified technologies required for improvement by the farmers and other relevant information that farmers would require especially before the beginning of the harvesting season, among others.

Keywords: Harvesting Technology, Farmer, Rice

INTRODUCTION

Rice ranks about forth among cereals, following closely after sorghum, millet and maize in items of land area cultivation for each crop and output. Estimated milled rice required for self-sufficiency in Nigeria is about 5 million metric tons while local production is just about 3 million metric tons of milled rice (National seed service, 2006).

Due to availability of several agro-ecologies suitable for rice production in Nigeria, Mr. President has directed that local production of rice must be substantially increased within a three year period after which importation of rice into Nigeria will be banned. The directive of Mr. President has led to the creation of two major projects aimed at meeting the target of rice self-sufficiency and export by 2007, namely:

The presidential initiatives of rice self-sufficiency, export, rapid multiplication and dissemination of NERICA 1 and NERICA 2 and other rice varieties.

There was an area of land identified feasible for rice production by a Japanese firm NIPPON Koei company of Tokyo, Japan (Okoli, 2002). This area is called Duu-Anambra Rivers Basin, located in Ayamelum L.G.A of Anambra State and Uzo-Uwani L.G.A of Enugu State of Nigeria. This basin is ecologically suitable and important in rice cultivation. Within this basin is located an irrigated rice cultivation projects executed by Anambra-Imo Rivers Basin Development Authority (AIRBDA). These projects are:

1. Adarice production Limited Adani

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2. World Bank Rice production Adani
3. Lower Anambra Irrigation project Omor

The Adarice production and World Bank rice projects were developed between 1976 and 1979 respectively (Achike, 1980).The implementation of lower Anambra irrigation project (LA.LP) commenced in 1981 by a contract awarded by AIRBDA to Nippon Koei Company Limited of Tokyo Japan, a firm of consulting engineers. A net irrigation area of 3,850 hectares for rice production and additional 350 hectares, for rain-fed production of staples such as yam, cassava, maize and pigeon pea was developed. Extension services were rendered by Japanese corporation Agency (JICA) company of Japan to the project farmers. About 350 farmers cultivate rice in the project annually. They produced about 4 tons of rice per hectare originally (Anambra-Imo Rivers Basin Development Authority, (AIRBDA, 2004).

The extension services rendered by JICA were withdrawn due to the expiration of the Japanese firm's contract. The withdrawal of the extension services led to decreasing yields since most new farmers are not groomed in the proper technologies in rice harvesting. Rice yields according to Nweke, (2007) have been declining from the 4 tons per hectare to 3.5 in 2005, 2.9 tons in 2006, 2.7 tons in 2007, and 2.7 tons in 2008 years respectively. Also series of wars in the area, like the wars between Aguleri and Urnueri, Omasi and Igga, and Omor and Igbakwu forced so many farmers to quit the area. As a result of these wars, new rice farmers were registered. Based on these reasons, therefore, there is need to determine the harvesting technologies required for improvement in the Duu-Anambra River Basin.

The major agricultural activity engaged by farmers in the study area was rice production by project participating farmers. The farmers come mainly from the rural communities within the projects area in Ayamelum and Uzo-Uwani L.G.As of Anambra and Enugu States of Nigeria respectively.

Rice harvesting technologies required for improvement by farmers in the study area was conducted so that difference or gap between actual performance and desired performance of the farmers are determined. A major constraint to improving rice harvesting technologies is competence gap, the difference between what farmers required and what they actually possess.

Technologies in Rice Harvesting

Harvesting is a necessary operation in any rice enterprise. It is advisable to harvest rice when over 80% of the panicles have mature and turned brown. This is to avoid losses usually due to some easily shattering varieties. Harvesting can be done manually using sickles or knives and can be mechanically handled with the use of rice reapers and harvesters. Whichever method that is used to harvest, it is essential that:

I. Only one variety at a time should be harvested for seed purposes.

II. Further dry the harvested rice to reduce the moisture content to safe levels before threshing.

III. Harvested rice should be placed on concrete slabs or tarpaulins for drying and threshing purposes; avoid the use of ordinary ground for drying and threshing.

IV. The different varieties should be kept, separately during and after harvesting (Gana, 2006).

Rice is harvested when the panicles had turned straw colored. The panicles are cut near the head and gathered in swaths especially for mechanical threshing. Some mechanical thresher

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does carry out some winnowing. Human labor should be used to further winnow the rice and dry to about 12-14% moisture content before bagging. Some deep water rice ripening in September and early October, are usually harvested in standing water. Most cultivars are harvested from late October to early December. The harvesting operation and the treatment of crop residues are important because of the significance of straw and stubble in the economy of the rice growers and because two of the major pests — yellow stem borer and stem nemathod — die overwinter in the rice stem. The panicles together with a length of about 45cm, is reaped by sickle, gathered into loose sheares and carried from the field the same day. In varieties with uneven ripening, which tend to shatter readily, the early ears may be removed a few days before the main harvesting.

Bainer, (2010) reported that most rice grown in the United States now is directly harvested with self- propelled combine harvesters. A small amount of seed rice is cut, and threshed from the windrow when the seed has drained down to 12 percent moisture or less. That direct combining and artificial drying is the most efficient and economical way of harvesting rice. Careful adjustment of the combine and proper methods of operation result in grain having highest milling quality and commercial value. Before the adopting of direct combining, the United State rice industry used three other methods of harvest. These in order, were:

1. Harvesting by hand with a sickle or cradle, and then stationary threshing.
2. Cutting with team -drawn grain binders, hand shocking the bundles, and then engine powered stationary threshing and
3. Cutting with a tractor-drawn holler or swatter, followed by threshing from the window with a pick-up combine.

Self-propelled rice combine harvesters are equipped with relatively large bins or hoppers for collecting the threshed grains. The hoppers are then emptied by mechanically auguring the rice into self-propelled “bank-outs” or tractor-drawn cat that take the rice to waiting field-side trucks. Rice then is hulled to driers or to aeration bins where it is unloaded by use of grain angers or other bulk- handling methods.

The technologies in harvesting of rice with combine are as follows: The operators should take care not to crowd the feed, because the straw is heavy and green at harvest. The ground speed of the machine should be low enough to avoid clogging. Since the rice kernel is very susceptible to cracking, the cylinder should be run at a slower speed than for other cereal crops and allowing a small percentage of kernels to crack may be necessary to thresh out a maximum yield (Mullins, 2011).

Most combines now are equipped with straw hoppers, which cut up the rice straw as it leaves the combine, and a distributor which spreads the straw particles uniformly over the stubble to facilitate ploughing under. The combine ground speed should be reduced to three km per hour when the rice is badly lodged. The height at which the rice was cut is very important, since the amount of straw serves as a cushion to the grain in threshing processes; and resulted in a loaner cylinder loss and less hulling and breakage. Combine loss also may be due to overloading or improper machine adjustment or a combination of the two. Over loading as a result of excessive ground speed usually is the major cause for excessive loss in all sizes of combines, several loss checks should be made on a machine in a given area to determine the effect of adjustment or change in ground speed.

On curing after hand harvesting, it is left in swath or bound into sheaves. It may be laid on the ground, hung on racks or stacked in varieties of ways to facilitate drying. Local weather

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conditions and customs influence the choice of techniques, but it is hardly possible to find a correlation between the various method and climatic conditions.

Threshing of rice involves separating the grain from the panicles, but not removing the husk. A wide variety of methods are employed. An ancient and still widely used method is to beat rice against a solid object. Another skill area of manual threshing still common is to beat bundles of rice with a device generally referred to as a flail. Presently rice has occasionally been threshed by using tractors with rubber tires instead of animals for treading. Mechanical threshing would enable the farmer to thresh the paddy immediately after harvest, when the grains still have a moisture content of 20% or even more. This would speed up the process and reduce spoilage, but the paddy would require thorough drying after it has been threshed.

Another skill area in field curing is that improper drying of rice, moisture content, must be removed from inside the kernel. Harvested rice should not be dried rapidly. The temperature of the drying air should not be too high so that quality should not be seriously unpaired. To prevent internal checking or breaking of the kernels from drying too rapidly, curing usually is done in three to five stages. In each stage the grain passes through the driver and then is tempered in a bin, so that the kernel moisture will equilibrate before threshing. Winnowing which is the removal of trash or impurities from the grain is done after threshing. In winnowing it is advisable to determine the direction of the wind as this will accelerate the process of manual winnowing.

STATEMENT OF THE PROBLEM

The farmers in the three rice production projects in the Duu- Anambra Rivers Basin produce rice in commercial quantity. Rice cultivation therefore, is their major source of income. But despite this fact, most of them are quitting the business as a result of low yield. The decreasing yields according to AIRBDA, (2008) were attributed to the withdrawal of extension services on rice agronomy rendered to the farmers by the projects. Based on this therefore, there is need to determine the technologies required for improvement by the farmers.

The operation of the majority of rice farmers in the study area as observed by Nweke (2009) are constrained by poor technologies in rice agronomy (including harvesting). The level of rice yields and quantity of produce depends to a large extent on the agronomic practices. It is expected that technology improvement needs of the rice farmers be determined and correct interventions addressed through educational strategies. The decrease in yields in the basin is also attributed to series of wars in the area; like the wars between Igga and Omasi, Omor and Igbakwu and Aguleri and Umeri. These series of wars forced so many rice farmers out of the study area. As a result many new rice farmers were registered in the area. Most of the old farmers have also retired. Based on these reasons, there is need to determine the technologies required for improvement in rice harvesting of the relatively new farmers.

SIGNIFICANCE OF THE STUDY

The findings of the study would be of benefit to many people. These people are; the rice farmers already in the field, the policy makers in the ministry of Agriculture including ADP the extension Agents as well as researchers. The findings of this study if published would provide information which will help the rice farmers to determine the areas in which technology improvement is required in rice harvesting.

The new entrants into rice production would gain much knowledge in terms of the areas that require improved technologies/practice in rice harvesting that would be employed in the rice cultivation business. With the findings of this study, the policy makers would be able to

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advice the government on the recommended technologies required by farmers for improvement in the study area. This would enable the government find suitable method to assist the rice farmers in order to adopt innovation and improved technologies in rice harvesting. Thus, the basin would contribute its quota in boosting rice production in the country.

OBJECTIVE OF THE STUDY

The objective of this study is to determine the harvesting technologies required for improvement by rice farmers in the Duu-Anambra Rivers, Basin of Enugu and Anambra States and also to determine whether gender has influence on harvesting technologies required for improvement by farmers.

RESEARCH QUESTION

What are the work-skill improvements required by the rice farmer in harvesting?

RESEARCH HYPOTHESIS

There is no significant difference in the mean ratings of male and female rice farmers in harvesting technologies required for improvement.

METHODOLOGY

One research question and one research hypothesis based on the objective of the study where formulated to guide the study.

The descriptive research design was employed to conduct the study. A structured questionnaire of 10 items was developed and utilized. The target population comprised of all the registered rice farmers in the three rice projects, (Adarice, Would Bank and Lower Anambra Irrigation project) in the basin. The total population for the study was 350. These comprise 140 for the Aderice, 100 for World Bank and 110 for the lower Anambra Irrigation Project. There was no sampling for the study because the population size was manageable. The questionnaire contained section A and B. copies of the questionnaire were administered to the farmers with the assistance of 4 research assistants who were trained by the researchers. Out of the 350 copies of the questionnaire distributed, 348 were completed and returned, data collected were analyzed using mean, standard deviation and independent t-test statistics was employed in the analysis of the data.

RESULT AND DISCUSSION

Research Question

What are the work-skill improvements required by the rice farmers in crop harvesting?

Table 1 shows the mean score of farmers on level of improvement required on work-skills in rice crop harvesting. Items 3, 4, 8 and 10 have mean range of 3.5- 4.49 which based on the decision point imply that they highly required improvement on these items, the item in which they highly required improvement are; appropriate within of the provides arranging the cut heads into swaths before threshing; use of threshing machine to thresh and paddy, to appropriate storage moisture content.

They moderately require improvement in items 1, 2, 5, 6, 7 and 9 which their means range from 2.5-3.49. The work skills at which they moderately require improvement are:- determine the optimum grain ripening stage and moisture content for harvesting, proficient use of harvesting implements. Manual threshing operation for optimal grain recovery.

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Operating and maintaining simple harvesters separating and clearing operation for optimal grain recovery and maintenance of threshing machines.

Table 1. Farmers Scores on work-skill improvement required for Rice Crop Harvesting N = 348

Item No	*Work-Skills in Rice Crop Harvesting*	$\overline{X}$	*SD*	*Remark*
1	Determine the optimum grain ripening stage and moisture content for harvesting	2.90	1.05	Moderate
2	Proficient use of harvesting implements	2.09	1.01	Moderate
3	Appropriate cutting of the panides	3.58	1.09	High
4	Arranging the cut heads into swaths	3.56	1.07	High
5	Manual threshing operations for optimal grain recovery	3.08	1.00	Moderate
6	Operating and maintaining simple harvesters	3.19	0.95	Moderate
7	Separating and cleaning operations for optimal grain recovery	3.34	1.01	Moderate
8	Use of trashing machine to thresh	3.60	1.10	High
9	Maintenance of threshing machine	3.18	1.01	Moderate
10	Paddy drying to appropriate storage moisture content	3.57	1.08	High

Research Hypothesis

There is no significance difference in the mean rate of male and female rice farmers in harvesting technologies required for improvement.

Table 2. Calculated t-values on work-skill improvement required of male and female rice farmers in harvesting in the study area

Item No	*Work-Skills in Rice Crop Harvesting*	$\overline{X}$	*SD*	$\overline{X}$	*SD*	*t-Cal*	*Sign Level .05*
1	Determine the optimum grain ripening stage and moisture content for harvesting	3.81	98	3.03	1.04	2.07	S
2	Proficient use of harvesting implements	2.99	1.11	2.99	0.95	0.21	NS
3	Appropriate cutting of the panides	3.71	1.21	2.99	0.95	0.21	NS
4	Arranging the cut heads into swaths	3.35	0.94	0.94	0.94	1.99	S
5	Manual threshing operations for optimal grain recovery	3.37	0.93	2.68	0.97	2.24	S
6	Operating and maintaining operations for optimal grain recovery	3.29	0.95	3.06	0.94	0.71	S
7	Separating and cleaning operations for optimal grain recovery	3.37	0.91	3.30	1.14	1.73	NS
8	Use of trashing machine to thresh	3.62	1.08	3.44	1.11	1.73	NS
9	Maintenance of threshing machine	3.48	0.9	3.28	1.15	0.71	NS
10	Paddy drying to appropriate storage moisture content	3.66	1.07	3.46	1.11	1.73	NS

Table 2, shows the means and calculated t-values for comparing the male and female rice farmers' ratings of level of improvement required on work-skills in crop harvesting. The analysis shows that the calculated t-values for items 2, 3 and 7-10 have no significant difference ($P > 0.05$) as perceived by male and female farmers. The Null hypothesis of no significant difference in respect of these items was therefore accepted. On the other hand, the

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t-test results show significant difference between the mean ratings of male and female farmers on items 1, and 4-6 ($P < 0.05$). The Null hypothesis of no significant difference in this respect was therefore rejected.

Gender therefore has no influence on work-skill improvement required in respect of items 2, 3 and 7-10 in rice harvesting, while gender has influence on work-skill improvement required in respect of items 1 and 4-6.

Discussion of the Findings

It was discovered that rice farmers require improvement in harvesting technology in the area of the study. The result also showed that gender of the farmers did not significantly influence their perceptions of level of technology improvement in rice harvesting in 6 out of the 9 items presented to them for the study. Another investigator made similar observation. Arkins (1989) observed that gender (male and female) of farmers did not significantly influence the farmers' perceived opinion on technology improvement required in rice harvesting. On the other hand, another observation made by Anuba (1987) differed in this respect.

The similarity between male and female rice farmers in their perceived opinion on technology improvement required in rice harvesting could be attributed to the fact that they have been involved in the cop production for a number of years now. The significant difference obtained from the perceived opinion of the male and female farmers in rice harvesting could be as a result of individual difference in technology acquisition and requirement.

CONCLUSION

On the basis of the findings of the study, the following conclusions were drawn. Rice farmers require improved technologies in harvesting. These include; planning of rice harvesting, use of sickle for harvesting, arranging panicles when threshing, determining the optimal grain ripening stage and moisture content for harvesting, proficient use of harvesting implements, manual threshing operations and maintaining operations for optimal grain recovery, separating and cleaning operation for optimal grain recovery and paddy drying to appropriate storage moisture content among others. Gender also has no significant difference in the mean rating of male and female rice farmers in the study area.

RECOMMENDATIONS

Based on the findings of the study, the discussion and conclusions therefore, the following recommendations were made;

1. Organizing workshop to rice farmers on technologies in rice harvesting to enable them acquire innovative technology practices in rice harvesting.
2. Improving rice harvesting technologies based on providing training for farmers to adopt identified requirements in rice harvesting.
3. There should be agricultural education programs on the media and this should be employed to educate farmers on the identified technologies required by the farmers for improvement and other relevant information that farmers would require especially before the beginning of the harvesting season.

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