

POST-HARVEST HANDLING OF RICE PADDY AND ITS EFFECTS ON PADDY QUALITY: A Case Study of Olam Nigeria Outgrowers in Pategi Local Government Area of Kwara State, Nigeria



A Research Project Submitted to Van Hall Larenstein University of Applied Science in Partial Fulfillment of the Requirements for the Degree of Masters of Development, Specialization in Rural Development and Food Security

SUBMITTED BY

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DEDICATION

This thesis is dedicated to the Almighty God for His grace upon my life from the inception of this programme and to my loving mother Mrs. Christiana Fadesere for her words of encouragement.

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LIST OF ACRONYMS

BLP	Back to Land Programme
DFRRI	Directorate of Food, Roads and Rural Infrastructures
FAO	Food and Agriculture Organization
IRRI	International Rice Research Institute
IITA	International Institute of Tropical Agriculture
KWADP	Kwara State Agricultural Development Programme
NAFPP	National Accelerated Food Production project
NAIC	Nigerian Agricultural and Insurance Corporation
NALDA	National Land Development Authority
NFRA	Nigeria Food Reserve Agency
NERICA	New Rice for Africa
NESG	Nigeria Economic Summit Group
OFN	Operation Feed the Nation
RBDs	River Basin Development Authorities
WARDA	West African Rice Development Agency

DEFINITIONS OF KEY TERMS

- Milled rice: Milled rice could essentially be called white rice. Unlike typical brown rice, which has only the husk removed, milled rice also has the rice bran layer and the germ of the rice removed
- Paddy rice: Paddy rice is the individual rice kernels that are in their natural, unprocessed state. Sometimes referred to as rough rice, paddy rice is harvested directly from rice field
- Technique: A technique is a procedure used to accomplish a specific activity or task
- Winnowing: It is an agricultural method developed by ancient cultures for separating grain from chaff by means of a current of air.

ABSTRACT

This study investigated the effects of post harvesting techniques used by Outgrowers of Olam Nigeria Limited in Patigi Local Government Area of Kwara State on the quality of harvested paddy rice. In order to achieve this, 25 farmers were selected from the list of the outgrowers provided by the State Agricultural Development Programme. Out of which 13 are male and 12 are female. A focus group was conducted according to the gender to gather information on the stages of post-harvest handling of the rice paddy. The result of the focus group discussion revealed that respondents harvest rice with sickle and after harvesting, they stockpile the harvested rice stalk paddy in heaps which they turn in order to dry before threshing. Threshing is manually done by beating the harvested rice stalk or straw on a metal water drum with capacity of 100 litre in order for the grains to be detached from the rice stalk. The respondents transport the paddy in bags of 50kg and buckets in order to clean and store the paddy rice. They clean their paddy by winnowing which is to allow the air current to blow off chaff gathered during threshing. Also, the use of sieve with a mesh that allows small stones gathered during threshing and drying to drop from the paddy grains and hand pick the heavier foreign materials like bigger stones and animal waste. After this stage, the rice paddy is bagged into 50kg sacks made of polythene.

To know the effect of the handling of paddy in the different stages, the farmers were interviewed individually. The result of the interview revealed that the techniques of drying used by the outgrowers is ineffective and cannot produce dry paddy free of the impurities like stones; animal excretes, stop grain from sprouting and to be discoloured as a result of mould. Also, threshing which is the most difficult operation in the post-harvest handling stages has introduced stones which determine to a greater extent the grade of paddy rice according to the specification of Olam Nigeria Limited. The methods used in cleaning the paddy are inefficient and have lots of impurity still find their way to the storage houses. The paddy quality is also affected during storage as farmers are faced with the constraints of available space and leaking roofs and also attack by rodents and weevil in the storage house which cause sprouted grains, discoloured (mould) grains, damaged grain during storage.

This study focuses on post-harvest handling of rice paddy by investigating the case of smallholder outgrower farmers Patigi Local Government area Kwara State in contract farming of Olam Nigeria Limited (an industrial rice mill) in Nigeria. The objective of the study is to know the effects of post-harvest handling techniques used by the contract farmers in Olam Nigeria Limited rice outgrowers initiative programme on the quality of harvested paddy rice. The development of the rice industry through public private partnership (PPP) is being supported by Olam Nigeria Limited through contract farming (CF) programmes in three states in the north-central part of the country; specifically in Benue, Kwara and Niger states. The objectives of the contract farming programmes according to Olam Nigeria Limited are to (i) support the development of farmer groups through the mobilization of farmers and facilitation of group formation, (ii) develop the capacity of farmers for increased production and improved productivity through training in rice production management practices, post-harvest handling, and maintenance of high quality standard and improved marketing strategies, (iii) improved the marketability of farmers' produce through quality improvement, increased output and improved storage facilities, (iv) establish viable strategic partnerships that include farmers, government agencies and Olam to ensure good flow of information, knowledge and technological innovations, (v) facilitate farmers' access to modern inputs such as improved seed varieties, fertilizers and agro-chemicals and (vi) increase profitability of rice cultivation by providing assured markets and profitability-enhancing technologies.

As mentioned above that Kwara State is one of the three States that started the rice contract farming with Olam Nigeria limited. The methods of post-harvest handling used by the farmers in Patigi Local Government Area was said to have contributed to the poor quality of paddy that the farmers in the rice producing region (Patigi Local Government) of Kwara State supply to Olam without knowing the sequence in which they handle the rice paddy and the constraints encountered by the farmers during the different stages of handling the harvested paddy (USAID, 2009). In order to achieve the objective this study, two focus groups comprising 12 female and 13 male were conducted to know the stages in post-harvest handling of rice paddy according to gender respectively. The respondents were selected through simple systematic random sampling from the register from the Kwara State Agricultural Development Programme (KWADP). The register has 450 names under 13 groups of rice farmers in Patigi. Also, these respondents were interviewed in order to gain in-depth understanding of the techniques they use at the individual level.

This report is structured into seven chapters. Following this chapter is chapter two that describes the background information of the study about the activities of Olam Nigeria Limited, the outgrowers of Olam Nigeria Limited in Patigi, the post-harvest stages of paddy handling in Outgrowers, and also the study area. Chapter three discusses the research problem, problem statement, problem definition and conceptual framework on how stages in handling of harvested rice paddy are linked to grain quality. Chapter four deals with the methodology on how this study was carried out. The findings and the summary of raw data is presented on chapter five. While chapter six focused on result by discussing the findings presented in chapter five. The study is rounded off with conclusion and recommendation on chapter seven and the interview questions, field pictures and value chain of rice production are presented in the annexes.

2.0

BACKGROUND INFORMATION OF THE STUDY

This chapter presents the activities of Olam Nigeria Limited in its contract with rice farmers. It also discusses the outgrowers of Olam Nigeria Limited in Patigi, the post-harvest stages of paddy handling in Patigi, and also study area where this research is carried out.

Basically Olam is a trading company from Singapore in agricultural commodities all over the world and its engagement in rice contract farming in Nigeria is a kind of backward integration to ensure a regular source of raw material for its rice mill and to enhance farmers' productivity and profitability (Olomola, 2010). It is also embarked upon as part of the company's corporate social responsibility. According to Olam Nigeria limited in Olomola (2010) the contracting procedure is by registering interested farmers. They added that registration of farmers is on an annual basis. Farmers are registered as groups or cooperative societies. As at 2007, Olam operated with 72 cooperative groups with group members ranging from 30 to 120.

Usually, Olam appoints a coordinator to manage the groups and there can be between 13 to 20 groups under each coordinator. The coordinator signs contract agreement on behalf of Olam while group leaders sign on behalf of the members. The coordinator reports directly to the project manager. The contract hinges specifically on input supply and buy-back of paddy.

2.1 Rice Pricing Mechanism of Olam Nigeria Limited

There is a price committee consisting of group leaders and coordinators. They move around markets in all the States and analyse the market prices and unanimously take a decision as to what should be the price of the paddy for that period.

Their decision is presented before Olam management for approval. Olam management compares feedback from price networks within the country with the price placed before them and approves accordingly. There can be variations in the prices received by farmers based on the quality of paddy. The presence of foreign materials and degree of admixture (of long grain and short grain e.g FARO 44 and TON 2) is the quality criterion which is often applied to differentiate prices. Variation in moisture content does not affect pricing. Further drying of paddy can be carried out at the factory if need be.

2.2 Major Risks and Risk Sharing Mechanisms Used by Olam Nigeria Limited

According to Olam Nigeria Limited in Olomola (2010), they identified two important risk areas associated with the rice contract farming: (a) Financial risk and (b) Commodity risk. With regard to the financial risk, the contract involves input supply as credit in-kind and there is need to intensify loan recovery efforts to sustain the system. At the current level of funding the risk appears to be manageable but if there is expansion of the programme to cover a larger number of rice farmers, the money involved will be too large for Olam to provide. Provision of any amount larger than what is currently being provided will imply moving into the high risk area because of the uncertainty in recovering such a large amount. For example, for 6000 farmers in 2007, the amount involved was about ₦170 million. The number of farmers was expanded to 10,000 in 2008 and the volume of money goes to ₦300,000 million and it is of great risk Olam Nigeria 2008 in Olomola (2010). For this reason, it is only in Benue that Olam has a total support model for the contract engagement. Olam maintained that different models have to be adopted in the case of Kwara and Niger states. The commodity risk is inherent in the buy-back system. All the inputs supplied remain with the farmers, right from the beginning of farm operations when they have to be supplied as a package. The final products which are supposed to be given to Olam is also under the control of the farmers and remain with them until they decide to bring to Olam. There lies the commodity risk. Unless farmers bring the produce to Olam, the possibility of total loss of the investment involved is quite high. Invariably, effective

monitoring of groups through the group leaders and buy-back of the produce at the prevailing market price are key instruments being employed to ensure that rice farmers will not sell in other markets but bring the produce to Olam. The major risk sharing mechanisms are as follows.

1. Establishment of Model Farms: To produce good quality seeds for distribution to the farmers and to serve as demonstration plots during field days for the training of farmers. This includes the green stage training otherwise known as the in-season training and the brown stage training during which farmers are taught good agricultural practices. At the green stage, cultivation practices such as land preparation, planting, weeding and plant protection measures are taught. At the brown stage attention is focused on pre-and post-harvest practices, bird scaring and proper harvesting methods. There is training of trainers' workshop (TOT) for the group leaders who are to embark on training of farmers in addition to the Field Days organized for the farmers.
2. Provision of Buy-Back Incentives. Olam provides bags and tractors for transportation and some money for bagging, stitching and security. The group leaders report to coordinators, collect tractor and go to the villages to convey the produce and bring to Olam's rice mill in Makurdi. Thereafter the paddy goes for milling. They are finally packaged into 5kg, 10kg, 25kg and 50kg bags. Olam provides the following incentives.
 - 10 empty bags per MT at no cost
 - ₦650/MT towards loading and delivery expenses bear the cost of transportation of the paddy from farmers' villages to the mill –about ₦4000/MT
 - Olam ensures that payment is made in full within 24 hours of receipt of paddy at the mill. If the bags weigh more than 100 kg (which is the standard package for paddy), there is additional proportional payment for the excess quantity.
3. Provision of Insurance Facilities. Olam ensures that the out-growers farms were insured with NAIC (Nigerian Agricultural and Insurance Corporations) in 2007. The premium paid is 3% of total cost of cultivation for the 6000 ha. Cost of production was estimated at ₦55,000 per ha. The crop cycle is from May to December but the actual gestation period is from 90 to 120 days for the FARO 52 and 44 varieties. In the case of any damage during the production year, compensation is limited to the proportional cost incurred up to that particular stage in the production process. There were reports of flood damage from 140 rice farmers in 2007. A sum of ₦4.7 million has been claimed by Olam as compensation from NAIC. This was paid to the affected farmers after the buy-back exercise was over around May 2008. If farmers default in their loan repayment the claim amount due to the farmers concerned can be used to partly offset the loans (Olamola, 2010).



Figure 1: Certified seed supplied to farmers by Olam Nigeria Limited (Source: KWADP, 2012)

The farmer groups formed are made to serve as collaterals such that the group guarantees the loans as well as ensures they are repaid on time. Where loans are obtained from banks through Olam's facilitation, they are in form of on-lent arrangements and commercial interests are charged. Olam Nigeria Limited recognized this limitation and thus encouraged the formation of farmer groups to provide social collateral. The number of people in a group varies. In Nigeria, for a group to be regarded under the cooperative ordinance as a cooperative society, the minimum number is ten. In the food crop producing areas as in Makurdi where rice is produced, the group obtains the loan, disburses the loan to its members and ensures that members pay back these loans on time, too. The group also uses sanctions such as loan denial, to keep erring members in check in terms of their dealings with Olam. Furthermore, it is easy to reach the several individual farmers with inputs, training, new technology or ideas through their groups which they run by themselves (Olomola, 2010).

2.3 The Study Area and Rice Outgrowers

The study was conducted in Patigi Local Government Area which is the largest rice producing community of Kwara State. The study area is in the southern-end of the Middle Niger (Nupe) Basin (otherwise called the Lower Niger Basin) lies within the northern edge of Kwara State in the west-central part of Nigeria.



Figure 2: The lower Niger basin Patigi

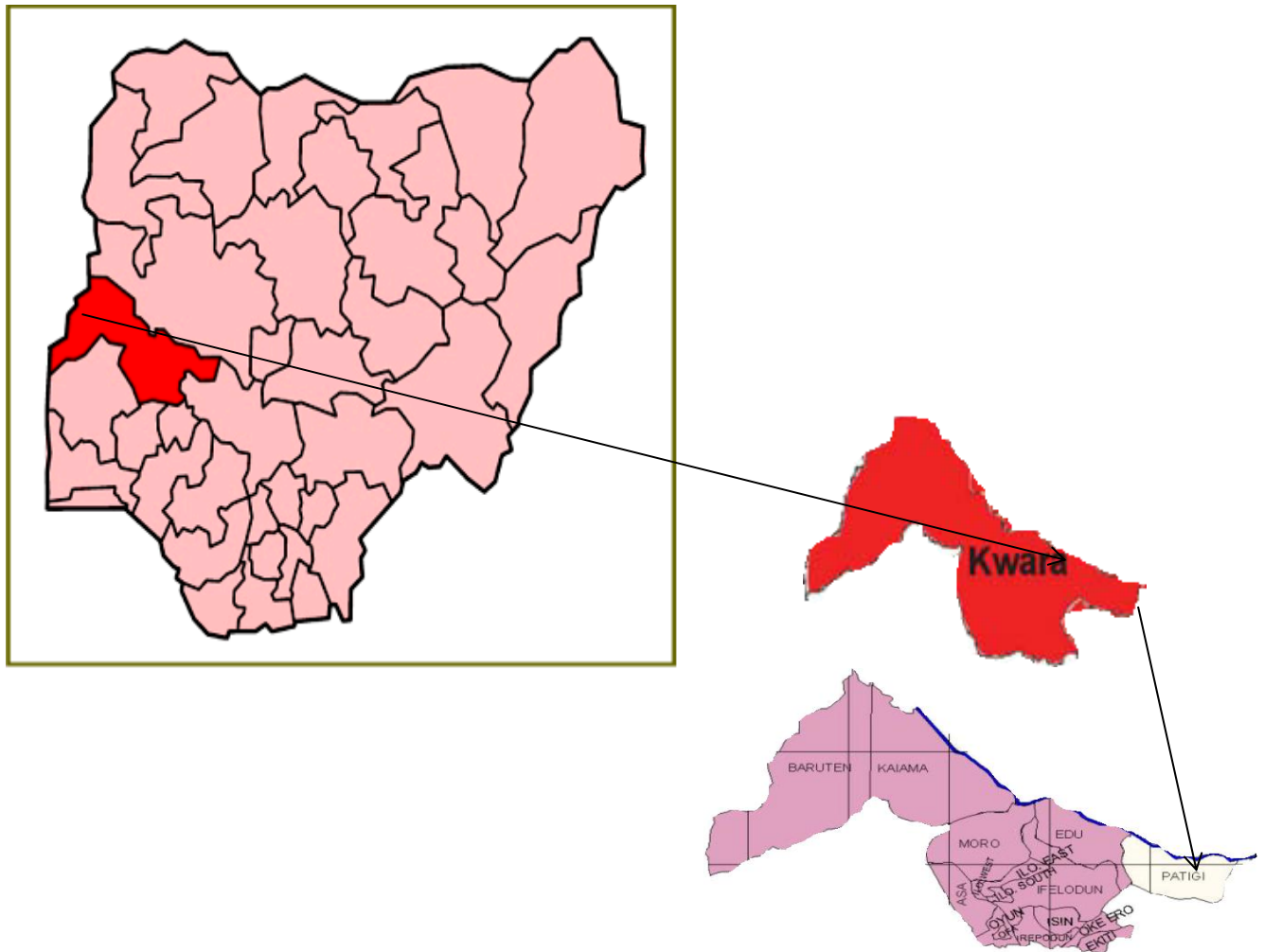


Figure 3: Map of Nigeria showing Kwara State and Patigi Local Government Area

Pategi Local Government Area is located within $8^{\circ}50^1$ N and $5^{\circ}25^1$ E of the equator and was created from Edu Local Government Area of Kwara State in Nigeria. Kwara State is located in the West-central area of Nigeria and lies in the region termed the middle belt of Nigeria. The state is bounded by Niger and Kebbi States in the northern part, Kogi State in the East and Osun, Oyo and Ondo State in the South and Republic of Benin in the West. It is located in the forested savanna and enjoys moderate dry and wet seasons, with heavier rains falling in September and October.

The major occupation of people in the area is farming and various crops are cultivated which they consume and also grown as cash crops. Rice, sorghum, cassava, maize, yam, beans and sweet potatoes are the major crops and as Bello and Ala (2011) ranked the percentages of income from different crops grown in the area with rice taking about 35%, sorghum (19%), melon (14.2%), yam (10.8%), maize (7.5%), groundnut (7.5%), cassava (5%), and millet (0.8%).

The ecology zone of Patigi is lowland and the majority of the farmers grow faro 44 which is a long grain with maturity day between 110 to 120 days and it was introduced to them by Olam Nigeria Limited in 2007 (KWADP, 2012). The population of the the area is 45,494 (22,712 males, 22,782 females) and total land area of about 2924.62sq.km, which is about 5% of the total land area of the state (Daniel, 2011).

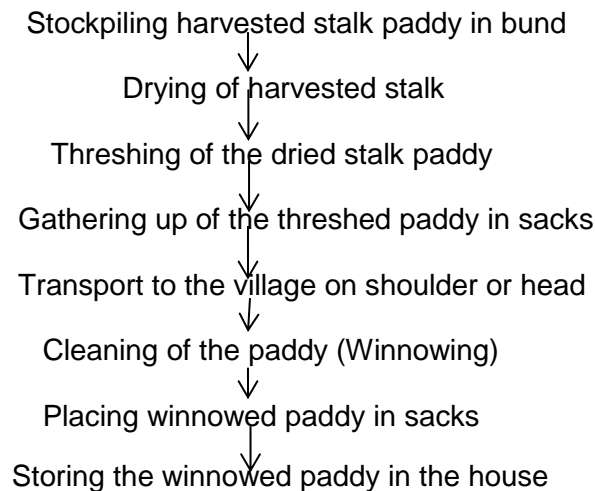
2.4 Rice Outgrowers in the Study area

In 2007, OLAM Nigeria Limited in collaboration with First Bank Nigeria disbursed N309 million as loan to farmers in Kwara State. In Patigi Local Government Area of Kwara State 450 rice farmers participated in the rice outgrower initiative (KWADP, 2012). They added that the loan was given to boost production in the area and the need for the production of homogeneous quality of paddy to ensure good quality rice. The loan was administered as certified seed (Faro 44), fertilizers, chemicals (pesticides and insecticides) and as cash to the groups for transportation to Olam Nigeria Limited's collection centre in Kwara. According KWADP (2012), Olam Nigeria initiated the rice project in 2007 with a 750-hectare farm and 450 farmers. Since the inception of Olam Out grower programme in 2007, the number of rice farmers participating in the programme has been on increase (Shabu, Gyuse and Abawua, 2011). In Kwara State 750 hectares of rice were cultivated in 2007; 1337 hectares in 2008 and 5,146 hectares in 2009 under Olam Nigeria Limited rice outgrowing project (KWADP, 2012). About 62.7% have farm size of between 1 – 5 hectares with mean farm size of 2.18 ha (Mantanmi et.al, 2011). They added that majority of the rice farmers are within the age category 41 – 50 years.



Figure 4: A rice field of one of the respondents in Patigi

2.5 Flow Chart of Post Harvesting of Rice Paddy in Patigi Local Government



Harvesting is mostly done with sickle by smallholder farmers in Patigi when grains are hard and are turning yellow or brown that is about 30–45 days after flowering (Ekeleme et al, 2008).



Figure 5: Sickle for harvesting rice in Patigi

There are two main methods of harvesting rice in Nigeria: cutting the rice plant near the ground to harvesting both the straw and the panicle together, or cutting just the panicle (rice head) and leaving the straw standing in the field (Olayanju et al, 2012). In Patigi the common method used by majority of the rice farmers is to harvest the rice stalk about 10-15cm near the ground. Farmers also cut just the panicle especially when paddy is to be threshed in the house. The stages in post-harvest handling are:

2.5.1 Stockpiling harvested stalk paddy in bundles or heaps

The harvest rice stalk is allowed to dry by placing the harvested stalks together with ropes tied across them in different bundles in an upright position for drying before threshing. Also the farmers gathered the harvested stalks in different heaps of about 100cm which they always turn every day to allow even drying. In Patigi, drying is basically carried out during the dry season and some farmers thresh two day after harvesting to discourage the grains from changing

colour. In general to avoid discoloration, Olam Nigeria limited advice the farmers to thresh immediately after harvesting (KWADP, 2012).

2.5.2. Drying of stalk paddy

Majority of the farmers leave the harvested stalk to dry on the field after harvesting for about one week under the sun because labour required for threshing is not readily available (KWADP, 2012). Also, some farmers prefer to dry immediately after threshing on concrete or mat under the sun. The required moisture content is about 14% by Olam Nigeria Limited. However, the traditional method of detecting the moisture content of the paddy is by biting randomly. According to KWADP (2012), Olam Nigeria Limited normally tests for moisture level with a small digital moisture tester before buying from the farmers.

2.5.3. Threshing of the stalk paddy

Threshing is done manually to separate grains from the harvested rice stalk. The unshusked grain is often called rice paddy or paddy rice. . The most frequent threshing method in Patigi is to beat the harvested stalks on a drum or with a stick on mats (if it is harvested at the panicle).

2.5.4. Gathering up of the threshed paddy rice in sacks

The threshed paddy is gathered in polythene bags (sacks) of different sizes or buckets (10litre). The available sizes are 50kg, 25kg and 10kg. According to KWADP (2012), the gathering of the threshed rice paddy into 50kg bags is done immediately after threshing to prevent gathering more impurities and also birds from picking the threshed grains.

2.5.6. Transport to the village on shoulder or head

After gathering the threshed paddy rice into bags (sacks) or big bucket, they are transported home in order to clean by winnowing, sifting and sorting out big particles with hands. Men always prefer to place the sacks on their shoulders and women carrying the sacks on their head.

2.5.7. Cleaning (winnowing) of rice paddy

The threshed paddy is transported home to thresh in order to monitor it and ensure that impurities are removed. In Patigi, paddy rice is cleaned by winnowing which is the popular method to separate the light particles such as chaffs that are gathered during threshing. Winnowing is done by making the grain fall down from a tray (46x35.8x2.3cm) to be collected on a surface such as mat made from different sacks. This method depends on air natural conditions and is very slow (Meija, 2004). Also, sifting is used separating stones from the paddy. The sieve for sifting is made from raffia cane and at the base is a mesh (size?) that allows the tiny stones and other tiny particles to fall and be separated from the rice paddy. It is also use to winnow. Another method of winnowing is to blow a thick mat that serves as fan over the threshed paddy.

2.5.8. Placing winnowed paddy in sacks (bags)

The winnowed or cleaned paddy is packed inside sacks of 50kg, 25kg or 10kg before storing. The recommended size according to Olam is 50kg because paddy is collected in 50kg bags.

2.5.9. Storing the winnowed paddy in the house

The winnowed rice paddy is stored in the house and to ensure long and safe storage of paddy rice, a few precautions are needed. The paddy rice must not contain more than 13–14% moisture, and be handled in a way to avoid moisture absorption either from rainfall or the moist air. Paddy should be protected from insects and rodents (IRRI, 2012).

2.6. Concept of Paddy Rice Quality and Overview of the International Standard for Paddy Quality

Several interrelated features determine the quality of paddy including: moisture content, purity, varietal purity, cracked grains, immature grains, damaged grains and discolored/fermented grains, IRRI said. The characteristics are determined by the weather conditions during production, crop production practices, soil conditions, harvesting and post-harvest practices.

-Moisture content (MC)

This influences all aspects of paddy and rice quality, making it essential that rice be milled at the proper MC to obtain the highest head rice yield. Paddy is at its optimum milling potential at an MC of 14% wet weight basis, IRRI said. Higher moisture contents are too soft to withstand hulling pressure, which results in breakage and possible pulverization of the grain. Exposing mature paddy to fluctuating temperatures and moisture conditions can lead to the development of fissures and cracks in individual kernels. Cracks in the kernel are the most important factor contributing to rice breakage during milling, IRRI said. This results in reduced milled rice recovery and head rice yields. Grain should be harvested at about 20% to 24% moisture or about 30 days after flowering. If harvest is too late, grains are lost through shattering or dry out and are cracked during threshing, which causes grain breakage during milling, IRRI said

-Crack Grain

Grain that is too dry is brittle and has greater breakage, IRRI said. MC and drying temperature also is critical, because it determines whether small fissures and/or full cracks occur in the grain structure.

-Purity

Purity refers to the presence of dockage (materials other than paddy) including chaff, stones, weed seeds, soil, rice, straw, stalks and other debris, IRRI said. The impurities generally come from the field or the drying floor. Unclean paddy means a longer cleaning and processing time for the grain. Foreign matter in the grain reduces milling recoveries and the quality of rice, and it also increases the wear on milling machinery, IRRI said.

-Admixture

Mixing paddy varieties can cause problems during milling, resulting in reduced capacity, excessive breakage, lower milled rice recovery and reduced head rice. Different sized and shaped grains makes it difficult to adjust equipment such as hullers, whiteners and polishers, IRRI said. This results in low initial husking efficiencies, a higher percentage of re-circulated paddy, non-uniform whitening and a lower quantity of milled rice. The amount of immature paddy grains in a sample greatly impacts the head rice yield and quality. The immature kernels are very slender and chalky, which results in excessive production of bran, broken grains and brewer's rice.

-Grain size and shape

Grain size and shape, or the length-width ratio, is different for the varying paddy varieties. Long, slender grains typically have greater breakage than short, bold grains and therefore have a lower milled rice recovery, IRRI said. The dimensions dictate to some degree the type of milling equipment needed. For example, Japanese-designed equipment may be better suited to short, bold grains whereas Thai-made equipment is more suitable for longer, slender grain types, IRRI said.

-Damaged grains

Grains can be damaged by water, insects and heat exposure. The paddy deteriorates through biochemical changes in the grain, the development of off-odors and changes in physical appearance. Yellowing is caused by over-exposure to wet environmental conditions before the paddy is dried. The grains contain partly gelatinized starch cells and resist the pressures applied during milling. The fermented grains do not impact milling yields, but do downgrade the quality of the milled rice because of the appearance. Insect or mold-damaged grains often have black spots around the germ end of the rice kernel. During milling, the black spots are only partly removed, which increases the presence of damaged grains.

2.6.1. Specification of Paddy Quality under Olam Nigeria Limited

1. General Features:

Paddy must:

- a) be the dried mature grains (with husk) of 'faro44';
- b) have uniform size, shape and colour;
- c) be hard, clean, wholesome and free from moulds, weevils, obnoxious smell, discolouration, admixture of deleterious substances and all other impurities except to the extent indicated under special characteristics;
- d) be in sound merchantable condition; and
- e) not have moisture exceeding 14 percent.

2. Special Characteristics

Table 2.0: Grade designation of paddy quality

Grade Designation	Maximum limits of tolerance for Paddy Quality			
	Foreign matter % by weight	Admixture % by weight	Damaged, immature, weevilled % by weight	Price of 50kg Rice Paddy as at October 2012
I	1.0	5.0	1.0	₦ 6,800
II	2.0	10.0	2.0	₦ 5,500
III	4.0	15.0	5.0	₦ 4,300
IV	7.0	30.0	10.0	

Source: Olam Office, Makurdi, Benue State, Nigeria (2012)

Definitions of terms according to Olam Nigeria Limited

- a) **Foreign matter:** It includes dust, stone, lumps of earth, chaff, stem or straw and any other Impurities. In case of admixture of other food grains (e.g. Sorghum, millet) in paddy, 0.5 percent of other food grains shall be treated as free tolerance and anything above 0.5 percent shall be treated as foreign matter. Stones are the major foreign matter because it causes mechanical damages when milling and it is the major determinant of the quality rice in the country.
- b) **Admixture:** Presence of inferior varieties (e.g TON 2) shall be considered as admixture.
- c) **Damaged:** Grains that are internally damaged or discoloured, presence of damaging and discolouring materially affecting the quality of other grains. The proportion of damaged grains shall not exceed 5.0 percent for grade IV.
- d) **Immature:** Grains that are not properly developed.

2.7 Mechanism used by Olam Nigeria Limited in Checking for Quality

Olam Nigeria limited used physical inspection and a digital moisture tester to determine the quality of paddy. Due to the distance and bad road, the staffs of Olam Nigeria Limited arrive at the village early in the morning and attend to the different farmer groups:

- a) The group leaders announce the day the staff Olam Nigeria Limited will arrive and farmers are informed to bring their produce in a neat and clean conditions conforming to the prescribed specifications by Olam Nigeria Limited.
- b) Farmers gather their produce in groups and Olam staffs attend to them through the register and different staff attend to different groups
- c) The staff and the group determine the quality together and weigh in bags of 50kg before stitching.
-Complaints are generally received in some cases that the paddy are rejected by the Staff because it does not conform to the prescribed specifications and whenever paddy is rejected and could not be further improved by cleaning. To prevent such paddy to be sold to other farmers that has not been checked because such paddy is sold at low price to the farmers by the other farmers whose paddy were rejected, a report is given to such farmers warning them not to do so.
- d) After inspecting for quality and weight, the 50kg sack of paddy is stitch manually by the farmers and the staff of Olam use a marker to inscribe the grade and a receipt is issued to the farmers
- e) Olam provides transportation to the village to convey the produce (rice paddy) from the farmers to its mill.



Figure 6: Rice paddy to be convey to the mill

- f) Olam issue receipt for cash payment to individual and they submit to the group leaders who collect cash from First Bank Nigeria and distribute to the farmers according to the record on the register and that of the receipt.
- g) Farmers that do not agree with the staff of Olam and that was unable to bring their paddy before it is transported from the village take the paddy to Olam's collection point in the city on a market day because of the bad road and long distance which is about 6 hours drive by bus from the city.

3.0 PROBLEM DEFINITION AND PROBLEM STATEMENT

This chapter starts with introducing the problem statement, the research problem, the problem definition between Olam Nigeria (an industrial rice mill) and its contract growers in Patigi. Also, the objective of the study, conceptual framework and research questions are presented in this chapter.

3.1 Problem Statement

Rice outgrowers do not supply sufficient quality paddy to Olam Nigeria Limited. The claim of Olam Nigeria Limited is that quality of paddy supply by its outgrowers has been affected by the post-harvest handling practices used by the farmers.

3.2 Research Problem

There has been poor understanding of the effect of the post-harvest handling practices used by the Olam Nigeria Limited rice outgrowers on quality of paddy.

3.3 Problem Definition

Between 2006 and 2009, Olam Nigeria Limited (an industrial rice mill) in collaboration with USAID and invested the sum of (₦309, 000, 000) as loan in rice production in Local Government Areas of Patigi, Moro, Edu and Ilorin East and South of Kwara. According to Olam Nigeria in a report by USAID (2009) the loan was given under the rice outgrowers' initiative programme to boost production in the area in the form of cash, seeds, fertilizer, and chemicals. In 2009, Olam Nigeria Limited complained about the quality of Paddy supplied by the farmers in Patigi Local Government of Kwara State. They explained that the major problem associated with the poor state of paddy quality is the post-harvest handling techniques used by the farmers. They expounded that the paddy that the farmers supplied contain stones, other forms of impurities like sand, animal excretes, and is not evenly dried which is the result of poor post-harvest management. In contrast to the claim of Olam Nigeria Limited, the farmers claimed that in 2009 after the flood that affected their yield, the relationship between them and Olam Nigeria limited has been affected has been affected. They explained that before the incidence of the flooding which happened 2 weeks after planting in 2009, Olam usually provide the transport to get the paddy from the fields to the collection points and thresh after which cash is paid on the spot. Olam Nigeria limited claimed that farmers frequently sell high-quality paddy on the side, even after they have provided most of the input costs.

3.4 Research Objective

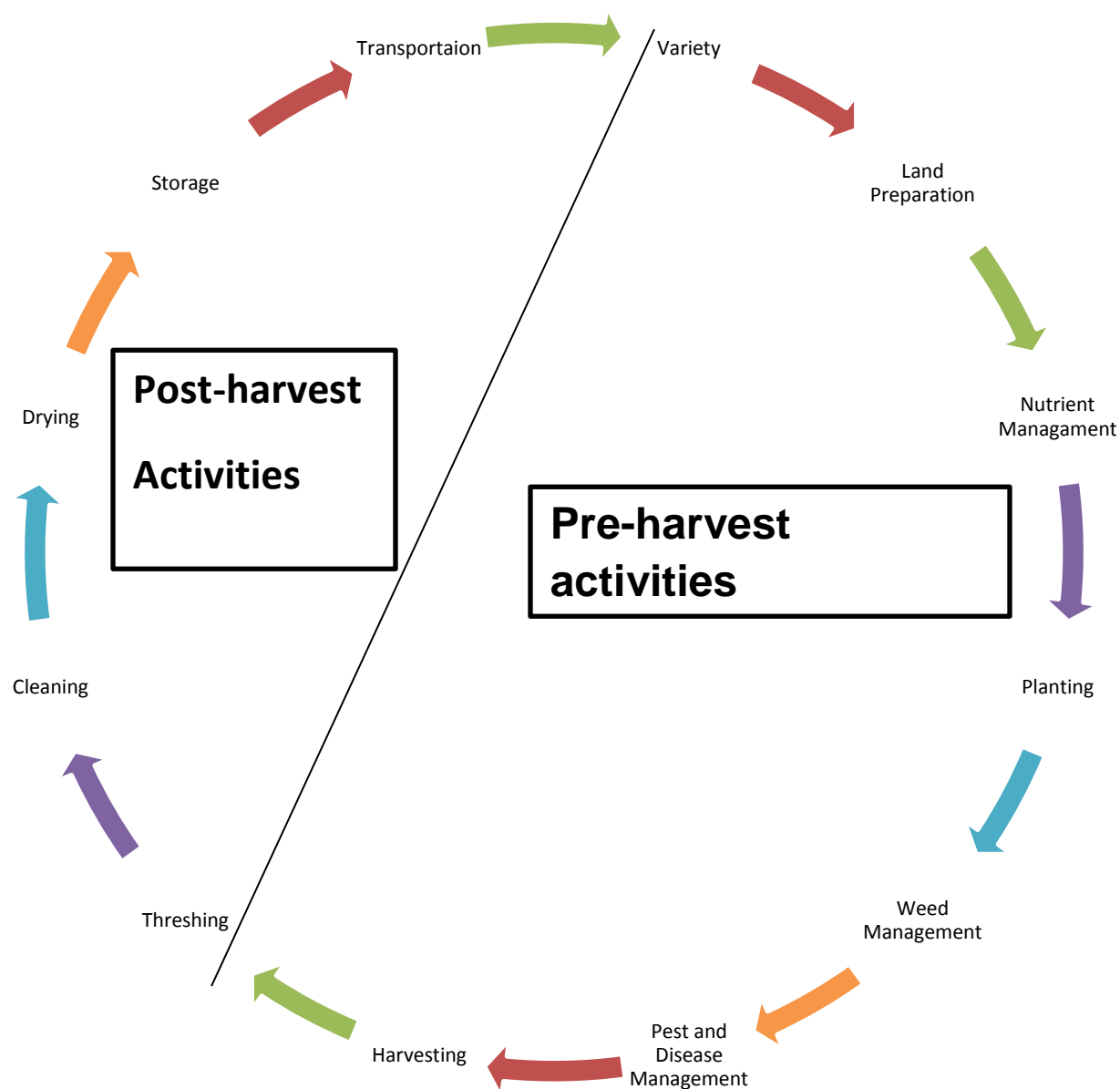
The broad objective of this study is to investigate the effect of post-harvest handling techniques used by paddy rice outgrowers of Olam Nigeria limited in Patigi Local Government area on the quality of rice paddy.

3.5 Specific Objective

The specific objectives will be:

- a) To identify the various techniques/technologies used in post-harvest stages of paddy by farmers
- b) To identify the constraints in postharvest handling of paddy rice

3.6 Conceptual Framework



Seed- to-seed cyle of rice grain quality. Source: IRRI (Knowledge Bank, 2012)

According to IRRI (2012), the seed-to-seed stages show how decisions at each stage can affect grain quality. The focus of this research is on the post-harvest handling of rice paddy and how it affects the quality of the harvested paddy. In developing the main research questions, the seed to seed cycle was divided into two; pre and post-harvest decisions taken by the farmers. The questions under each stages of the post-harvest decisions by the farmers where used in developing the interview questions and the stages of post harvesting were used in formulating the main research questions.

3.7 Research Question

What are the post-harvest handling techniques used by Olam Nigeria Limited rice outgrowers in Patigi Local Government Area and how are the techniques affecting paddy rice quality?

3.8 Sub Questions

1. What are the techniques used for drying, threshing, cleaning and storing paddy?
2. What are the effects of these techniques on paddy quality?
3. What are the constraints of post-harvest handling of paddy encountered by the Outgrowers?

4.0

RESEARCH METHODOLOGY

This chapter describes the methodology of the research. It presents the research design, research strategy in achieving the objective and methods of data collection

4.1 Research Design

The approach of this research is basically qualitative and a case study was used as research strategy also secondary data were collected from Olam Nigeria Limited and Kwara State Agricultural Development Programme (KWADP).

4.2 Research Strategy

The case study was used as strategy for this research to collect firsthand information from the respondents. It employs both focus group discussion to have the general perception about their relationship with Olam and the stages in handling harvested rice paddy. Also, in-depth interview was used in gathering information on the techniques used by the respondents and how the techniques affect the quality of paddy which has to do with what is expected from Olam Nigeria limited (an industrial rice mill). The research was conducted in Patigi Local Government Area of Kwara State which is also the largest rice producing areas of the States. The village was chosen because of the complaint of Olam Nigeria Mills about the poor quality of paddy the outgrowers are supplying. This research strategy was chosen to investigate the claim of Olam Nigeria mills about its outgrowers in Patigi. In order to gain access to the study area and the respondents, the list of outgrowers was collected from the Kwara State Agricultural Development Programme (KWADP) and they were contacted by the extension officer of KWADP in Patigi.

4.3 Research Population

The research population was drawn out the 450 registered Outgrowers of Olam Nigeria Limited. Out of the 450 registered Outgrowers, 180 are women and 270 are men. It was observed that rice production in Patigi was dominated by men. All the 25 respondents for the in-depth interviews were selected from the list provided by KWADP. At the initial stage 26 respondents were selected but one respondent (a woman) was not available for the interview.

4.4 Selection Criteria

The respondents were randomly selected from the list of Outgrowers provided by KWADP. They were divided into two focus group based on gender. All of the respondents have more than 5 years of contract as outgrowers with Olam Nigeria limited.

4.5 Data collection

Primary and secondary data were collected. The secondary data were collected at the office Kwara State Agricultural Development Programmes (KWADP) and Olam Nigeria Limited. The primary data was collected on the field by interviewing rice farmers. The data collection instrument was semi-structured questionnaire for interviews and focus group discussions respectively. The focus group discussion was used to explore the relationship between the rice farmers and Olam Nigeria Limited (Industrial Mill) and also to gather information on the post-harvest stages of paddy handling. The semi-structured questionnaire which comprised several open-ended questions allowed respondents a wide range of options and encouraged them to express their views and flexibility to follow up of on responses in a pattern of participation and gave respondents the opportunities to articulate the stages in post-harvest handling of paddy as it relate to paddy quality. The interviews were recorded as videos and voice notes.



Figure 7: respondents explaining the stages in post-harvest handling during the group discussion



Figure 8: A respondents during the interview

4.6 Methods of Data Presentation

The data collected was presented in table, matrix, and pictures. The table and matrix were used to describe how the post-harvest handling techniques used by farmers affect the quality of paddy and pictures were used to show the techniques used by the farmers.

5.0

FINDINGS AND SUMMARY OF RAW DATA

This chapter presents the findings and summary of the raw data collected from the field. It focuses on answers of the research questions raised in chapter 3. The findings from the 25 respondents are presented and in addition to these answers, their comments were also summarized and presented in this chapter.

5.1. Drying Paddy Rice in Patigi

Respondent	How do you dry your paddy	When do you dry/ how long do you dry	Which labour do you use in drying	What are the constraints you encounter	What are the factors that affect paddy quality at this stage	How do these factors affect your paddy quality
1	In heaps on the field after harvesting and turn everyday	Immediately and for 1 week before threshing	Family labour	Where to dry the paddy on the field	-rain -water logged field -inadequate sun	-Grain sprout -Gives off Odour -Uneven dry grains
2	In heaps on the field after harvesting	3-4 days before threshing	Family labour	How to ensure that paddy do not get moist	-birds -rain -mud -overdried grain	-broken grains -animal excretes -sprouted grains -mould
3	In heaps on the field after harvesting	On the field for about one or two weeks	Family and relatives	How to move paddy to the village and not dry on the field.	-rain -not enough sun to dry -water logged field	-Wet paddy sprout in the store house -discoloured grains with black spot
4	Spread on the field	for one to two weeks before threshing	Family labour	Animal excrete from Fulani cattle/ trampling by cattle	-mud -animal waste	-impurities from mud -stones -wet grains
5	In heaps on the field after harvesting	Depending on the labour, I threshed immediately	Paid labour relatives, groups and family	Transporting the paddy home to thresh with few labours	-Rodents -wet field -insect	-Grain sprout -Gives off Odour -Uneven dry grains
6	In heaps on the field after harvesting	1-2 weeks before threshing	Family and relatives	How to ensure that paddy are evenly dry	-not enough sun -wet field	-black spot on grain -grain sprout

7	In heaps on the field	1-2 weeks before threshing	Family and relatives	How to ensure evenly dry paddy	-rain -rodents	-discolouration -wet grain	
8	In heaps on the field	1-2 weeks before threshing	Family labour	To prevent further damages from Fulani herdsmen	-rain -Animal excretes -mud	-mould -off odour -impurities	
Respondents	Sun Drying of Paddy						
	How do you dry your paddy	When do you dry/ how long do you dry	Which labour do you use in drying	What are the constraints you encounter	What are the factors that affect paddy quality at this stage	How do these factors affect your paddy quality	
	9	In different bundles tie in upright position on the field	Immediately after harvesting and for 1 week	Family labour and paid labour	Extra cost of labour for making bunds	-rain -inadequate sunlight	-Uneven dry grains allow paddy to germinate
	10	In heaps on the field after harvesting	3-7 days before threshing	Family labour	To have a uniform moisture content	-wet field	-causes mould to grow
	11	In heaps on the field after harvesting	On the field for about one or two weeks	Family and relatives	How to ensure the field is well drained	-rain -water logged field	-Wet paddy sprout in the store house
	12	Spreading on mat in the house	for one to two weeks before threshing	Family labour	Transportation to village takes one week.	-Animal excrete -rain	-Impurities like stones, animal waste.
	13	In heaps on the field after harvesting	1-2 weeks before threshing	Paid labour relatives, groups and family	Transporting the paddy home to thresh with few labours	-Rodents -wet field -insect	-Wet grain gives off odour
	14	In heaps on the field after harvesting	1-2 weeks before threshing	Family and relatives	How to ensure that paddy are evenly dry	rain -rodents	-discolouration -wet grain

15	In heaps on the field	1-2 weeks before threshing	Family and relatives	How to ensure evenly dry paddy	-not enough sun -wet field	-black spot on grain -grain sprout	
16	In heaps on the field	1-2 weeks before threshing	Family labour	How to ensure the field is well drained	--rain -water logged field	-mould -off odour	
Respondents	Sun Drying of Paddy						
	How do you dry your paddy	When do you dry/ how long do you dry	Which labour do you use in drying	What are the constraints you encounter	What are the factors that affect paddy quality at this stage	How does this factors affect your paddy quality	
	17	In heaps on the field after harvesting	On the field for about one or two weeks	Family and relatives	How to move paddy to the village and not dry on the field.	-rain -not enough sun to dry -water logged field	-Wet paddy sprout in the store house -discoloured grains with black spot
	18	In heaps on the field after harvesting	On the field for about one or two weeks	Family labour	How to ensure that paddy do not get moist	-birds -rain -mud	-broken grains -animal excretes -sprouted grains -mould
	19	Spread on mat on the road and concrete	Everyday till it evenly dry	Family and relatives	Not totally dry field on which we dry our paddy	-rain -not enough sun to dry	-Wet paddy sprout in the store house -Mould causes damaged to other grains
	20	Spread on the field	for about one or two weeks	Family labour	How not to make contact with soil especially mud	-mud	-impurities from mud
	21	In heaps on the field after harvesting	Depending on the labour, I threshed immediately	Paid labour relatives, groups and family	Transporting the paddy home to thresh with few labours	-Rodents -wet field -insect	-Grain sprout -Gives off Odour -Uneven dry grains

22	In heaps on the field after harvesting	1-2 weeks before threshing	Family and relatives	How to ensure that paddy are evenly dry	-not enough sun -wet field	-black spot on grain -grain sprout
23	In heaps on the field	1-2 weeks before threshing	Family and relatives	How to ensure evenly dry paddy	-rain -rodents	-discolouration -wet grain

Respondents	Sun Drying of Paddy					
	How do you dry your paddy	When do you dry/ how long do you dry	Which labour do you use in drying	What are the constraints you encounter	What are the factors that affect paddy quality at this stage	How do these factors affect your paddy quality
24	In heaps on the field	1-2 weeks before threshing	Family labour	To prevent further damages from Fulani herdsmen	-rain -Animal excretes -mud	-mould -off odour -impurities
25	In heaps on the field after harvesting	On the field for about one or two weeks	Family and relatives	How to move paddy to the village and not dry on the field.	-rain -not enough sun to dry -water logged field	-Wet paddy sprout in the store house -discoloured grains with black spot

5. 2. Threshing of paddy rice in Patigi

Respondent	Threshing of Paddy					
	How do you thresh your paddy	When do you thresh your paddy	Which labour do you use in threshing the paddy	What are the constraints you encounter during threshing	What are the factors that affect paddy quality at this stage	How are these factors affecting the quality of your paddy
1	Beating the rice stalk on a big drum	After ensuring the paddy are evenly dried	Family labour and paid labour	-The grains move away from the point of threshing -cost of labour -it is backbreaking.	-tiny stones with same colour as the paddy are gathered and re difficult to separate.	-Stones and chaffs content are two important criteria used by Olam in determining the quality of paddy.
2	Beating the rice stalk on a big drum	Immediately after ensuring the paddy is dry evenly	Paid labour	-Lots of grain are lost during the process -stones are gathered	-stones -impurities -lot of chaffs are gathered	-impurities in the forms of stones, and other unwanted materials.
3	Beating the rice stalk on a big drum	Immediately after drying	Family labour and paid labour	-Scattering of rice paddy -even when threshed on mat stones is the major problem	-Stones -chaffs	-Lots of impurities are gathered (e.g stones, animal wastes, shells)
4	Beating the rice stalk on a big drum	After ensuring the paddy are evenly dried	Family labour and paid labour	-Lots of grain are lost during the process -stones are gathered	-Mix with foreign substances when gathering	-Lots of impurities are gathered (e.g stones, animal wastes, shells)
5	Beating the rice stalk on a big drum	Immediately after drying	Family labour and paid labour	-Scattering of rice paddy	-Stones and other substances are gathered	-Lots of impurities are gathered(stones, chaffs, and animal waste)
6	Beating on mat with stick	I also use the drum because it easy on the field after drying	Family labour and paid labour	-The grains move away from the point of threshing	-stones -impurities -lot of chaffs are gathered	-impurities in the forms of stones, and other unwanted materials

Respondents	Threshing of Paddy					
	How do you thresh your paddy	When do you thresh your paddy	Which labour do you use in threshing the paddy	What are the constraints you encounter during threshing	What are the factors that affect paddy quality at this stage	How are these factors affecting the quality of your paddy
7	Beating the rice stalk on a big drum and beating with stick on the mat for harvested panicle	Immediately after drying	Family labour and paid labour	-Scattering of rice paddy	-Stones and other substances are gathered	-Lots of impurities are gathered(stones, chaffs, and animal waste)
8	Beating the rice stalk on a big drum	Immediately after drying	Family labour and paid labour	-Scattering of rice paddy	-Stones and other substances are gathered	-Lots of impurities are gathered(stones, chaffs, and animal waste)
9	Beating the rice stalk on a big	Immediately after drying	Family labour and paid labour	-Scattering of rice paddy -even when threshed on mat stones is the major problem	-Stones -chaffs	-Lots of impurities are gathered (e.g stones, animal wastes, shells)
10	Beating the rice stalk on a big drum	Immediately after ensuring the paddy is dry evenly	Paid labour	-Lots of grain are lost during the process -stones are gathered	-stones -impurities -lot of chaffs are gathered	-impurities in the forms of stones, and other unwanted materials.
11	Beating the rice stalk on a big drum	Immediately after drying	Family labour and paid labour	-Scattering of rice paddy -even when threshed on mat stones is the major problem	-Stones -chaffs	-Lots of impurities are gathered (e.g stones, animal wastes, shells)
12	Beating the rice stalk on a big drum	Immediately after drying	Family labour and paid labour	-Scattering of rice paddy	-Stones and other substances are gathered	-Lots of impurities are gathered(stones, chaffs, and animal waste)

Respondents	Threshing of Paddy						
	How do you thresh your paddy	When do you thresh your paddy	Which labour do you use in threshing the paddy	What are the constraints you encounter during threshing	What are the factors that affect paddy quality at this stage	How are these factors affecting the quality of your paddy	
	13	Beating the rice stalk on a big drum	Immediately after drying	Family labour and paid labour	-Scattering of rice paddy	-Stones and other substances are gathered	-Lots of impurities are gathered(stones, chaffs, and animal waste)
	14	Beating the rice stalk on a big drum and beating with stick on mat	Immediately after ensuring the paddy is dry	Paid labour and Family labour	-Lots of grain are lost during the process -stones are gathered	-stones -impurities -lot of chaffs are gathered	-impurities in the forms of stones, and other unwanted materials like mud.
	15	Beating the rice stalk on a big drum	Immediately after drying	Family labour and paid labour	-Scattering of rice paddy	-Stones and other substances are gathered	-Lots of impurities are gathered(stones, chaffs, and animal waste)
	16	Beating the rice stalk on a big drum and beating with stick on mat	Immediately after ensuring the paddy is dry	Paid labour and Family labour	-Lots of grain are lost during the process -stones are gathered	-stones -impurities -lot of chaffs are gathered	-impurities in the forms of stones, weeds, other food grains.
	17	Beating the rice stalk on a big drum	Immediately after drying	Family labour and paid labour	-Scattering of rice paddy	-Stones and other substances are gathered	-Lots of impurities are gathered(stones, chaffs, and animal waste)
	18	Beating the rice stalk on a big drum	Immediately after drying	Family labour and paid labour	-Scattering of rice paddy	-Stones and other substances are gathered	-Lots of impurities are gathered(stones, chaffs, and animal waste)

19	Beating the rice stalk on a big drum	Immediately after drying	Family labour and paid labour	-Scattering of rice paddy	-Stones and other substances are gathered	-Lots of impurities are gathered(stones, chaffs, and animal waste)	
Respondents	Threshing of Paddy						
	How do you thresh your paddy	When do you thresh your paddy	Which labour do you use in threshing the paddy	What are the constraints you encounter during threshing	What are the factors that affect paddy quality at this stage	How are these factors affecting the quality of your paddy	
	20	Beating the rice stalk on a big drum and beating with stick on the mat for harvested panicle	Immediately after drying	Family labour and paid labour	-Scattering of rice paddy	-Stones and other substances are gathered	-Lots of impurities are gathered(stones, chaffs, and animal waste)
	21	Beating the rice stalk on a big drum	Immediately after drying	Family labour and paid labour	-Scattering of rice paddy	-Stones and other substances are gathered	-Lots of impurities are gathered(stones, chaffs, and animal waste)
	22	Beating the rice stalk on a big drum and beating panicle with stick on mat	Immediately after drying	Family labour and paid labour	-Scattering of rice paddy -even when threshed on mat stones is the major problem	-Stones -chaffs	-Lots of impurities are gathered (e.g stones, animal wastes, shells)
	23	Beating the rice stalk on a big drum	Immediately after ensuring the paddy is dry	Paid labour	-Lots of grain are lost during the process -stones are gathered	-stones -impurities -lot of chaffs are gathered	-impurities in the forms of stones.
	24	Beating the rice stalk on a big drum	Immediately after drying	Family labour and paid labour	-Scattering of rice paddy -even when threshed	-Stones -chaffs	-Lots of impurities are gathered (e.g stones, animal wastes, shells)

				on mat stones is the major problem		
25	Beating the rice stalk on a big drum	Immediately after drying	Family labour and paid labour	-Scattering of rice paddy	-Stones and other substances are gathered	-Lots of impurities are gathered(stones, chaffs, and animal waste)



Figure 9: a) Method of threshing in Patigi ; b) Man making mat for threshing in patigi; c) Scattered grain from threshing paddy at home

5.3 Cleaning (Winnowing) of paddy rice in Patigi

Respondent	Cleaning (Winnowing) of Paddy					
	How do you clean your paddy	When do you clean your paddy	Which labour do you use in cleaning your paddy	What are the major constraints you encounter when cleaning your paddy	What are the factors that affect paddy quality during cleaning	How are these factors affecting the quality of your paddy
1	Winnowing, sifting and sorting	2-3 days after transporting from the farm	Family labour (wives and children)	Too many impurities to separate	This method cannot effectively remove all the stones.	It affect the grading and we have to separate them into very clean and clean
2	Winnowing, sifting and sorting	Done in the house after 2-3 days of threshing	Family labour	When winnowing women complain of itching	It depends on the wind to separate the chaff and the empty grains	Heavy substances always remain when winnowing
3	Winnowing and sifting	2-3 days after transporting from the farm	Family labour (wives and children)	Too many impurities from threshing to remove	This method cannot effectively remove all the stones, weeds and chaff	It affect the grading and we have to separate them into very clean and clean
4	Winnowing, sifting and sorting	Immediately after threshing	Family labour and relatives	Impurities are difficult to remove except if they are lighter than rice grain	it depends on the height of fall of the paddy and also the direction of wind	It is does not affect paddy quality but removes impurities
5	Winnowing, sifting and sorting	Immediately after threshing	Family labour (wives and children)	It causes itching and impurities are difficult to remove	It depends on the speed of the wind	
6	Winnowing, sifting and sorting	Done immediately after threshing	Family labour (wives and children)	Too many impurities from threshing to remove e.g. stones	Difficult to remove stones	Paddy rice have stones and other impurities
7	Winnowing, sifting and sorting	Immediately after threshing	Family labour (wives and children)	Too many impurities from threshing to remove e.g. stones	Difficult to remove stones	Paddy rice have stones and other impurities
8	Winnowing, sifting and sorting	2-3 days after transporting from the farm	Paid and family labours	Impurities from threshing like stones are difficult to remove	Difficult to remove stones	Paddy rice have stones and other impurities

Respondent	Cleaning (Winnowing) of Paddy					
	How do you clean your paddy	When do you clean your paddy	Which labour do you use in cleaning your paddy	What are the major constraints you encounter when cleaning your paddy	What are the factors that affect paddy quality during cleaning	How are these factors affecting the quality of your paddy
9	Winnowing, sifting and sorting	Immediately after threshing	Family labour and relatives	Impurities are difficult to remove except if they are lighter than rice grain	it depends on the height of fall of the paddy and also the direction of wind	It cannot remove stones from threshing and d mud
10	Winnowing, sifting and sorting	Immediately after threshing	Family labour (wives and children)	Too many impurities from threshing to remove	It depends on the speed of the wind	Paddy have stones
11	Winnowing and sifting	2-3 days after transporting from the farm	Family labour (wives and children)	Too many impurities from threshing to remove	This method cannot effectively remove all the stones.	It affect the grading and we have to separate them into very clean and clean
12	Winnowing, sifting and sorting	Done immediately after threshing	Family labour (wives and children)	Too many impurities from threshing to remove e.g. stones	Difficult to remove stones	Paddy rice have stones and other impurities
13	Winnowing, sifting and sorting	Immediately after threshing	Family labour (wives and children)	Too many impurities from threshing to remove e.g. stones	Difficult to remove stones	Paddy rice have stones and other impurities
14	Winnowing and sifting	2-3 days after transporting from the farm	Family labour (wives and children)	Too many impurities from threshing to remove	This method cannot effectively remove all the stones	It affect the grading and we have to separate them into very clean and clean
15	Winnowing, sifting and sorting	Immediately after threshing	Family labour (wives and children)	Too many impurities from threshing to remove e.g. stones	Difficult to remove stones	Paddy rice have stones and other impurities
16	Winnowing, sifting and sorting	2-3 days after transporting from the farm	Paid and family labours	Impurities from threshing like stones are difficult to remove	Difficult to remove stones	Paddy rice have stones and other impurities

Respondent	Cleaning (Winnowing) of Paddy					
	How do you clean your paddy	When do you clean your paddy	Which labour do you use in cleaning your paddy	What are the major constraints you encounter when cleaning your paddy	What are the factors that affect paddy quality during cleaning	How are these factors affecting the quality of your paddy
17	Winnowing, sifting and sorting	Immediately after threshing	Family labour and relatives	Impurities are difficult to remove except if they are lighter than rice grain	it depends on the height of fall of the paddy and also the direction of wind	It cannot remove stones from threshing and d mud
18	Winnowing, sifting and sorting	Immediately after threshing	Family labour (wives and children)	Too many impurities from threshing to remove	It depends on the speed of the wind	Paddy have stones
19	Winnowing and sifting	2-3 days after transporting from the farm	Family labour (wives and children)	Too many impurities from threshing to remove	This method cannot effectively remove all the stones, weeds and chaff	It affect the grading and we have to separate them into very clean and clean
20	Winnowing, sifting and sorting	Done immediately after threshing	Family labour (wives and children)	Too many impurities from threshing to remove e.g. stones	it depends on the height of fall of the paddy and also the direction of wind	Paddy rice have stones and other impurities
21	Winnowing, sifting and sorting	Immediately after threshing	Family labour (wives and children)	Too many impurities from threshing to remove e.g. stones	Difficult to remove stones	Paddy rice have stones and other impurities
22	Winnowing and sifting	2-3 days after transporting from the farm	Family labour (wives and children)	Too many impurities from threshing to remove	This method cannot effectively remove all the stones,	It affect the grading and we have to separate them into very clean and clean
23	Winnowing, sifting and sorting	Immediately after threshing	Family labour (wives and children)	Too many impurities from threshing to remove e.g. stones	Difficult to remove stones	Paddy rice have stones and other impurities
24	Winnowing, sifting and sorting	2-3 days after transporting from the farm	Paid and family labours	Impurities from threshing like stones are difficult to remove	Difficult to remove stones	Paddy rice have stones and other impurities

Respondents	Cleaning (Winnowing) of Paddy					
	How do you clean your paddy	When do you clean your paddy	Which labour do you use in cleaning your paddy	What are the major constraints you encounter when cleaning your paddy	What are the factors that affect paddy quality during cleaning	How are these factors affecting the quality of your paddy
25	Winnowing, sifting and sorting	Immediately after threshing	Family labour (wives and children)	Too many impurities from threshing to remove e.g. stones	This method cannot effectively remove all the stones, weeds and chaff	It affect the grading and we have to separate them into very clean and clean



Figure 10 (a and b): Woman demonstrating how she winnows and women winnowing in Patigi

5.4 Storage of paddy rice in Patigi

Respondents	Storing Paddy Rice				
	How do you store your paddy	Where do you store your paddy	What are the major constraints you encounter when storing your paddy	What are the factors that affect paddy quality during storage	How are these factors affecting the quality of your paddy
1	In 50kg sack after winnowing	In the store house at home	To ensure that paddy is free of impurities and sorted into grades	When paddy is not well dry its sprout and some develop mould	-sprout grains -mould -off odour
2	In 50kg sack and stack of 3 or 4	In the house	No constraint	-Rodents and weevils	-damaged grains
3	In 50kg sacks	In the store house	Available space is small and we store everywhere in the house	-rodents and wet paddy	-damaged from rodents and mould
4	In 50kg sacks	In the store house	No constraint	Wet grain sprout and gives off odour	-sprout grains -mould
5	In 50kg sacks, 25kg or 10kg	In the house	You have be sure the store is dry	New sacks are expensive and Olam does not give sacks	-mould from wet grains
6	In 50kg sacks	Everywhere in the house	No constraint	-mould and wet grains (sprouts)	-olam check for sprout grains and it can be easily noticed
7	Stack on each other in 50kg sacks	In the house	No constraint	-Rodents and weevils -wet paddy	-Sprout grains -discoloured (mould) -damaged grains
8	In 50kg sack after winnowing	In the store house at home	To ensure that paddy is free of impurities and sorted into grades	When paddy is not well dry its sprout and some develop mould	-sprout grains -mould -black spot(deteriorating paddy)

Respondents	Storing Paddy Rice				
	How do you store your paddy	Where do you store your paddy	What are the major constraints you encounter when storing your paddy	What are the factors that affect paddy quality in storage	How are these factors affecting the quality of your paddy
9	In 50kg sack after winnowing	In the store house at home	No constraint	When paddy is not well dry its sprout and some develop mould	-sprout grains -mould -discoloured grains
10	In 50kg sack and stack of 5 to 8	In the house	No constraint	-Rodents and weevils	-damaged grains
11	In 50kg sacks	In the store house	Available space is small and we store everywhere in the house	-rodents and wet paddy	-damaged from rodents and mould
12	In 50kg sack and stack of 3 or 4	In the house	No constraint	-Rodents and weevils	damaged grains
13	In 50kg sack and stack of 3 or 4	In the house	-getting new sacks specified by Olam	-Rodents and weevils	-damaged grains
14	In 50kg sacks	In the store house	Small space for storing	Rodents	-damaged grains
15	In 50kg sacks	In the store house	The store roof leaks when it is raining	wet grain and rodents	-discoloured paddy -sprout grains -damaged grains
16	In 50kg sacks	Everywhere in the house	Small space for storing paddy and rain	-Rodents and wet grain	-damaged -wet paddy allow mould to grow and discoloured the paddy

Respondents	Storing Paddy Rice				
	How do you store your paddy	Where do you store your paddy	What are the major constraints you encounter when storing your paddy	What are the factors that affect paddy quality in storage	How are these factors affecting the quality of your paddy
17	In 50kg sacks	In the store house	The store roof leaks when it is raining	-wet paddy and rodents	-discoloured paddy -sprout grains -damaged grains
18	In 50kg sacks	In the house	You have be sure the store is dry	New sacks are expensive and Olam does not give sacks	
19	In 50kg sacks	Everywhere in the house	The store roof leaks when it is raining	-mould and wet grains (sprouts)	- mould from wet paddy
20	Stack on each other in 50kg sacks	In the house	No constraint	-Rodents and weevils -wet paddy	-Sprout grains -discoloured (mould) -damaged grains
21	In 50kg sacks	In the store house	No constraints	-wet paddy and rodents	-discoloured paddy -sprout grains -damaged grains
22	In 50kg sacks	In the store house	The store roof leaks when it is raining	-wet paddy and rodents	-discoloured paddy -sprout grains damaged grains
23	In 50kg sacks	In the store house	Available space is small and we store everywhere in the house	-rodents and wet paddy	-damaged from rodents mould
24	In 50kg sack and stack of 3 or 4	In the house	No constraint	-Rodents and weevils	-damaged fom rodents

Respondents	Storing Paddy Rice				
	How do you store your paddy	Where do you store your paddy	What are the major constraints you encounter when storing your paddy	What are the factors that affect paddy quality in storage	How are these factors affecting the quality of your paddy
25	In 50kg sacks	In the store house	Available space is small and we store everywhere in the house	-rodents and wet paddy	-damaged from rodents mould

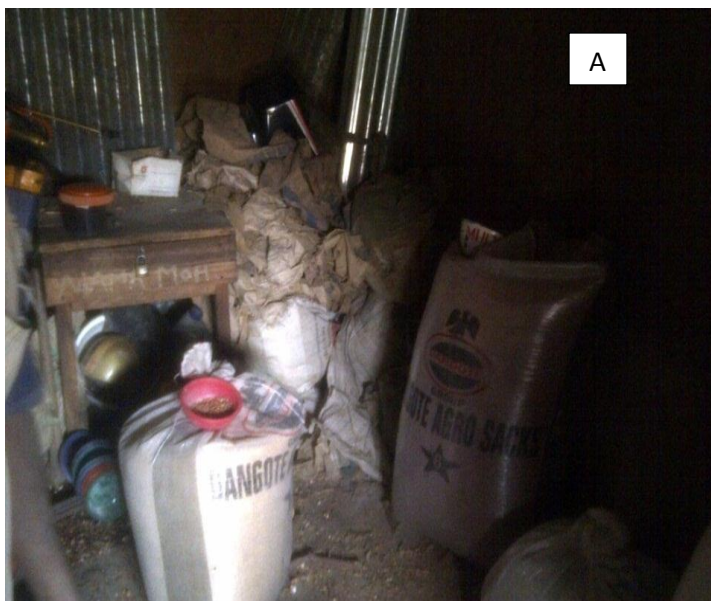


Figure 12(a and b): Rice paddy stored in 50 kg and respondents showing paddy rice affected by mould in storage

Comments: The farmers expressed that they store paddy for three main purposes

- 1) To supply to Olam Nigeria
- 2) To store as food or sell to get money after milling by themselves in the local mill at the village
- 3) To use it as seed for the next cropping season

They added that Olam always want to buy at ~~N4~~, 300 which is not better than the ~~N4~~, 000 they sell local varieties to the mills across the village. They added that this money is not enough since they have to pay children's school fees, feed and pay back their debt to Olam Nigeria limited because he has been complaining to the chief (village head) about the farmers that defaulted in paying back their debt.

6.0

RESULT

This chapter discusses the findings on chapter five on the post-harvest handling of rice paddy used by Olam Nigeria Limited and how it affects the quality of the paddy.

6.1 Drying Techniques Used by Rice Farmers in Patigi and Effects on Paddy Rice Quality

According to the respondents there are four ways of drying the paddy after harvesting.

- a) Stockpile the harvested rice stalk in heaps of 100cm on the farm
- b) Spread the harvested rice on the farm
- c) Place the rice stalk in bundles (diameter about 1.2m) in an upright position
- d) Spread harvested rice stalk on the mat at home or on the road

80% of the respondents dry the harvested rice stalk by stockpiling it in heaps of 100cm on the field after harvesting. Only 1 out of the 25 respondents claimed to dry the rice stalk in bundles, the respondents that dry his paddy in bundles claimed that he paid for extra labour for making the bundles. 2 out of the 25 spread the harvested rice stalk on the farm after harvesting and remaining two take the paddy home to dry on mats. The respondents harvest their paddy about the same time (after 120 days of planting). They intimated that it is recommended for the variety they plant.

One out of the 2 respondents that spread the harvested rice stalk on the field expressed the major constraint is how to keep the harvested rice stalk away from Fulani cattle that trample over the rice stalk. They both claimed that mud from the farm causes impurities in the paddy.

Majority of the respondents stockpile the harvested rice stalk on the farms in heaps up to 100cm, they admitted that when paddy are stockpile the quality can be affected because paddy are not evenly dry when lots of water are retained on the farm that causes the paddy to sprout, gives off odour, discolour the grain and allow mould to grow on the paddy. Also during the drying process the paddy can be wet by rain and it becomes difficult to have an even dry paddy.

The two respondents that spread the paddy on mats at home agreed that paddy quality are affected when small stones and animal excrete falls into it.

Only one respondent dry paddy in bunds, he admitted that the paddy is not evenly dry during the process.

The respondents listed the factors that affect the quality of paddy at this stage as inadequate sun to dry the paddy, rain, water-logged farms, rodents, birds, mud, animal waste, and stones. They admitted that these factors affect the quality of paddy by introducing impurities like stones; animal excretes, allowing grain to sprout and to be discoloured as a result of mould.

6.2 Threshing Techniques Used by Rice Farmers in Patigi and Effects Paddy Rice Quality

The respondents identified two methods of threshing rice paddy:

- a) Beating the dried rice stalk on a big metal water drum for the grains to be separated from the rice stalk
- b) Beating the rice stalk (placed on mats mad from different numbers of sacks) with stick or wooden rod

100% of the respondents in the study area threshed their paddy by beating the dried rice stalk on drums and only few out of these respondent also threshed by beating the rice stalk on mats which they claimed it majorly practice when paddy are transported home. During the group discussion the respondents expressed that threshing is most difficult operation in post-harvest stages of paddy handling. They also claimed that it is the most sensitive stage in determining the quality of paddy according to the specification of Olam Nigeria Limited and the major problem is the quantity of small stones in the paddy rice. 100% of the respondents revealed that when threshing, lots of grains moved away from the point at which the grains are collected and when they are gathered they are gathered with stones, animal waste, mud and many more impurities like other food grains. The respondents added that chaff is another major factor that has effect on the quality of factor. They maintained that when paddy is threshed lot of chaffs are produced along with the threshed grains.

6.3 Cleaning Techniques Used by Rice Farmers in Patigi and Effect on Quality of Paddy Rice

100% of the respondents used the same techniques for cleaning the paddy which are:

- a) Winnowing: the respondents winnow by allowing air to blow the threshed paddy to remove the chaff and other impurities that is lighter than the paddy rice. 8 out of the 25 respondents claimed the cleanliness of the paddy with method depends on the direction and the speed of wind. As shown in figure 11 and figure 12, the respondents explain that the 5kg paddy rice is put into a tray and allow to fall slowly on a mat in order for the chaff and other light materials to be removed, the process is repeated for the same paddy depending on how much the chaff is and on the average it is done 2 times for the same paddy rice.
- b) Sifting: the process is used in removing stones and other heavier impurities. The sieve with a mesh is used to allow tiny stones to fall and the paddy and heavier materials to remain in the sieve. 17 out of 25 respondents admitted that this process does not remove stones effectively. 7out of these 17 respondents that admitted that stones are not removed by this method maintained paddy quality is affected by this stone and it gives them difficulty in grading before supplying it to Olam Nigeria Limited.
- c) Sorting: this process is done with hand by picking the unwanted substances like mould grain, stones, animal excrete and other food grain like maize and sorghum from the sieve and from the rice paddy.

14 out of the 25 respondents confirmed that stones remained inside the paddy rice after the cleaning process.

100% of the respondents that are married indicated that winnowing is done by their wives and children and they also occasionally join them. 100% the respondents mentioned that the major constraints when cleaning the paddy is that there are too many impurities to be removed.

6.4 Storing Techniques Used by Rice Farmers in Patigi and Effect on Quality of Paddy Rice

The entire respondents store their paddy rice in 50kg bags made of polythene according to the specification of Olam Nigeria. They all store the paddy in the house. 6 out of the 25 respondents claimed that the constraint they encounter is where to store the paddy because the available space in the house is small. In addition to this, 4 out of the 25 respondents expressed that the major constraints when storing paddy is the leaking roof. They explained that it is always a problem when it starts raining. 17 out of the 25 respondents explained that rodents attacked the paddy in store houses. Also 17 respondents mentioned that wet paddy is one of the factors that affect the paddy in the store houses. The respondents explained that these factors causes sprout grains, discoloured (mould) grains, damaged grain during storage. One of the respondents intimated that Olam Nigeria also look for sprouted and mould grains and these two are visible.

7.0

CONCLUSIONS AND RECOMMENDATIONS

This chapter presents the conclusion and recommendation of this study. The conclusion is deduced from the result of the findings in chapter six on the effect of the post-harvest handling techniques used by farmers in Olam Nigeria Limited rice outgrowers initiative on the quality of harvested paddy. Based on the conclusions, the recommendations on this chapter are suggested.

7.1 Conclusions

Rice is an important grain in Nigeria from a food security and economic perspective. From food security perspective rice, it is consumed on a daily basis by every household in Nigeria and its availability is a strong indicator that the country is food secured. Also, its accessibility depends on the income of the buyers and the demand for quality rice is on the increase in the country especially the urban population preferred imported rice because of its quality. From the economic perspective rice cultivation provides income for the farmers and the landless that work as labour during the production cycle. In addition Nigeria is the second largest importer of rice and there have been several efforts by the Government to ensure self-sufficiency in rice production which has been hampered by the demand for quality rice in spite huge investment from private sectors, donor agencies and the Government.

This study investigated the effect of the post-harvest handling techniques used by Outgrowers of Olam Nigeria Limited in Patigi Local Government Area on the quality of the harvested paddy rice. Based on the result from the finding the following conclusions are deduced:

- 1) The techniques of drying used by the outgrowers is ineffective and cannot produce dry paddy free of the impurities like stones; animal excretes, and cannot stop grain from sprouting and to be discoloured as a result of mould.
- 2) Threshing is the most difficult post-harvest operation by beating the dried rice stalk on a metal water drum for the grains to be separated from the rice stalk. This method has introduced stones which determines to a greater extent the grade of paddy rice according to the specification of Olam Nigeria limited.
- 3) The paddy quality is also affected during storage as farmers are faced with the constraints of available space and leaking roofs and also attack by rodents and weevil in the storage house which cause sprouted grains, discoloured (mould) grains, and damaged grain during storage

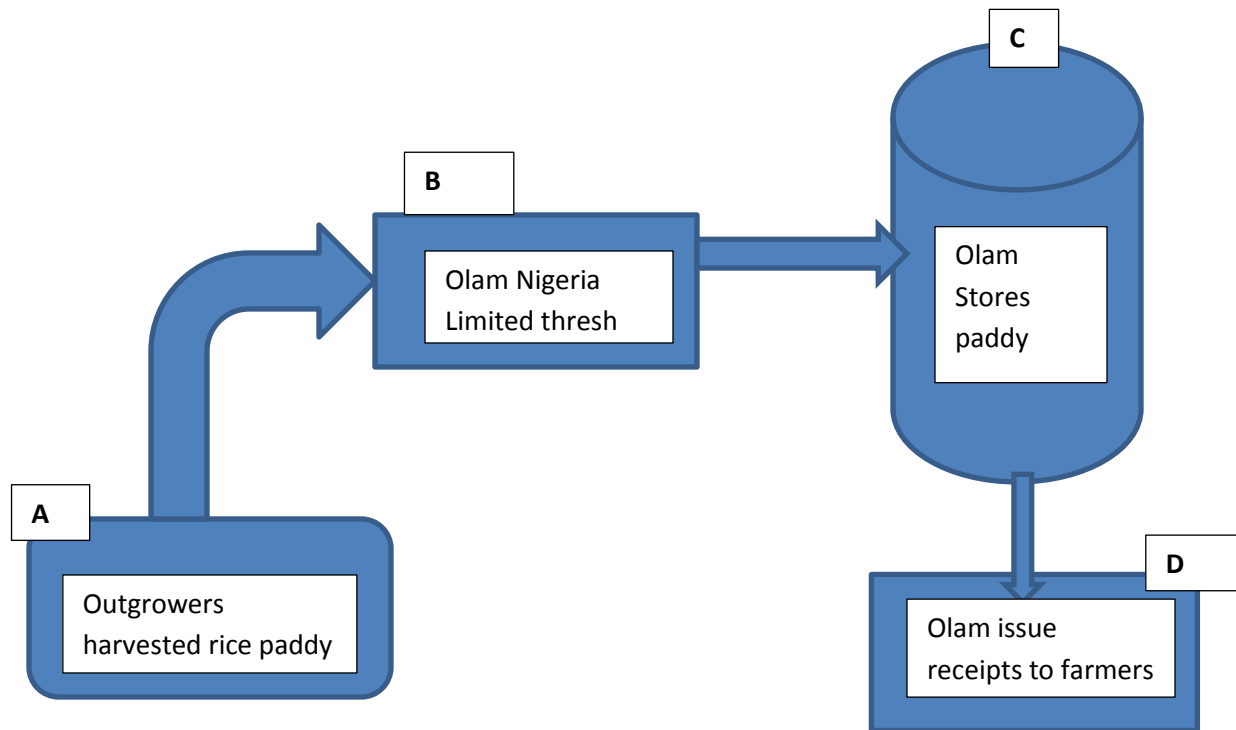
7.2 Recommendations

Recommendations for Olam Nigeria Limited

A metal silo for storing rice paddy and a threshing machine to thresh the paddy after harvesting will reduce the chain of post-harvest activities by the farmers. This can be achieved by Olam Nigeria Limited. As a private business based on the contract between Olam and its Outgrowers

Olam Nigeria charges the money for threshing and storage from the farmers and issue receipts after weighing the threshed paddy. The cost of threshing and storage is deducted from the value of paddy supplied by individual farmers.

The model is presented in the diagram below.



- 1) At point A, farmers gathered the paddy immediately after harvesting which is announced by the group leader.
- 2) At point B, farmers supply their harvested paddy to Olam Nigeria and the latter threshed
- 3) At point C, Olam Nigeria weighs the threshed paddy and subtracts the charge for threshing and storing from the value of the threshed paddy supplied by the farmers.
- 4) Olam issue receipt to the farmers which the group leader or individual farmers take to the bank and convert to cash.

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APPENDICES

Post-Harvest Handling and Effects on Paddy Rice Quality: A Case of Olam Mill Outgrowers in Patigi Local Government Area, Kwara State, Nigeria

Questionnaire

Informed Consent

You are being asked to participate in a study on investigating the post-harvest handling and quality of paddy: a case of smallholder farmers in Kwara State. The project is in fulfillment of a master degree in management of development with specialization in rural development and food security. Your participation is voluntary, and you are free to withdraw from the interview at any point. You will encounter no personal risk from participating in this study. The information you provide will be anonymous and kept strictly confidential. If you have any questions about the study, please do not hesitate to contact us, either by email or phone. Email: fadesere@blumail.org; Phone no: +2347033981318

Section A: Socio-economic characteristics

Age:

Sex: Male () Female ()

Marital Status: Single () Married () Widowed

Religion: Christianity () Islam () Others

Education level: Primary () Secondary () Tertiary () others ()

Primary Occupation:

Secondary Occupation

Ownership of land: Self () Lease () Government () others ()

How would you assess the quality of your paddy...Very good () good () average () poor ()
Very Poor

How many years have you been into rice farming:

Section B: Harvesting

What are the methods used for harvesting paddy.....

When do you harvest your paddy.....

Which labour do you use in harvesting your paddy.....

What are the constraints you encounter during harvesting.....

What are the factors that affect paddy quality during harvesting.....

How are these factors affecting the quality of your paddy.....

Section C: Threshing

When do you thresh your paddy.....
What are the methods you use in threshing your paddy.....
Which labour do you use in threshing your paddy.....
What are the constraints you encounter during threshing.....
What are the factors that affect paddy quality during threshing.....
How are these factors affecting the quality of your paddy.....

Section D: Drying

How do you dry your paddy.....
When do you dry your paddy.....
Which labour do you use in drying your paddy.....
What are the major constraints you encounter during drying.....
What are the factors that affect paddy quality during drying.....
How are these factors affecting the quality of your paddy.....

Section E: Cleaning

How do you dry your paddy.....
When do you clean your paddy.....
Which labour do you use in cleaning your paddy.....
What are the major constraints you encounter when cleaning your paddy.....
What are the factors that affect paddy quality during cleaning.....
How are these factors affecting the quality of your paddy.....

Section F: Storage

How do you store your paddy.....
When do you store your paddy.....
Where do you store your paddy.....
Which labour do you use in storing your paddy.....
What are the major constraints you encounter when storing your paddy.....
What are the factors that affect paddy quality during storage.....
How are these factors affecting the quality of your paddy.....

Transportation

How do you transport your paddy to the mill.....
What are the major constraints in transporting your paddy.....
How can paddy quality be affected with the way you transport it.....

Socioeconomics Characteristics of respondents

Marital Status of Respondents

Marital status of respondents

	Single	Married	Widowed
Male	5	8	-
Female	-	11	1

Years of Experience in Rice Farming

Years of experience in rice farming of respondents

Years of farming experience	Male	Female	Sub Total
0-5	2	2	4
10-15	2	4	6
15-20	6	4	10
20-25	1	1	2
25-30	2	1	3

Value Chain of Rice Production in Nigeria

The value chain for domestically produced rice is currently dominated by a largely fragmented production and milling industry, with limited new investment in either production or processing (USAID, 2009). Estimates indicate that over 90 percent of domestic rice production comes from resource-poor and weakly organized smallholders, a key fact when considering the wide-ranging constraints that continue to impede significant progress in Nigeria's farm-level productivity and international competitiveness in rice.

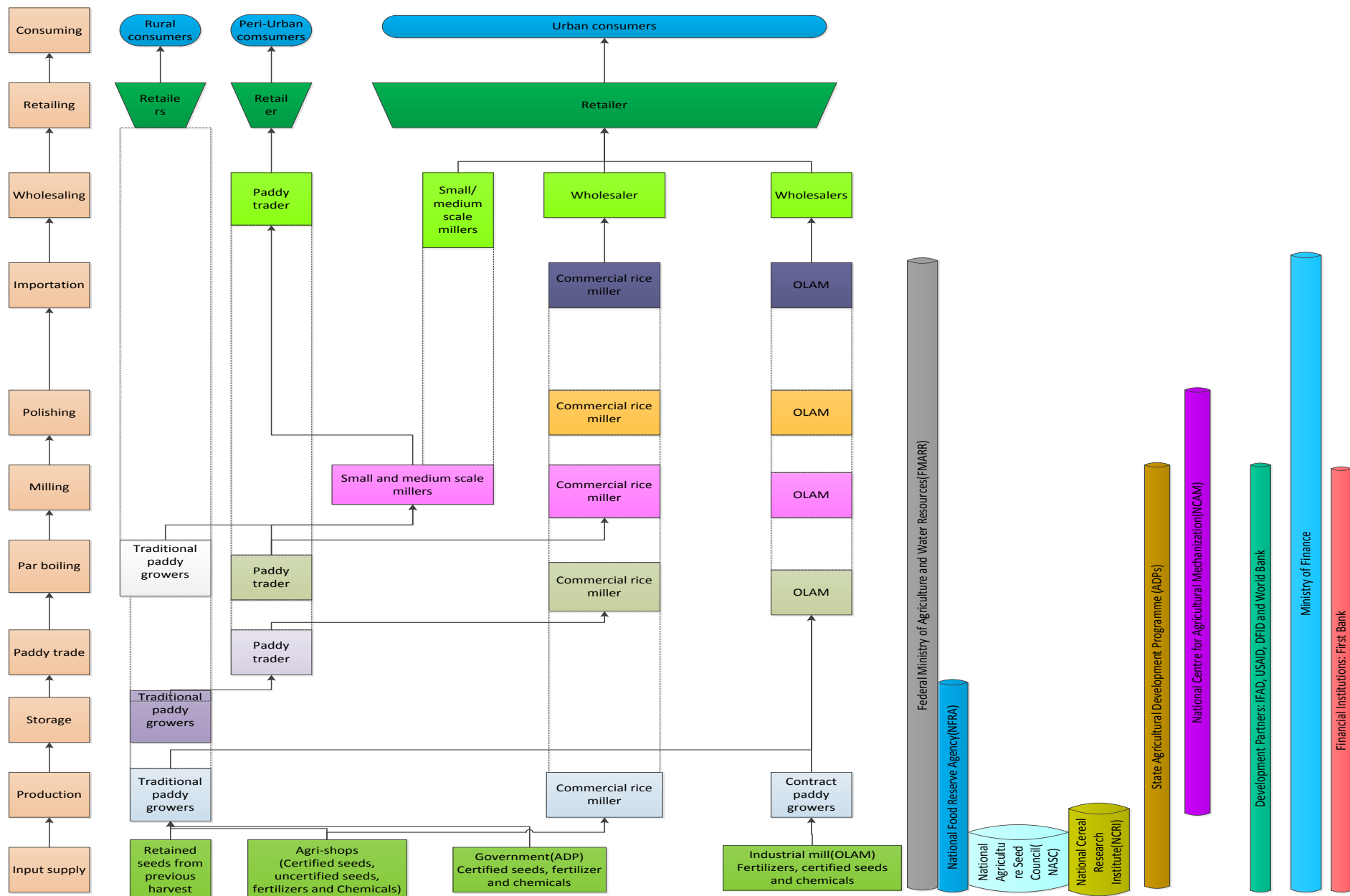


Figure Chain Map of Rice production in Nigeria. Source: Adapted from USAID (2009); Ayebiowu (2010) and modified by author

Input Supply: Addressing the problem of inadequate input supply system and delay in disseminating improved rice seeds requires that there should be more programmes aim at strengthening input supply systems in Nigeria. Currently, Olam (a private sector industrial mill) has a contract growing scheme that requires farmers to use new seed, which Olam itself is producing on 400 hectares and selling (about 700 tons of seed per annum) to its contract growers. This is the largest seed production and marketing activity in the country (Ayibiowu, 2010). The stakeholders involved in providing improved seeds are Federal Ministry of Agriculture and Rural Development (FMARD), the National Seed Council. (NASC), National Cereal Research Institute (NCRI) and the State Agricultural Development Programmes (ADP). Similarly, the supply of fertilizers is done by FMARD, ADPS and State-level public. Also, over 90 percent of agricultural work in Nigeria is done using hand tools this causes low level of mechanization in Nigeria including high cost of machinery and equipment; lack of service providers; inadequate mechanization technology; and low level of equipment leasing (USAID, 2010).

Production: Ayibiowu (2010) estimated that Nigeria has approximately 4.6 million hectares of land suited for rice production with only about 1.8 million hectares or 39% is currently developed for rice cultivation. Nigeria also possesses huge untapped potential for irrigated rice development. There is an estimated 3.14 million hectares of irrigable land out of which less than 50,000 hectares is currently under rice irrigation. Nigeria is also a major rice consumer. Per capita consumption is 32 kg per annum while domestic production (approximately 2 million MT) is far below the 5 million tonnes annual rice demand, leading to considerable imports. Increasing population and urbanization has continued to drive growing demand for rice in Nigeria. In addition, consumer preference for higher-quality rice is very strong and currently there is limited potential for substitution of poorer-quality domestic rice to meet this demand. According to the USAID (2010) report on the response of Nigeria to global food security where they analysed the value chain of rice production in the country. They identified that farmers can be categorized into three as follows: (1) smallholders using a low-risk, low-input, low-yield strategy that requires a minimum of purchased inputs (fertilizer, seed and Chemicals) with yields of less than 2 MT per hectare; (2) larger-scale commercial farmers, generally retired military or civil servants, who produce on 20 or more hectares, may own their own processing equipment, and purchase paddy from other farmers to “top up” their processing capacity; (3) a new category of contract growing farmers or outgrowers, emerging from the smallholders, who, with the assistance of the lead firm, are adopting improved production practices, are accessing the right inputs and are linked into the commercial channels. They concluded that getting the smallholders to shift to contract growing requires both operational systems and demonstrated incentives to making the shift.

Paddy Traders: Paddy traders play a critical role in Nigeria’s rice value chain. They are often the source of short-term finance for the farmers and buy as much as they can at harvest (some in repayment for loans). They will store some paddy to sell later. The paddy traders often have some from their own production (or from their family) and then purchase the rest of their stock. In many parts of Nigeria, much of the local paddy trade between producers and local traders is dominated by women who take the surplus production from their husbands, complement it with other paddy purchases, and then either take it to the mills for processing and sale to rice traders, or sell it to other intermediary paddy traders or millers. Since they thrive on the additional margins stemming from market inefficiencies, they have the least incentive to see the value chain working more efficiently (USAID, 2010).

Parboiling: Most Nigerian rice is parboiled before milling, adding significantly to the cost of the finished product. Most parboiling is carried out at the artisanal level. USAID (2010) added that only the two major industrial mills (OLAM and Veetee) have large mechanical parboilers, but this is still the main point of constriction in the flow of the rice mill. The NCRI has developed a mechanical parboiler appropriate for 300-500 kg of paddy at a time, but it is not widely used due to cost. Artisanal parboiling will be a casualty in the upgrading of the entire channel (USAID, 2010).

Milling: Small mills dominate the processing of Nigeria's domestic paddy. However, small mills have the disadvantages of a high broken rice rate and poorer milled quality. The profit margins for traditional milling are quite small. Small mills will charge about N250 for a 100-kg bag of paddy but heavy duty mills may charge up to N500 100-kg bag of paddy. A small mill can process up to 15 100-kg bags of paddy in a day for total sales of N3, 000 from which electricity; diesel, spare parts and labor costs must be subtracted. The small margin is a disincentive the investment of marginal improvements in rice processing capacity by small millers. Recently the industrial mill has taken over this activity especially in the North central of Nigeria where rice production is highest.

Polishing: Two new large-scale industrial mills owned by major multinational food companies (Olam and Veetee) began operation in Nigeria. Each mill has the potential to produce cleaned and polished rice that can compete with imported product. There are also some large scale mills in Sokoto, Badegi and Onitsha established by State governments but they are barely operational due to lack of spare parts (Ayibiowu, 2010).

Importation: The estimated annual consumption of rice in Nigeria is 4.0 million metric ton out of which local production accounts for 1.7 million metric tons and the remaining 2.3 million metric tons is imported, making Nigeria the second largest importer of rice in the world (USAID, 2009). Omotola and Ikechukwu (2006) argued that as far as Nigeria is concerned, rice consumption has histrionically increased since the 1970s and creating a substantial surge in rice imports since then making rice a political commodity in the country. They added that on one side rice became a critical component of the Nigerian diet and the other side, a major consumer of the country's foreign exchange.

The table below shows the countries with the largest volume of rice with Nigeria ranked second after Phillipines.

World largest importers of Rice in million metric tons

Number	Largest Importer	2008 MMT	2009 MMT	2010 MMT
1	The Philippines	2.3	1.8	2.5
2	Nigeria	2.0	1.8	1.8
3	Iran	1.0	1.4	1.2
4	Iraq	0.8	1.1	1.2
5	Europe	1.3	1.1	1.0
6	Saudi Arabia	1.0	1.0	0.9
7	Malaysia	1.0	0.9	0.9
8	Ivory Coast	0.9	0.9	0.9
9	Senegal	0.9	0.9	0.8
10	South Africa	0.8	0.9	1.0

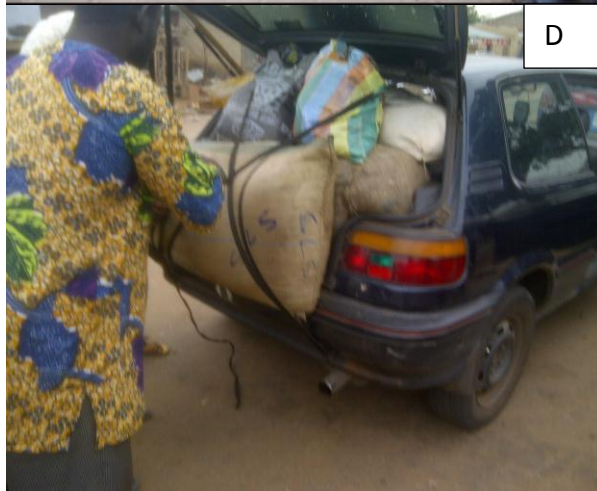
IRRI, 2012

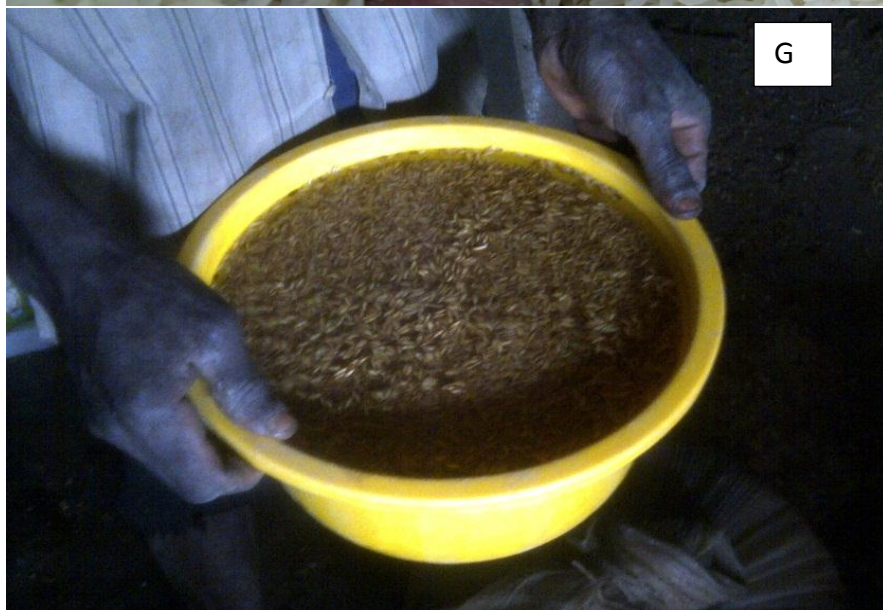
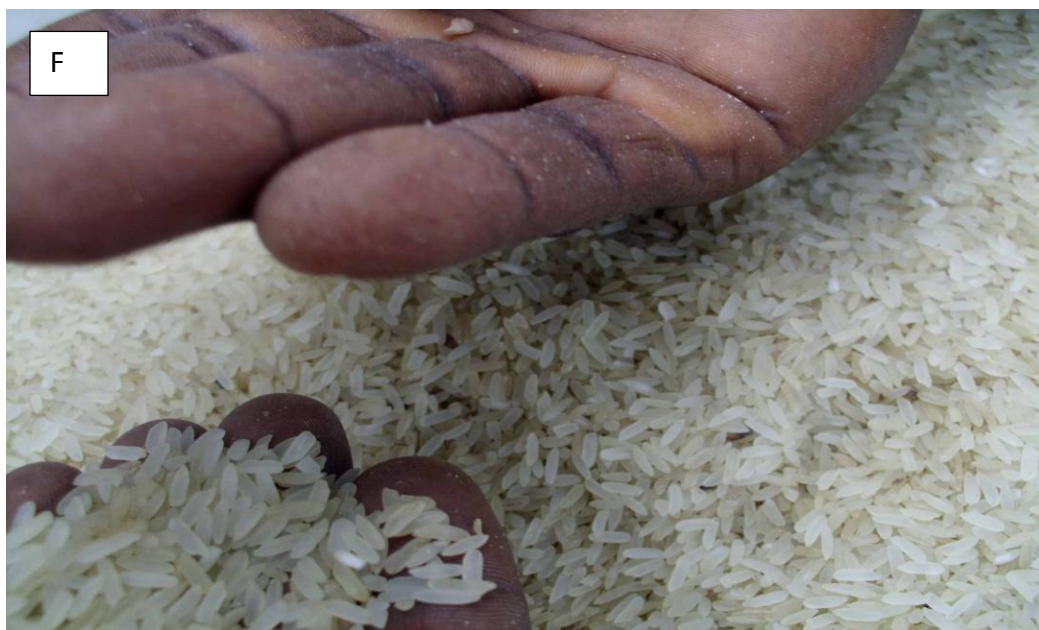
The biggest importers have branded varieties that are sold at varying quality and price levels. Major importers, such as Olam, Stallion and Veetee, import 200-300,000 MT of rice per year, packaged into bags that are labeled for Nigeria in the country of origin (e.g., Thailand, India, Vietnam or the U.S.). While imported rice varies in quality, it is all of a higher quality than the domestic rice in channel two. Top-quality imported rice has wholesale and retail prices up to 50 percent more than lower-quality imports, but the vast majority of imported rice retails within a fairly narrow, lower-end range, currently around N9, 500 per 50-kg bag (USAID, 2009). Imported rice enters into the country through the major ports and borders which are situated mostly in the major rice consuming areas. From these areas, the commodity is transported to other centers including the producing ones. The additional cost of transportation which is transferred to the final consumer reflects in the relative high cost of imported rice in the producing areas. In addition, the high level of competition in the sale of imported rice prevalent in the major consuming areas which thus accounts for the relative low price of imported rice in these areas is virtually absent in the producing areas. Most producing areas will rather consume more of local rice than imported rice.

Wholesaling: This basically done by the importers and the industrial rice mills. The domestically milled rice and the imported rice are distributed to different retailing outlets across the country.

Ayibiowu (2010) indicated marketing of domestic rice is subject to a complex distribution structure involving numerous levels of middleman and rice merchant. He mentioned that rice is supplied primarily to the immediate and adjacent urban markets. Large scale inter-state transfer of produce is only common during harvesting period. Accordingly, marketing of domestic rice heavily depends on the season. Marketing of imported rice however involves an organized distribution network geared to consumer taste. While imported rice varies in quality, it is all of a higher quality than the domestic rice. He added that usually traders are able to sell domestic rice at roughly 15-20 percent below the cost of imported rice. Ayibiowu (2010) argued that lack of market information creates unequal playing fields between middlemen and farmers. This negatively affects the terms of trade for small holder farmers and raises market transaction costs which lead to poor integration of markets across space and time (Emodi and Madukwe 2008). Nigeria's tariff policies also affect marketing of domestic rice in the country. The lifting of imported rice ban and the adoption of inconsistent and flexible tariff rates has resulted in aggressive participation of private sector rice importers in the marketing sector, highly competitive rice markets, significantly increased imported rice quantity, and changes in consumer taste in staple food.

Retailing: Majority of the rice retailers in Nigeria are women. They buy both the imported rice and the domestic milled rice directly from wholesalers. The prices vary with the imported rice having the highest prices and the industrial milled rice in the country also compete in terms of prices with imported. The locally milled rice from small and medium scale mills in Nigeria commands the lowest price because of its low quality and most time consumed by the urban poor and the rural population.





Order of Pictures

- A- Before the start of the focus group discussion
- B- Woman demonstrates how she threshed during the interview
- C- Respondents explaining he has a leaking roof during the interview
- D- Respondent leaving for Olam Nigeria Limited
- E- Milled rice by respondents containing stones, chaffs, discoloured grains and damaged grains.
- F- respondent pre-germinating paddy in store house
- G- Women respondents during the focus group discussion