SURVEY ON POST HARVEST PRACTICES AND CONSTRAINTS IN RICE IN THE KETU-NORTH DISTRICT

BY

AMUZU AGATHA MAWUSI

10238230

A DESSERTATION SUBMITTED TO THE COLLEGE OF AGRICULTURE AND CONSUMER SCIENCES, UNIVERSITY OF GHANA

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF B.SC. (HONS.) AGRICULTURE

DEPARTMENT OF CROP SCIENCE,
UNIVERSITY OF GHANA
LEGON

MAY, 2013

DECLARATION

I hereby declare that this dissertation, except for references to other peoples work which have been duly acknowledged, the work presented here in this dissertation was done by me as a student of the Crop Science Department, University of Ghana, Legon in the 2012/2013 academic year and this work has never been presented neither in partial nor whole for the award of degree elsewhere.

....

Amuzu Agatha Mawusi (10238230) Prof P.N.T. Johnson

Student Supervisor

DECLARATION

I hereby declare that this dissertation, except for references to other peoples work which have been duly acknowledged, the work presented here in this dissertation was done by me as a student of the Crop Science Department, University of Ghana, Legon in the 2012/2013 academic year and this work has never been presented neither in partial nor whole for the award of degree elsewhere.

....

Amuzu Agatha Mawusi (10238230) Prof P.N.T. Johnson

Student Supervisor

ABSTRACT

A survey was carried out at Afife Irrigation Development Authority in the Ketu North District of the Volta Region using a semi-structured questionnaire. The study was meant to obtain information on rice post harvest practices such as harvesting, drying, milling, storage and constraints faced by rice processors.

In all a total of 50 processors' were interviewed. Data on the following parameters were taken; the equipment used for harvesting, methods used in threshing, drying and storage as well as customers perception on grain homogeneity, cleanliness and operating capacity of mills. The data was analyzed using SPSS and the results showed that rice processors were using improper and unscientific methods of post harvest operations and faced with major challenges in financial support and technical problems

ACKNOWLEDGEMENTS

To God Be The Glory for the great things he has done. What shall I render unto him for all his benefits towards me during the period of my study in this institution? All that I want to say is thank you Lord.

I wish to express my deepest appreciation and gratitude to my supervisor, Prof. P.N.T. Johnson for his patience, advice, guidance and efforts as a result of which this work was accomplished.

I wish to express my indebtedness to my beloved husband, Mr. Divine S. Amuzu for his love, support and prayers.

My heartfelt thanks and appreciation goes to my family members and friends for their support and prayers.

Special thanks also goes to the chief of Awalaviga, Togbui Akuna Fietsu II, the Farm Manager, Rev. Boakye and all the rice processors at Afife Irrigation Authority for their enormous contribution to the success of this work. I say God bless you all !!!!!!!!!!!!!!!!!!!!!!!!!

DEDICATION

This work is dedicated to the Almighty God from whom my strength and hope came and to my lovely husband, Mr Divine S. Amuzu and to my sons Edwin Selinam Amuzu and Carol Sedem Amuzu.

TABLE OF CONTENTS

DECLARATION i

ABSTRACT ii

ACKNOWLEDGEMENTS iii

DEDICATION iv

TABLE OF CONTENTS v

CHAPTER 1 1

INTRODUCTION 1

1.1 BACKGROUND 1

1.2 Problem statement 2

1.3 Justification 2

1.4 Main objective 3

1.4 Specific objectives 3

CHAPTER TWO 4

LITERATURE 4

2.1 ORIGIN AND DISTRIBUTION OF RICE 4

2.2 Botanical Description 4

2.3 CLIMATE 5

2.4 AGRONOMY 5

2.5 DISEASES AND PESTS OF RICE 6

2.5.1 DISEASES 6

2.5.2 PESTS 6

2.6 POST- HARVEST PRACTICES 7

CHAPTER THREE 10

MATERIALS AND METHODS 10

3.1 EXPERIMENTAL SITE 10

CHAPTER FOUR 11

4.0 RESULTS AND DISCUSSIONS 11

CHAPTER FIVE 20

CONCLUSIONS AND RECOMMENDATIONS 20

5.0 CONCLUSIONS 20
5.1 RECOMMENDATIONS 20
REFERENCES 21
APPENDIX 23
Semi-structured Survey Questionnaire 23

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Rice is a monocarpic annual plant of two domesticated species namely *Oryza sativa* and *Oryza glaberrima.* It is one of the most important food crops for almost half of the world's population and also the most widely cultivated cereal next to wheat (IRRI, 2009). According to UNDP Human Development Report for 1997, human consumption of rice accounts for 85% of total production as compared to 72% for wheat and provides 21% global human per capita energy and 15% per capita protein and also minerals vitamins and fiber. It is the only major crop that is consumed by humans directly as harvested. The protein content of rice is around 7% and contains glutelin which is also known as oryzenin. The nutritive value of rice protein with a biological value of 80 is much higher than that of wheat with a biological value of 60 and maize with a biological of 50 and other cereals. The minerals are mainly located in the pericarp and germ and contain about 4% phosphorus and some enzymes. (www.agmarknet.nic.in)

Post harvest is one of the most critical factors in rice production. With this De Padua (1999) stresses that there is the need to venture into research and development in order to determine the improvements needed to lessen post harvest losses. According to (Calvery, 1994) data should be supported by basic statistical analysis in order to understand how efficiently a post harvest system works within a rural community.

Poor post harvest practices used in rice production system such as floor drying, parboiling, milling and bagging pose significant problems causing decline in quality that has rendered the rice sector low in marketability and profit making to processors. According to Grolleaud (2001) post harvest practices is made up of a set of operations from the period of harvesting until it reaches the final consumer. The main post harvest practices used by rice farmers are threshing, drying, paddy cleaning, storage and milling.

In Africa, it has been estimated that rice sustains the livelihood of 100million people and its production has employed 20 million farmers (WARDA, 2005). According to (FAO, 2001) it has been estimated that by 2025,10 billion people will depend on rice as a main source of food and demand will reach about 880Mt. Africa's inability to produce rice to self-sufficiency levels is an indication of the presence of major constraints in the rice industry which requires an urgent attention.

According to (WARDA, 2007) Ghana was below 25% self sufficiency in rice production which means that Ghana still require huge imports to augment the difference. Ghana currently spends about 450million dollars annually on rice to augment local demand. The country's self-sufficient in the rice production stands at about 30%, leaving a shortfall of 70% (GNA, 2010). According to De Padua (1999) the rice post harvest practices must be improved to reduce food losses which occur in the post production operations.

1.2 Problem statement

Ghana's inability to produce rice to self-sufficiency levels is an indication of the presence of major constraints in rice industry which requires an urgent attention.
Adhering to the UN's Millennium Development Goals, there is the need to continuously provide information as the basis of the government in order for them to address urgent needs of its people (FAO, 2001).

1.3 Justification

The importance of rice post harvest practices to maintain quality and minimize losses until it reaches the final consumer deserve much attention through obtaining first hand information from processors to evaluate the post harvest practices and its accompanied problems. The unavailability of sufficient information on precise post harvest practices makes it difficult to estimate post harvest practices and how to address them. This study is expected to improve post harvest practices and address the constraints to reduce losses and maintain quality after obtaining information from the various processors.

1.4 Main objective

The main objective of this study was to assess post harvest practices and the constraints in rice production.

1.4 Specific objectives

i. To assess post harvest practices in rice in the Ketu District of the Volta region of Ghana.

ii. To obtain information on processors' perceptions of the constraints in the rice industry.

CHAPTER TWO

LITERATURE

2.1 ORIGIN AND DISTRIBUTION OF RICE

Rice (*Oryza spp*) belong to the grass family Gramineae. *Oryza sativa* and *Oryza glaberrima* are the two species that are most popularly cultivated and of these two species Oryza sativa is widely produced. The African rice (*Oryza glaberrima*) is thought to have originated in the Central Delta of the Niger River where it may have been grown since 1,500BC.However, its domestication was around 300BC in West Africa and the Asian rice species were introduced in West Africa by the Portuguese around 1,500BC. The upper coastal part of West Africa was historically known as the Rice Coast due to its abundance in the region (Diange, 2008). According to Porteres (1976), *Oryza glaberrima* evolved from the annual wild rice , *Oryza barthii*, about 3500 years in the Inland Niger river Delta(Mali)(IND).There are believed to be three centers of domestication for *Oryza glaberrima*, in Mali which is the primary centre followed by the Sene–Gambia and Guinea.

2.2 Botanical Description

The rice plant is an annual plant with round, hallow, jointed culms with flat leaves and a terminal panicle. It has fibrous root system which consist of rootlets root hairs. The root system consist of two major types, crown root which includes mat roots develop from nodes below the soil surface and the nodal roots develop from nodes. The culm is more or less erect, cylindrical, and hollow except at the nodes and varies in thickness from about 6-8mm. A typical tillered plant develops when the lowermost bud from the crowded nodes at ground level develop into branches. Each node of the culm bears a leaf which consists of leaf sheath, leaf blade, auricle, ligule and flag leaf. The number of nodes varies from 13-16 with only the upper four or five separated by long internodes (http://www.agricultureandupdates.blogspot.com/...botanical description). There is one leaf from each node and each leaf has a lamina and a long sheath which completely usually hairy but glabrous in *Oryza glaberrima*. The inflorescence is a panicle which is loose and encircles the internode. In *Oryza sativa*, the lamina is long (30-50cm) and narrow (1.2-1.5cm)and many

branched. Each branch of the panicle bears one or more spikelets and the average panicle bears 100-150 kernels. The lemma and palea constitute the hull or husk which enclosed the rice grain and are removed in shelling rice for consumption. During milling and polishing, the pericarp, aleurone layer and embryo, which are rich in protein and fat are removed leaving mostly the starchy endosperm. The endosperm is usually white or translucent but other colours are also known. The size of the grain varies from 3.5-14.5mm long, 1.7-3.7mm broad and from 1.3-2.3mm thick. The grain has characteristic aroma in certain cultivars (CTA,1991).

2.3 CLIMATE

Rice is cultivated under varying climatic conditions. This is because of the great diversity of rice cultivars.

It is cultivated from the equator to latitude 53N, 40S and from sea level to 3000m. Water supply is the chief limiting factor to its growth. The average optimum temperature for rice cultivation ranges from between 20°C and 35°C. Rice crop is extremely sensitive to water shortages but too much of water is also a problem. Rice transpires 600-120mm of water for each crop and 1000-1800mm is needed to produce a rice crop. (Onwueme et al,1991). Rice is more suited to high rainfall regions because it requires abundant moisture either through rainfall or irrigation to keep the soil under saturation throughout its life period. Therefore the practice of rice cultivation is mostly dependent on the rainfall conditions. The soils most suited for the cultivation of rice are clay, loam and dry soils. Such soils are capable of holding water for a very long period (Chandy, 1987).Rice thrives well under a wide range of pH ranging from 7.03 to 8.92 with a mean pH of 8.07. The optimum soil pH for rice production is 5.5 to 6.5 under dry conditions that is non-irrigated rice production system and 5.5 to7.2 under flooded conditions (Landon et al., 1991).

2.4 AGRONOMY

There are three main systems of rice cultivation viz: low land or wet, dry or upland and semi-dry systems. Transplanting is done in low-land cultivation whereas in the other system direct seeding is done. Low-land rice is grown on low lying areas where water can be collected and retained by artificial irrigation, rainfall or flooded river to keep the soil constantly submerge at the appropriate growing period of the crop. Upland rice is grown on higher lands, hill tops or

areas where neither irrigation nor any water retaining device is available. It grows and matures with rain just like other dry land crops. In semi-dry condition rice is grown under low lying conditions but mostly depends on rain. The rain water is collected, field is puddle and then germinated seeds are broadcasted. This is also known as Lehi cultivation of rice. (Chandy, 1987)

2.5 DISEASES AND PESTS OF RICE

2.5.1 DISEASES

Blast *(Pyricularia oryzae)* is a fungal disease and widespread in all rice growing ecologies. It infests all stages of crop growth and any organ of the plan t. The panicle remains if infestation start at the milky stage and the grains do not fill well and the quality is affected (chalky, brittle or greenish) if starts at the latter stage. It is favoured by too high a dose of nitrogen and high humidity. The use of resistant varieties, clean seeds for planting, recommended spacing and recommended doses of nitrogen can minimize the extent of infestation.

Rice yellow mottle virus (RYMV) is only found in Africa and widespread in all rice growing areas in Eastern Central and West Africa. It is most serious in lowland irrigated and rain-fed cultures. It is transmitted by insect vectors, mechanically and during transplanting. The use of resistant varieties, avoidance of continuous cropping, destruction of wild rice and grass weeds can be used to control infestation.

Bacterial blight (*Xanthomonas oryzae pv oryza*) is widespread in all rice growing areas. The spread of the disease is favored by wind, storm ill-balanced mineral nutrients in the soil. The source of infestation is infected seeds and airborne spores. Fungicidal treatment of seeds and planting of clean seeds can reduce infestation.

Other minor diseases are Narrow leaf spot, Sheath blight and False smut (Shao-Mwalyego et al., 2011).

2.5.2 PESTS

Rice Thrips (RTH) (*Stenchaetothrips biformis*) is a pest of young rice seedling caused by both adult and the lavae. The damage is severe under water stress conditions. Late planted crops are more prone for damage and short duration traditional rice varieties like Dahala and

Kaluheanati. Application of recommended insecticides and submergence of infested crops intermittently for 1-2days and a wet cloth dragging on seedling are effective control methods.

Rice Leaffolders (RLF) (*Cnaphalocrosis medinalis*) infest the leaves and feed on the mesophyll and the damage is caused by the caterpillars. Feeding reduces productive leaf area that affects plant growth. Cloudy and humid weather, shady locations and high N-fertilizer favour pest build up. Recommended plant spacing, the use of recommended dose of N-fertilizer and monitoring are effective control measures.

Red flour beetle (*Tribolium casteneum*) is a secondary storage pest that damages the seeds and caused by both adult and larvae. The pest could be controlled by following sanitary measures and spraying.

Grain moth (*Sitotroga cerealela*) infestation starts on the field and may reach serious level in store. The damage is caused by larvae which are elongated and infestation could be minimize by sun-drying of seeds to minimize moisture content down to 8.0% and pack in a polythene or paper bags.

Grain weevils (*Sitophilus granarius*) infestation starts on the field and can be controlled by spraying in the store with pirimiphos-methyl at the rate of 27ml per 91litres of water (DOASL,2006).

2.6 POST- HARVEST PRACTICES

The post harvest practices consist of a set of operations from the period of harvesting until it reaches the final consumer (Grolleaud, 2001).The basic post harvest practices of rice include threshing, drying, storage and milling. Threshing, drying and storage methods of rice vary from farmer to farmer and also from country to country.

Harvesting

Harvesting generally refers to all operations carried out in the field which includes cutting the rice stalk, reaping the panicles, laying out the paddy on stalk or stacking to dry it and bundling for transport. (NAPHIRE,1997).

Threshing

Threshing is a practice during which the paddy kernel is detached from the panicles through rubbing action, impact and stripping. The rubbing action occurs when paddy is threshed by humans, trampling by animals or tractor (Toqueroet al.,1974).

Drying

This is the process that reduces grain moisture content to a save level for storage. Delays in drying, incomplete drying or ineffective will reduce grain quality and result in losses. (IRRI, 1997).There are two methods of drying, natural (sun-drying and aeration) and artificial (mechanical).

Parboiling

It is a hydrothermal treatment of rough rice prior to milling. It is commonly used in many rice producing countries. In the process rough rice is soaked, steamed and re-dried before milling. It affects the milling, storage, cooking and ultimately consumer preferences. (De Datta,1981)

Paddy cleaning

It consists of the separation of undesirable materials such as weed seeds, straw, chaff, panicle stems, empty grains, inmate and damaged grains, sandy rocks, stones, dust, plastic and even metal and glass particles. According to Lantin 1997, milling recovery is low when paddy is not cleaned.

Milling

It is the separation of the husk (dehusking) and the bran (polishing) from rough rice to produce polished rice for consumption. Milling ranges from hand pounding with the simple wooden mortar and pestle to the modern mills (Lantin, 1997).

Storage

Paddy is a living hygroscopic and biological food material that respire at a rate dependent upon its moisture content and surrounding conditions. Respiration rate increases with moisture content of the grain and is usually stored with 14 percent moisture content or lower. As a

staple food in most rice producing countries, harvested paddy must be dried, cleaned and stored as a source of food supply until the next harvest (Lantin,1997).

Grading

Grading is the process of sorting of a given product according to the grades or classes. In grading of paddy, mainly thickness of length of grain is considered and graded accordingly. Grading of paddy is usually done through mechanical devices such as rotating graders, plansifier, trieurs, circular purifier and colour grader or sorter. (Pandey,1998).

CHAPTER THREE

MATERIALS AND METHODS

3.1 EXPERIMENTAL SITE

The research was conducted at Afife in the Ketu-North District in the Volta Region of Ghana on rice farmers.

A survey on processors perception and knowledge on post-harvest practices and constraints in rice was conducted at Afife in the Ketu-North District of the Volta Region of Ghana. A semi-structured questionnaire (see Appendix) aimed at investigating rice processors perception about post-harvest practices and constraints of rice was administered to fifty rice processors in Afife, a rice farming community in the Volta Region of Ghana. Information on processors' perception on post-harvest practices and constraints was collected. The study also took some personal observation to get salient information that would help identify problems faced by the processors. Statistical Package for Social Sciences (SPSS) version 20 was used to analyze the responses on processors' perception on post harvest practices and constraints.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSIONS

A survey was conducted to assess post harvest practices and constraints in rice processing. Fifty (50) rice processors at Afife were interviewed. The results of the survey indicated that most (73%) of these processors' were aged between 30 and 50 years as shown in **figure 4.1.** This suggests that most of the rice farmers were middle aged. On the other hand, 13% of the processors' were aged less than 30 years. This means that processors' were energetic and have the potential of growing the rice industry.

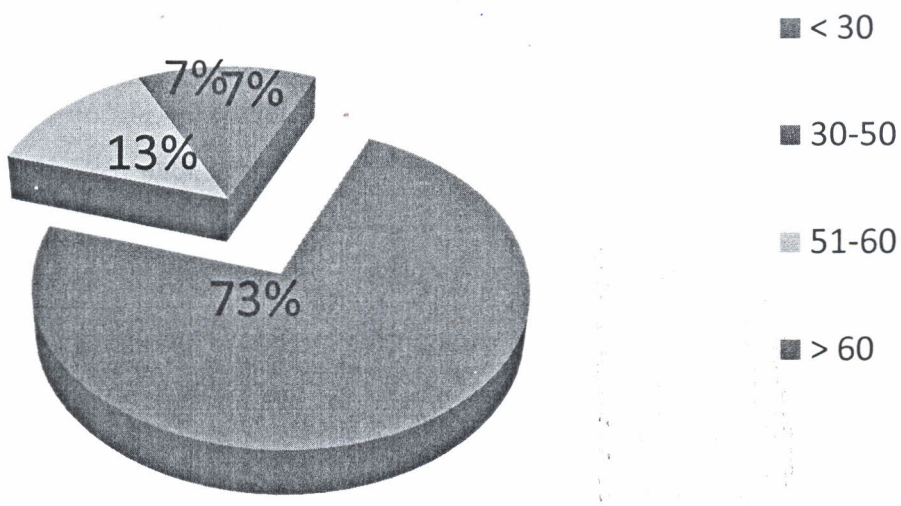

Figure 4.1: Age distribution of the processors

Processors' equipment used for harvesting

Respondents were interviewed on the equipment used in harvesting their rice. 50% of the respondents interviewed use the combine harvester to harvest their produce. And on the other hand 50% of the farmers use sickle to harvest their produce.

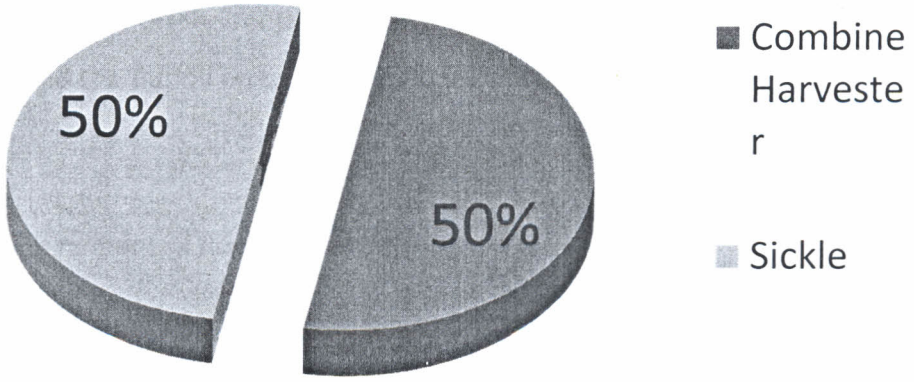

Figure 4.2: Equipment used for harvesting

Processors' equipment used for threshing

Respondents were interviewed on the equipment used for threshing and the options include; combine harvester and threshing box. Out of a total of 50 farmers interviewed 50% of them use combine harvester while the remaining 50% use threshing box.

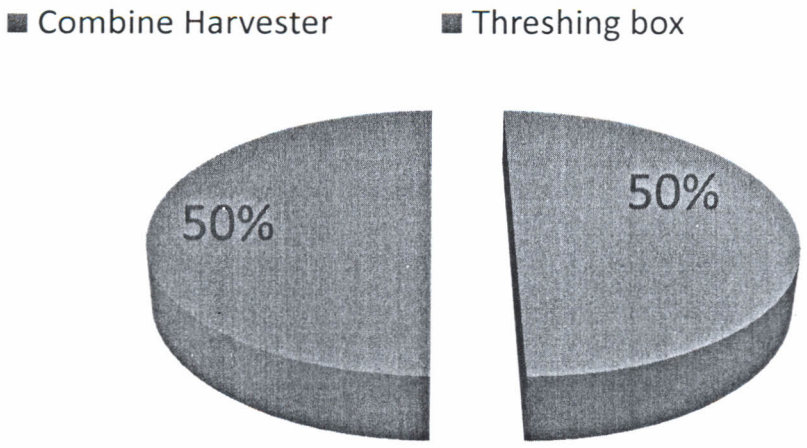

Figure 4. 3: Equipment used for threshing

Processors' methods used for drying

Processors' were interviewed on the methods of drying their paddy after threshing. The results indicated that 50 % dried the paddy on cemented floors with the remaining 50 % dried it on the tarpaulin.

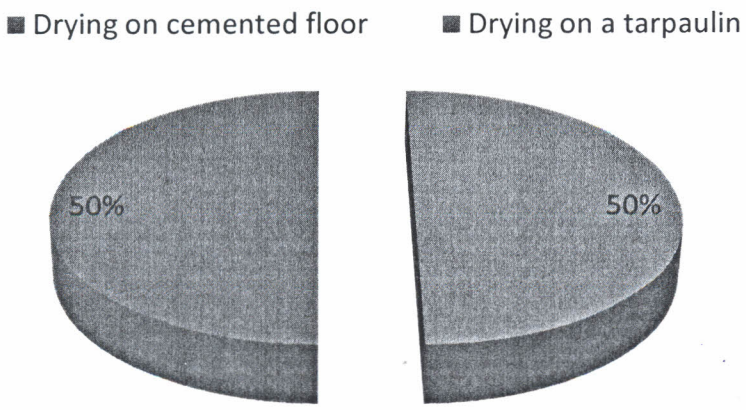

Figure 4.4: Methods of drying paddy

Number of days used for drying

Processors were interviewed on the number of days used for drying and from the interview, 20% of the farmers dry their produce for a day, 10% for 2 days, 50% for 3 days and 20% for more than three days depending on the sunlight intensity.

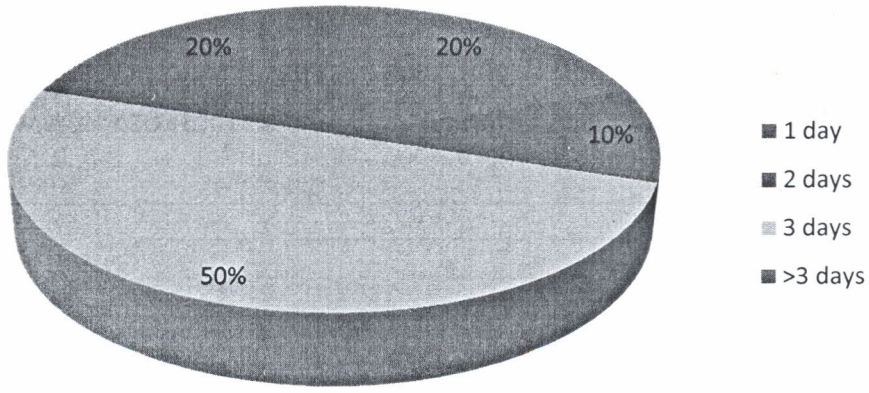

Figure 4.5: Number of days used for drying

Paddy cleaning before milling

Upon receiving paddy from farmers, some of the millers do clean the paddy whereas others do not. From the interview, 75% of the millers clean the paddy before milling whilst the remaining 25% do not clean the paddy before milling.

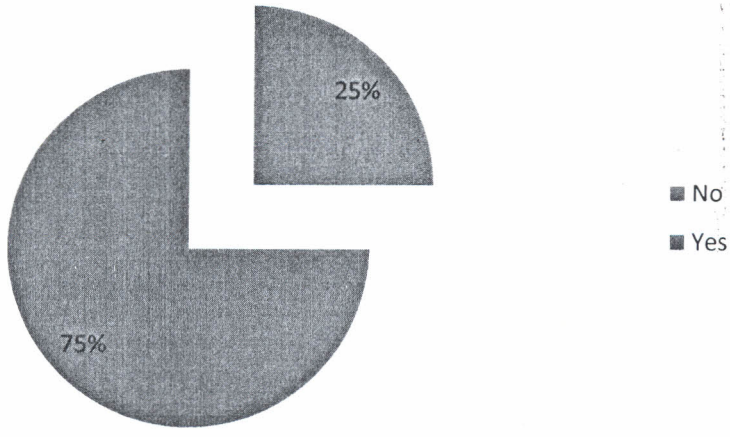

Figure 4.6: cleaning before milling

Materials removed before milling

During cleaning of the paddy, materials such as stones, marshy clay (mud) and at times metals are removed. When asked the type of foreign materials remove during cleaning, 50 % of the millers mentioned stones whilst that for metals and marshy clay was 25 % each.

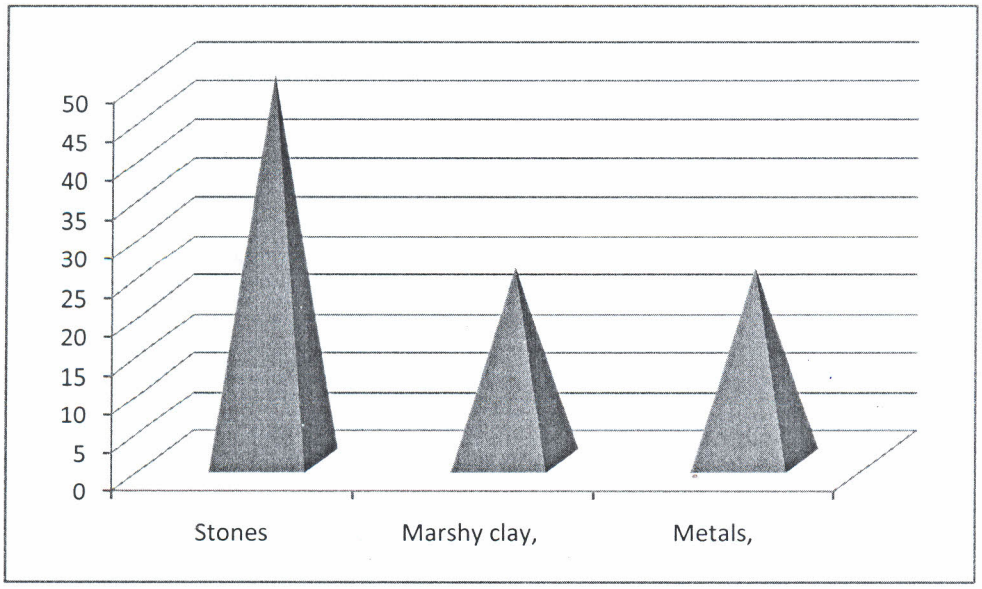

Figure 4.7: Types of materials removed before milling

Equipment used for paddy cleaning

Processors' were interviewed on the equipment used for the cleaning the paddy and it appeared that 75% of mills were with destoners whereas 25% of the remaining mills were without destoners.

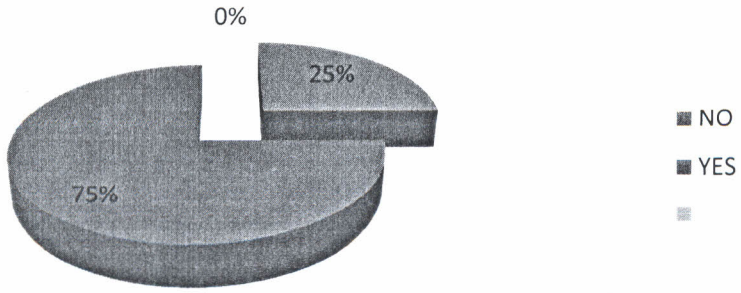

Figure 4.8: Equipment used for cleaning paddy

Operating capacity of mills

The capacity of the mills at Afife ranges from as low as 100kg rice paddy per hour to over 500 kg rice paddies per hour. Mills with capacity less than 100 kg per hour were only 25% of the mills in the area. The ones with capacity over 500 kg per hour also constituted 25% of the mills in the area.

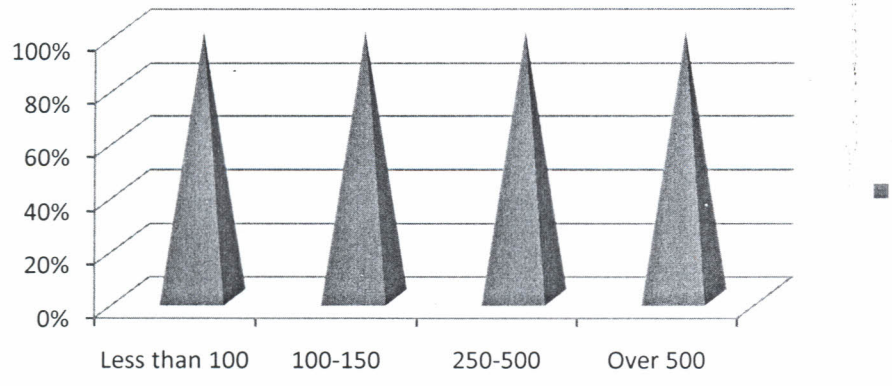

Figure 4.9: Operating capacity of mills

Customers' perception on grain homogeneity

The millers were further interviewed on how satisfied their customers were in terms of homogeneity of the milled rice. 25% of the millers rated the grain homogeneity from their mill as very good. Another 25% of the millers had their customers rating the grain homogeneity as good.

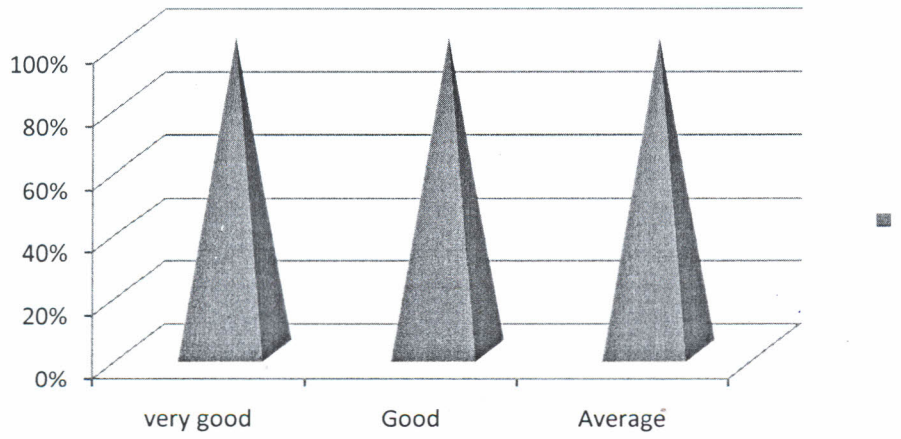

Figure 4.10: Customers perception on grain homogeneity

Customers' perception on cleanliness of milled rice

Processors' were interviewed on their views on the cleanness of the milled rice and 75% of them rated it as very good, with the remaining 25% being rated it as good.

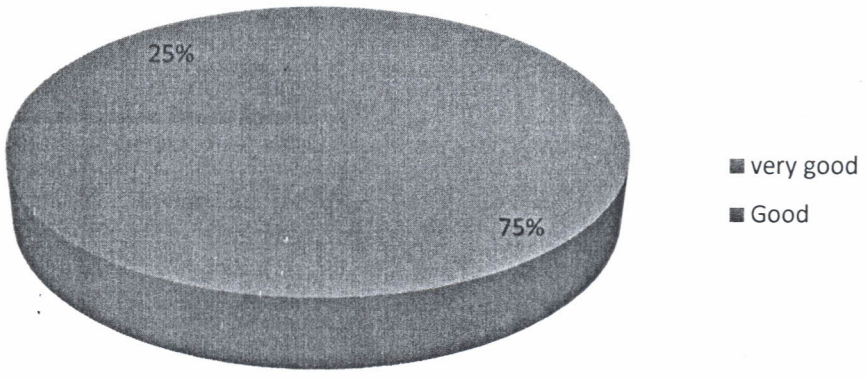

Figure 4.11: Customers perception on cleanliness of milled rice

Storage structures used by processors

The respondents were again asked about where they store the rice before selling. The percentage of respondents who store their rice in shops or warehouses at their homes were 20% each. Only 6.7% store their rice in the market warehouse. Majority of the respondents (53.3%) store their rice in the mill house. Before storage the rice is first bagged. The bagged rice is then packed on pallets in the warehouses.

Figure 4.12: Storage structures used by processors

Treatment of rice before storage

Processors' were interviewed as to whether they treat their stored rice before storage and from the interview, only 20% of the respondents do treat their rice before storage. The remaining 80% respondents do not treat their rice before storage.

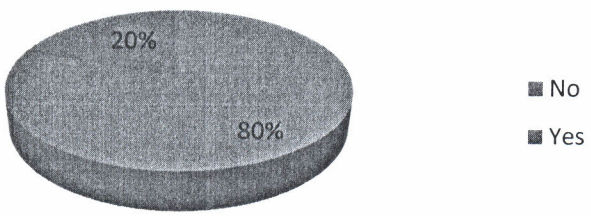

Figure 4.13: Treatment of rice before storage

Incidence of pest attack during storage

Processors' were interviewed as to whether there were incidences of pest attack during storage and for most (53.3%) there were no incidence of pest attack during storage of the rice. However the remaining 46.7% of the respondent said their stored rice were often under pest attack. The pests that usually attack the stored rice are mice and weevils.

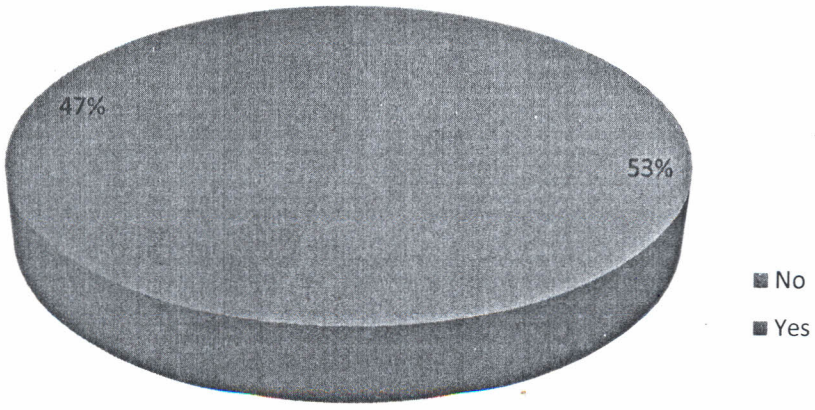

Figure 4.14: Incidence of pest attack

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.0 CONCLUSIONS

The survey has revealed that rice processors were still using improper and unscientific methods of drying, threshing and storage

5.1 RECOMMENDATIONS

Post harvest practices and technologies should be improved by following proper post harvest practices such as proper methods of harvesting, ensuring uniform drying, use proper techniques of processing, use proper scientific methods storage, efficient and good packaging for storage as well as in transportation to upgrade the quality and marketability of locally produced rice in order to meet urban consumer preferences.

I recommend that this study should be repeated at different rice communities to generate more information on post harvest practices.

REFERENCES

Calvery, D.J.B.(1994). Programme for the prevention of food losses. A study of eleven projects in Asia concerned with rice. Final report.FAO

Chandy, K.T.(1987) Agricultural and Environmental Education

De Padua,D.(1999).Rice post harvest handling in Asia

Diange, A.(2008).Opportunities for collaboration between SLU and the African Rice Centre (WARDA).SLU/CGIAR workshop, September 23-24th2008 Uppsala, Sweden

DOASL (2006). Department of Agriculture, Sri-Lanka.

FAO,(2001).Workshop on policy support for rapid adoption of hybrid rice on large scale production in Asia, Hanoi, Viet Nam,22-23 May.FAO Final Report,p.10.

GNA,(2010).Ghana spends $450m on rice importation annually.(Accessed on 14/3/2013)

Grolleaud, M. (2001). Post harvest losses. Discovering the full story, overview of the phenomenon of losses during the post harvest system. Rome, FAO.

IRRI (1997).IRRI rice facts. Los Banos, Phillipines, IRRI.

IRRI (2009).Rice Policy-World Rice Statistics(WRS).

Landon, A.R.(1991).and De Datta, S.K.(1981).Principles and Practices of rice production. Wiley and Sons, New York.

Lantin, R.(1997).Rice post harvest operation. A chapter for the post harvest compendium with information Network on Post harvest operations. (INPhO).Available online at www.fao.org/inpho/index-e.htm

Mejia, D.J.(2002).An overview of rice post harvest technology: use of metallic silos for minimizing losses. Proceedings of the 20th session of the International Rice Commission (Bangkok,Thailand,23-26 July,2002).

NAPHIRE,(1997) .Technical Guide on Grain Post harvest operations. National Post harvest Institute for Research and Extension. Munoz, Nueva Ecija, Phillipines.

Onwueme,I.C.andSinha,T.D.(1991).Tropical Field Crops.

Porteres,R.(1976).Arican cereals .p 409-452.In:Harlan JR and De Wet JMJ ed.Origins of African Plant Domestication.Mouton,The Hague.

Shao-Mwalyego,Kayeke,J.M. and Mghogho,R.M.(2011).ASARECA-RICE PROJECT,Livelihood Improvement through Integrated Management Practices for Rainfed lowland rice.Mbeya,Tanzania.

Toquero,Z.F.and Duff, B.(1974).Survey of post production practices among rice farmers in Central Luzon.Proceedings of Saturday Seminar Paper.Los Banos,Phillipines,IRRI.

WARDA(2005).Rice a Strategic crop for Food Security and Poverty Alleviation.

WARDA(2007).Overview of Recent Development in Sub-Saharan Africa Sector.Africa Rice Trends,Cotounuo,Benin,p.10.

APPENDIX

Semi-structured Survey Questionnaire

Place:..... Date ..... Age .....

Name of respondent:..... Sex:1. Male 0. Female

1. Have you ever had any training in the determination of « best time for harvesting »?

   /__/ *1=Yes 0=No*

2. Have you ever had any training in the use of grain moisture meters?

   /__/ *1=Yes 0=No*

3. What equipment do you use in harvesting? /__/
   1=Combine, 2=Mini-combine, 3=Reaper, 4= Sickle, 5=Cutlass 6=Knife, 7=Other (specify
4. Threshing*(Threshing involves separating the grain from panicles but not removing the husk)*
5. How do you determine the time for threshing?

   _____

6. What are the methods used? _____
7. What problems do you face during threshing? _____
8. Threshing rate: /__/__/./__/ Kg/hrDrying After Threshing
9.

10. Is this done? /__/ *1=Yes, 0=No*

11. Why? _____
12. What methods are used? _____

10. Do you save some of the seeds for the next planting season? /__/ *1=Yes 0=No*
11. Are these (seeds) set apart in different storage areas or containers? /__/ *1=Yes 0=No*
12. Are any special treatments given to these seeds? /__/ *1=Yes 0=No*

13. If yes, what is the treatment? _____

14. Is your harvested crop threshed on your farm? /__/ *1=Yes 0=No*

15. If not, by what mean do you transport the paddy to the place of threshing? /__/ /__/

1=Trucks, 2=Horse/animal drawn carts, 3= Hand drawn carts, 4=By foot/walking, 5= Others (specify)

16. Is your threshed paddy milled right on the farm? /__/ *1=Yes 0=No*

If not, by what mean do you transport the paddy to the place of milling? /__/ /__/

1=Trucks, 2=Horse/animal drawn carts, 3= Hand drawn carts, 4=By foot/walking, 5= Others (specify)

17. Is your milled rice stored in the rice mill? /__/ *1=Yes 0=No*

18. If not, by what mean do you transport the milled rice to the warehouse? /__/

/__/

1=Trucks, 2=Horse/animal drawn carts, 3= Hand drawn carts, 4=By foot/walking, 5= Others (specify)

19. Is your milled rice directly sold from the warehouse? /__/ *1=Yes 0=No*

20.If not, by what mean do you transport the milled rice to the market?/__/ /__/

1=Trucks, 2=Horse/animal drawn carts, 3= Hand drawn carts, 4=By foot/walking, 5= Others (specify

21.What are your sources for financing your operations? /__/

1=Self, 2=Spouse, 3=Other family members, 4= Money lenders, 5=Banks 6=Other (specify)

22.How is the support provided if applicable? (credit facilities etc.)

_____

23.Technicalsupport (maintenance, repairs, operations etc.)

24.Do you have any problems of a technical nature? /__/ *1=Yes 0=No*

If yes, elaborate

_____

25.Are you able to handle these problems yourself? /__/ *1=Yes 0=No*

26.If not, what local or external agencies provide technical assistance to your establishment?

_____ _____

27.Name the agency and indicate the type of assistance

28.Where is the paddy dried a/__/ *1=Cement floor, 2=Earth floor, 3=Tarpaulin, 4=Other*

29.Duration of drying /__/__/ hours

30.Phases of drying /__/ /__/ *1=single drying period, 2=split drying with rest period, 3 =other*

Split drying (specify details)

_____

31.Density of drying (to be measured) /__/__/ . /__/ kg/m^2

32.How often is it turned? /__/ times per hour

33.How long is paddy handled/stored before milling.

34.Location of the main mill /__/ *1=At market, 2=At home, 3=Other*

If other, please specify _____

35.Nameof the main mill _____

36.Shareholders/owner(s) of the main mill _____

37. Year of installation of the main mill /__/__/__/__/
38. Source (country of origin) of the equipment _____

39. How easily do you obtain spare parts? _____
40. Have you done any major equipment replacement since installation? /__/ *1=Yes, 0=No*

41. Do you clean the paddy before milling? /__/ *1=Yes, 0=No*
42. What type of foreign matter is removed? _____
43. How do you do the cleaning? _____

_____

44. What equipment are used for this cleaning operation?

_____

45. What are the sources of power for your mill? /__/ /__/ /__/ *1=Electricity, 2=Diesel, 3=Animal power, 4=Other (specify)*
46. What is the installed capacity of the mill (in kg per hour)? /__/ *0=unknown, 1=less than 100 kg/hr, 2=[100 - 150], 3=[150 - 250], 4=[250 - 500], 5=Over 500 kg/hr*

47. Which of the following components are present in your mill?

47.1 Paddy cleaner /destoner /__/ *1=Yes, 0=No*

47.2 Elevators /__/ *1=Yes, 0=No*
47.3 Rubber rolls /__/ *1=Yes, 0=No*
47.4 Paddy separator /__/ *1=Yes, 0=No*
47.5 Polisher /__/ *1=Yes, 0=No*
47.6 Grader /__/ *1=Yes, 0=NO*

47.7 Scales and sealers /__/ *1=Yes, 0=No*

47.7Scales and sealers /__/ *1=Yes, 0=No*

48. At what capacity is the mill operating? /__/__/__/ %

49. Why is the mill not operating at 100% capacity(if not) _____

_____

50. Where is the paddy grown? /__/ *1=same area as mill, 2=elsewhere 3=Both*
51. What do clients use milled products for? /__//__/*1=sale, 2=self-consumption 3=Both*
52. How do clients get paddy? /__//__/*1=They are farmers, 2=They buy from other sources 3=Both*
53. How reliable are the sources? /__/ *1=very reliable , 2=fairly reliable, 3=not reliable*
54. How much milled rice do you get from milling 10 kg of paddy? (To be measured) /__/ . /__/ kg
55. Is there any form of grading of milled rice done? /__/ *1=Yes, 0=No*

56.Does milling go on all year round? /__/ *1=yes, 0=no*

57.How do your customers find the quality of your milled rice in the following aspects? **Codes**: *1=Very good, 2=Good, 3=Average, 4=Bad*

/__/Cleanness of the milled rice /__/Grain homogeneity /__/Milling yield /__/Percentage of whole grain

58.In what form do you get the paddy? /__/ /__/ *1=Not parboiled local source, 2=Parboiled local source, 3=Other*

59. Do you store paddy in the mill house / warehouse before milling?/__/ *1=Yes, 0=No*

60. Do you store milled rice in the mill house/warehouse before sale?/__/ *1=Yes, 0=No*

61. Are there incidence of pest/insect attack during storage?/__/ *1=Yes, 0=No*

- If yes, specify:

62.How far is the storage place from the place of marketing? _____ km

- How far is storage place from the mill house? _____km
- Elaborate on transaction costs for transportation (eg. loading and unloading fee, transport fee etc.)

_____

63. What is your frequency of going to the place of marketing? /__/ *1=Daily 2=Weekly, 3=Twice monthly, 4=Monthly, 5=Half-yearly, 6=Other (specify)*

64.What treatment is given to the rice before storage? _____

If yes, what kind of treatment do you administer?

_____

65.Where is the milled rice stored? /__/ *1=Market warehouse, 2=Warehouse at home, 3=Shop, 4=Others (specify)*

66. In what container is rice stored? /__/ *1=Bag, 2=Bowl, 3=Other*

6.1 How is the rice stored? /__/ *1=On the ground, 2=On pallets, 3=Other (specify)*

67. Do you experience incidence of pests attack in storage? /__/ *1=Yes, 0=No*

If yes, specify

_____

68. Do you experience incidence of insect attack in storage? /__/ *1=Yes, 0=No*

If yes, specify

_____

69. Do you experienceother forms of attack in storage? /__/ *1=Yes, 0=No*

If yes, specify

70.How is the milled rice sold? /__/ *1=Packaged, 2=Not packaged 3=Both*

a. If packaged, which kind of packaging material? /__/ *1=Polythene, 2=Paper, 3= Jute sac, 4=other (specify)*
b. If packaged, is the milled rice sold sealed? /__/ *1=Yes, 0=No*
c. Kind of sealing: _____
d. Is packaged rice labeled? /__/ *1=Yes, 0=No*

71.To whom is the milled rice sold? /__/ *1=Family members, 3=Regular customers, 3=Anybody*

72.How long is the milled rice kept before sale

Minimum: /__/__/ days Maximum: /__/__/ days

73.Do you get complaints from your customers about the quality of the rice? /__/ *1=Yes, 0=No*

If yes, what complaints?

_____

74.Do you have any specific strategy of selling rice? /__/ *1=Yes, 0=N*

If yes, specify (Quality aspects, client preference, seasonal effect, presence of imported rice with better quality?)

_____