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Making Nigerian Agricultural Markets Work for the Poor

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## **Business Opportunity for Threshing in Kano Rice Value Chain**

**By**

**Optimum Agricultural Consultants**

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**Business Opportunity for Threshing in Kano Rice Value Chain**

**Final Report**

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## **Executive Summary**

A study on the business opportunity for rice threshing was carried out in Kano rice value chain, specifically in Kura, Garko, Tudun Wada, Chiromawa, Karfi and Tamburawa. The main objective of the study was to provide a basis against which progress towards adopting a manual-mechanized thresher can be pursued in the study area. Information was collected from rice farmers and rice threshing service providers. Data were collected using well structured questionnaires from 120 rice farmers selected randomly as well as 60 rice threshing service providers. Data collection was through the use of well trained enumerators who were trained by field scientists. Case studies were also conducted for one rice farmer and one service provider in the Kura rice cluster.

## **Rice Farmers**

Majority of rice farmers in the study area are males. Tamburawa has the highest number of female rice farmers. The ages of the rice farmers range from under 20 to above 51 years, there is a variation in the ages of these farmers between the rice clusters. About 70-75% of rice farmers are married with 10-30% single, divorced or separated. Majority of respondents have 6-20 years of experience in rice farming while a few others have more than 20 years of experience in rice farming. In terms of level of education, 10-35% of respondents have higher education while others have primary and secondary education. Majority do not have a formal education across the clusters.

House hold size varies but majority have a house hold size of 1-20. There is also a variation in household income but majority of the rice farmers have an income below N50, 000 but 20% of the rice farmers in Tudun Wada have a household income above N500, 000 which is the highest among the clusters. 65% and 75% of the farmers in Chiromawa and Karfi falls within the lowest income category of below N50,000 per annum. Total farm size vary, majority have 0.4 2 hectares as their farm size. However, 25% of the farmers in Tudun Wada have farm size above 8 hectares. The nature of farm cultivation operation in the study area is the manual method with 55-85% of respondents using manual method with only 15-40% using both manual and manual mechanized method. Farming is the major occupation in the study area with 70-90% having farming as their major occupation across the clusters, others engage in livestock rearing and trading.

Manual method of rice threshing is very common in the study area with 100% of respondents in Garko, Tudun Wada and Tamburawa, 85% each in Chiromawa and Karfi and 95 % in Kura using the manual method of rice threshing. Only 5% in Kura and 15 % in Chiromawa and Karfi reported ever using the manual-mechanized threshers in rice threshing in the past few years but not last season. Farmers mentioned several reasons for using the manual method with 50-85% of respondents claiming availability of the manual technology as the major reason for using it. Others claim convenience of skill and affordability as the reasons for using the manual technology. Some changes have also taken place in threshing method over the last two cropping seasons; these changes include improvement in technical skill through extension, use of drum instead of stick and enhanced productivity.

Majority of farmers are willing to adopt a more efficient threshing technology, 70-90% of respondents are willing to adopt an efficient rice threshing technology while 5-35% of respondents are not willing to adopt the technology. The major (50-70%) reason for willingness to adopt the technology is the expected increase in productivity. Other reasons such as time saving, cheapness and ease in using the technology are some of the reasons for willing to adopt the technology.

Average cost of threshing a 100kg bag of paddy vary between the rice clusters but it range from N100-N300, with Garko having the highest rate of N300 per bag and Kura having the least rate of N100 per bag. The average cost of threshing a hectare ranges from N9884.00 to N24,710.00, with Kura and Karfi having the lowest rate of N9884.00 and Garko have N17297.00 and the remaining clusters having the highest rate of N24,710.00. Majority of the farmers are willing



to pay more for using a more efficient threshing method that will reduce loss due to splitting and breakages of grains.. The average amount willing to pay range from N334-N557 per 100kg across the clusters and an average of N39947.92 per hectare as reported in Kura and Tudun Wada and N23968.70 as reported in Chiromawa.

Differences occur in the number of productive plots available to farmers in the rice clusters, a minimum of one plot and a maximum of above 5 productive plots were obtained, and 10% of farmers in Tudun Wada, Garko, Karfi and Tamburawa have more than 5 productive plots. The largest productive plot size in Garko is 2.02 hectares and 0.99 hectares as the smallest productive plot size. Chiromawa has 0.68 and 0.40 hectares as the largest and smallest productive plot sizes. Farmers in Tamburawa have 1.40 and 0.57 hectares as the largest and smallest productive plot sizes respectively.

Farmers in Karfi thresh the minimum average quantity of 56.25 bags hectare while the farmers in Tudun Wada thresh an average of 67.8 bags per hectare which is the highest. Losses are incurred during threshing in all the rice clusters; an average of 3.38-5.5 bags of paddy per hectare is lost during threshing. The highest loss of 5.18 bags representing 8% of the total yield was obtained in Kura and the lowest loss of 3.38 bags per hectare was obtained in Karfi which represent 6 % of the total yield in the cluster.

Labour is an important variable in rice threshing and farmers interviewed across the clusters use hired labour mainly in threshing. The use of labour in the rice clusters is also not uniform, 18-21 people are used per hectare in an average of 5-6 hours per day. Averages of 2-2.5 days are used in threshing a hectare of rice. The rate paid for threshing rice per hectare also range from N400 in Tamburawa to N700 in Kura. Estimated total cost of labour per hectare range from a minimum of N17, 680 in Garko to to a maximum of N25, 200 in Kura.

Winnowing also involves the use of labour, an average of 5-6 people are used per hectare in an average of 6.5-7.5 hours per day for 2-3 days. The rate paid per person per day also varies, N524-N700 is paid per person per day and N50-N60 paid per 100kg bag of paddy. Additional inputs such as food and rice given as gifts are also valued as part of the total cost of threshing and winnowing. Rice is valued between N800-N960 while food given to rice threshers is valued at N1350-N2400 and that given to winnowers is valued at N250.N300. The total cost for threshing a hectare of rice in Kura was estimated to be N26, 820 including costs of incentives such as food and it is N20,080 in Garko, N21,840 in Tudun Wada, N23,310 in Chiromawa, N20,250 in Karfi and N20,160 in Tamburawa.

Majority of farmers do not own threshing equipment while few of the farmers own trampoline, drums and cement bags. The values of some of this equipment vary depending on the quantity owned. The life span of these equipment range from 1 year for cement bags and 5 years for trampoline and drum.

Consultation on issues related to rice threshing is rare among rice farmers, 65-80% of the farmers do not consult while 20-35% consult co-farmers and extension agents. Farmers are radio listeners, a number of AM and FM stations and other national and international stations are the farmer's favourite stations. Early morning and late evening hours of the day are the favourite times for listening to radio. Television viewing is not common with farmers. There are some specific agric programme especially in the local radio stations such as Na Gona and Noma Karkara in Radio Kano and Radio Kaduna respectively which are transmitted in Hausa language and which the farmers usually listen. Such programme and stations can be used as a medium of disseminating information on manual-mechanized threshers to the farmers.

Even though some farmers are aware that wide scale adoption of manual mechanized thresher will displace labour, but majority are willing to adopt the technology as indicated by 100 % of the farmers in Chiromawa and Tamburawa, 95 % in Garko and Tudun Wada, 90 % in Kura and Karfi. The major constraints of rice threshing among the farmers across the clusters are; high cost of threshing, inadequate tools, lack of modern equipment, inadequate labour and loss of grains.

### **Rice threshing service providers**

Majority of rice threshing service providers are males (70-80%) while 10-20% are females, 70-80% are married and fall within the age range of 20 to above 51 years but majority fall within the age category of 26-45 years and have 6-20 years of experience in rice threshing. There is a variation in household size but about 20-60% have a household size of 6-10 members. Literacy level is low with 30-50% of respondents not having any formal education; others have primary and secondary education. Islam is the practicing religion in the study area.

Household income also vary, 70-90% of respondents have an income below N50, 000. The common method of rice threshing is the manual method, 20-80% have rice threshing as their major occupation while others have livestock rearing and trading as their major occupation. About 1-6 household members contribute to threshing. There is no any cooperative group for the rice threshers and rice is the major crop threshed last season. Daily income of rice threshers range from N100 to above N500 and seasonal income from rice threshing is N10, 000-N20, 000. A daily income in the range of N100-N200 is obtained among 30% of respondents in Garko and Tudun Wada, while 40% of the respondents in Tamburawa had a daily income in the range of N201-N300. The seasonal income from last years cropping season also vary but it ranges from less than N10, 000 to above N50, 000 but only 10% of respondents in Tamburawa had a seasonal income above N50,000. Majority of respondents, 60% in Tamburawa, 50% in Kura, Karfi and Chiromawa had a seasonal income of less than N10, 000 in last years cropping season. However, 60% of respondents in Tudun Wada and 50% of the respondents in Garko had a seasonal income in the range of N10, 000-N20, 000 in last the years cropping season.

Manual threshing is the common method used by rice threshers in the study area as indicated by 90 % in Kura, Tudun Wada, Chiromawa and Karfi and by 70% in Garko. The use of manual mechanized thresher was not common but 30 % of the service providers in Garko and 10 % in each of the other clusters indicated using manual mechanized threshers in the past few years but not last season. Convenience, availability of equipment, and affordability of the technology are some of the reasons given for using the manual method of rice threshing. Rice threshers claimed that changes have not taken place in the method of rice threshing. Majority (60-100%) are willing to adopt a manual mechanized rice thresher while 10-40% are not willing to adopt. Those willing to adopt mentioned increased efficiency as the major reason for the willingness in adopting the technology.

Average charge for threshing a hectare of paddy using the manual method varies across the clusters, the highest charge of N37, 065 was obtained in Tudun Wada and Tamburawa and the lowest charge of N18, 532.50 was obtained in the other clusters. .

Some of the rice threshers believe that with the adoption of manual mechanized rice thresher charges for threshing will decrease while others believe that the fee charged for threshing will increase. Those who will increase refer to the expected higher costs in terms of investment ( higher price of purchasing the equipment) and operation ( cost of fueling) of the manual-mechanized thresher as their reason and those that will decrease refer to the expected efficiency in terms of less labour requirement and more output per unit time as their reasons.

Men are more involved in rice threshing while the females are involved in winnowing of rice. The mode of operation in threshing is either individual threshing unit or group threshing unit. Individual threshing unit is more common in Kura and Garko. Tudun Wada, Chiromawa, Karfi and Tamburawa practice group threshing system. Where threshing is done in group, the number per group is 1 to above 10 but above 10 people per group is more common.

Average hectares threshed last season by service provider's interviewed, vary from 4.4 hectares in Kura, Chiromawa and Karfi to 10.6 hectares in Tudun Wada. The quantities of rice threshed also vary; the minimum average quantity threshed is 41.6 bags in Kura while the, maximum average quantity threshed is 79.1 bags in Tamburawa. Losses are also incurred during threshing using manual method. The highest loss was 9.2 bags per hectare obtained in Karfi with an average quantity threshed of 56.3 bags, while the minimum loss incurred was 3.8 bags per hectare in Chiromawa with an average quantity threshed of 51.9 bags. The percentage loss may depend on the quality of the paddy in terms of its water content, the drier the paddy the less may be the losses. It may also depends on the quality and adequacy of threshing equipment used and the skills of the threshers, for instance the wider the trampoline use the less the possibilities of loss through splitting of grains.

Majority of the service providers owned rice threshing equipment, some of the equipment owned include; Trampoline, drum, cement bag mats and sticks. The total value of this equipment depends on the quantity owned. The life span of the equipment is one year for the stick, 2 years for trampoline and 3.5 years for the drum across the clusters. Winnowing equipment also includes; calabashes and bowls, the lifespan of which is 2-6 years for calabash and 1-3 years for the bowls. This equipment is either individually owned, group owned or hired but majority hire the equipment.

Consultation on issues related to rice threshing is not common, 50-90% of respondents do not consult anybody but 10-30% consults co-threshers and winnowers on issues related to rice threshing and winnowing. Rice threshing service providers are also regular radio listeners, 60-100% listen to radio while 10-40% do not listen to the radio. Some of the popular stations are Kano Radio, AM and FM, Freedom Radio, FRCN Kaduna, BBC and VOA. They generally listen to news and Hausa programmes throughout the week at early morning and evening hours. Television viewing is also not very common among service providers, 40-90% are not regular television viewers while 10-60% are regular Television viewers.

Rice threshing service providers are aware of labour displacement by wide scale adoption of manual mechanized rice thresher; 30-100% is of the opinion that labour will be displaced while 20-70% is of the opinion that wide scale adoption of manual mechanized rice thresher will not displace labour. Men will be the ones that will be most affected by the labour displacement. Majority of the service providers are however willing to adopt the manual-mechanized threshers despite its implication in terms of displacing labour as indicated by 100% in Kura and Tudun Wada , 90% in Karfi, 80 % in Tamburawa and 60 % in Chiromawa.

The major constrain associated with rice threshing is inadequate capital; others are lack of modern equipment, inadequate and inefficient equipment and inadequate labour. The major constraints in winnowing include; inefficient equipment and inadequate capital to invest in the purchase of more winnowing equipment leading to inadequate tools and equipment among winnowers. . In the process of winnowing the equipment used are not efficient especially at the point of blowing where adequate air flow required cannot be generated and this stage is very critical in the whole process.

The costs involve in threshing business include initial investment in the purchase of drums and trampoline and it also include operational costs such as the costs of transportation to and from the farm. Food and water are provided by the farmer as indicated by the threshers in all the clusters. The highest average costs of investment of N18, 984 for a threshing unit

was obtained in Garko and the least of N6, 800 was obtained in Tudun Wada. The highest operational cost of N3, 050 was obtained in Tamburawa and the least of N2, 240 was obtained in Kura. In terms of net return or profit the highest profit of N22, 960 was obtained in Kura and the least of N 14,950 was obtained in Tamburawa. In general rice threshing business is a profitable business.

## 1.0 BACKGROUND

Rice is an increasingly important crop in Nigeria. It is grown for sale and for home consumption. In some areas there is a long tradition of rice growing, but for many, rice has been considered a luxury food for special occasions only. With the increased availability of rice, it has become part of the everyday diet of many in Nigeria. There are many varieties of rice grown in Nigeria. Some of these are considered 'traditional' varieties; others have been introduced within the last twenty years. In the northern states of Nigeria, rice is grown in lowland or on upland fields, depending on the requirements of the particular variety. New varieties are produced and disseminated by research institutes, or are imported from Asia. The spread of these strains is determined by their perceived success, and farmers multiply seed for their own plots when they see a variety doing well in someone else's field, or if a variety is fetching a good price in the market. Presently many farmers undertake some land preparation and harvesting operations manually. Generally tasks are allocated along gender lines especially in the Kano production clusters, but in some areas men and women work together. Women are involved in the transplanting of seedlings to the fields and threshing, whilst it is often the men who do land preparation and weeding.

Harvesting constitutes a major operation among agricultural activities and differs according to the part of the plant to be harvested. Threshing is a major aspect that is usually carried out after harvesting of grain crops. This involves the beating of the grains from the stalk.

### 1.1 The Traditional Methods of Harvesting Rice

The crop is ready for harvest when 80% of the grains have turned to straw colour. Rice is harvested manually using a sickle or a Knife. The farmer lifts only the panicles, which he puts together in bundles. The sickle as a harvesting implement is widely used and preferred among the small holders in the Kano rice production clusters. Harvesting with sickle according to some few small holder farmers is more efficient in terms of time consumption and output obtained than knife. The harvested rice is usually threshed in the field and some farmers do the threshing outside the farm after transporting the harvested rice to the village.

The techniques of rice processing employed in the Kano rice production cluster include threshing, drying, winnowing, parboiling and milling. Harvesting and threshing are done at the farmers' level and many farmers prefer to sell their rice as paddy to traders and processors who further undertake the remaining processing operations

Threshing is carried out immediately after harvest to avoid grain losses. Farmers thresh on a dry mat or tarpaulin over hard floor by beating the panicles with sticks. In some areas, the panicles are also threshed by loading them into a jute sack before beaten repeatedly with a stick. With this kind of operation, it may take about 4-5 hours per person to thresh a bag of 100kg weight full of panicles. This kind of threshing method is inefficient; it may lead to significant post harvest losses of the paddy, high costs of the operation, adds impurities to the paddy, thus affecting the efficiency and quality of subsequent processing operations. There is the need therefore for technically and economically efficient threshing practices especially among rice producers.

Some medium and large scale producers of rice are using mechanical threshing equipment and method which are more efficient in terms of labour saving, time spent and quality of outputs. Whether small holders would adopt mechanized threshing method and abandon the traditional methods they are currently using will depend on technological as well as economic and social factors. This implies that, the selection and promotion of an appropriate technology for threshing will depend on technological considerations such as the type and efficiency of machine and process to use, agronomic consideration such as the production cycles, the nature of the rice varieties grown, relative advantage of the technology in terms of costs and accessibility and socio-economic consideration such as the income of the farmers, gender, labour availability and variability, culture and norms especially as they

relate to information communication among the farmers, and so on. All these will determine the extent to which technology can be adopted and subsequently adapted among the rice farmers in the production clusters.

## **2.0 OBJECTIVES OF THE STUDY**

The main objectives of this study are;

- Provide bases against which progress towards adopting manual-mechanized thresher can be pursued
- Collect data related specifically to socio-economic variables of rice producing households, rice production, harvest, and post-harvest practices especially as they relate to threshing method and output, threshing and post harvest efficiency parameters, labour requirement and utilization, gender roles and responsibilities in rice production and processing, socio-economic factors and communication behavior that may influence the adoption of threshing technologies.
- Provide a basis of comparison between the different sites where catalytic activities are undertaken.

### **2.1 Some of the Expected Outputs**

1. The study will produce baseline information detailing on;
  - Post-harvest practices (threshing, winnowing) and their technical and economic efficiencies used by the rice farmers in Kano cluster.
  - Gender roles and responsibilities in rice production and post harvest activities will be understood.
  - Provide information on costs and relative importance of manual versus mechanised methods of threshing.
  - Socio-economic factors and communication behaviour influencing adoption of threshing technologies among the rice farmers will be identified and evaluated.
2. The study will provide information that will aid comparison in terms of practices, socioeconomic factors and other factors influencing technology adoption between the different sites where catalytic activities in rice are implemented.

## **3.0 METHODOLOGY**

### **3.1 Rice Production Clusters in Kano State**

Rice is produced in almost all the Local Government Areas of Kano state. However, the bulk of rice production and processing activity in the state is mainly in the following clusters;

- Kura corridor rice production cluster which include mainly sites in Kura, Karfi, Chiromawa, Tamburawa, Garum Malam, and Bunkure. Farmers in this cluster produce rice during rainy season mainly within the perimeter of the Kano River Irrigation Project which is a public irrigation project with a capacity of about 22,000 hectares of irrigable land. The farmers use the designed irrigation farms within the project perimeter during the rainy season to produce rice crop. The irrigation facilities of the project are used to provide supplementary irrigation to the rice fields during the production cycles. Most of the rice varieties grown in this cluster are the low land types.
- Tudun Wada cluster is another important rice cluster in Kano where farmers produce rice using upland and lowland fields and varieties. In this cluster rice is a major crop during the rainy season and a significant number of farmers are involved in rice production operating at both small and large scale levels of production.
- Garko cluster is another important cluster where upland fields mainly and some Fadama fields are used in the production of various rice varieties during the rainy season. The Garko cluster implies production activities in Garko and some parts of Kibiya Local Government Areas.
- Danbatta is another important cluster where many farmers use the perimeter of the Thomas Dam Irrigation Scheme and other low land fields to produce rice during the rainy season. Most of the rice varieties grown in this cluster are the low land types.

### **3.2 Sampling Frame and Sample Size**

Data were obtained from farmers in the important rice production clusters of the state. In order to get a good representation of the farming populations in the clusters, six production clusters were selected and they include; Garko , Kura, Chiromawa, Karfi, Tamburawa, and Tudun Wada. In all the clusters, 20 rice farmers were selected in each; this gave a total of 120 farmers.

In the sampling, male farmers were randomly selected but for the female farmers, a purposive sampling method was used in identifying and selecting them. In terms of scale of operation the sample include a significant number of large scale farmers. In addition to farmers, threshers (service providers) were also identified and interviewed separately in each cluster using questionnaires and case studies. As such, in each cluster, 10 threshers were selected for questionnaire survey.

**Table 1: Sampling Procedure**

Cluster	Type	
	Farmers	Farmers
Garko	20	10
Kura	20	10
Tudun wada	20	10
Tamburawa	20	10
Karfi	20	10
Chiromawa	20	10
<b>Total</b>	<b>120</b>	<b>60</b>

\* All samples were stratified using gender and scale of operation

### 3.3 Data Collection

The data collection was done using the enumerator conducting survey mainly. Structured questionnaires were used for collecting the data from the samples of farmers and hired threshers (service providers) in each of the selected villages in the clusters. All samples for the surveys was drawn in such a way that gender, scale of operation and location differences between clusters were incorporated to ensure good representation and data quality.

### 3.4 Data Analysis

#### 3.4.1 Data collation and entry

The data collation and entry was achieved by using trained and experienced data entrants (specific training on this assignment will be conducted for the data entrants). The data entry and analyses was carried out using the Statistical Package for Social Sciences (SPSS). This package apart from its good features for both quantitative and qualitative analyses, it is also very compatible with Microsoft excel programme and hence enabled effective transfer of the database on to excel sheet for the records of project (PropCom).

#### 3.4.2 Statistical analyses of data

Descriptive statistics such as mean, variance, percentage, and frequency distribution was employed in analysing the data. In addition, inferential statistical tools such as t-test were used. The t-test was used to statistically compare results based on the different stratification factors used in the sample (gender, scale of operation, cluster).

## 4.0 RESULTS AND DISCUSSIONS: RICE FARMERS



#### 4.1 Socioeconomic Features of Rice Farmers

Result of the study revealed that the age of rice farmers in the study area range from 20 years to above 50 years. However, the ages of the rice farmers vary between clusters. In Kura and Chiromawa majority of farmers (25% and 40% respectively) fall within the age category of 20-25 years while majority of the farmers in Garko, Karfi and Tamburawa (30%, 35% and 35% respectively ) are within the age category of 26-35 years. Tudun Wada is the only rice cluster where majority of farmers (35%) fall within the age range of 46-50 years. Rice farming is a male dominated activity in all the rice clusters. Kura, Karfi, Garko and Tudun Wada have only 5% female farmers with the remaining 95% as males. All the rice farmers in Chiromawa are males but Tamburawa has the highest number of female farmers (15%) as against the 85% that are males.

Majority of the rice farmers in all the clusters are married. All the respondents (100%) in Garko and Tamburawa are married while 75% of respondents in Kura are also married, With only 20% and 5% of respondents being single and divorced. Tudun Wada and Karfi have 90% of their farmers being married with only 10% remaining single. Years of experience in rice farming range from under one year to above 20 years. Few farmers in Chiromawa and Karfi (10% and 5% respectively) have less than a year in rice farming while 30% each of the farmers in Garko and Tudun Wada have more than 20 years experience in rice farming. Household sizes of respondents also vary between the clusters. Majority of farmers (40%, 35%, 35%, 35%, 25% and 35%) in Kura, Garko, Tudun Wada, Chiromawa, Karfi and Tamburawa have a house hold size of between 11-20 while 5% of the respondents in Kura, Tudun Wada, Chiromawa and Karfi as well as 15% and 10% of the respondents in Garko and Chiromawa respectively have a household size of above 20.

Literacy level of rice farmers also vary between the rice clusters, 35%, 30% and 25% of farmers in Garko, Chiromawa and Karfi respectively have a higher education compared to the farmers in Kura, Tudun Wada and Tamburawa where 35%, 50% and 45% of farmers do not have any formal training. Majority of farmers in all the rice clusters (35%, 35%, 20%, 25%, 45% and 25%) have secondary education. Some of the farmers in all the rice clusters have primary education. There is also a variation in household income between the clusters. However, majority of farmers(50%, 52%, 40%, 65%, 75% and 50%) in Kura, Garko, Tudun Wada, Chiromawa, Karfi and Tamburawa have household income below N50,000 while 20% of the farmers in Tudun Wada and 10% of farmers in Kura, Garko and Tamburawa have a house hold income above N500,000.

All the respondents from Kura, Garko, Tudun Wada, Karfi and Tamburawa are muslims. In Chiromawa, 95% of respondents are muslims while 5% are Christians.

Most farmers in the study area have a farm size below 4 hectares with few of the farmers having a farm size above 8 hectares. Majority of the respondents ( 40%, 55%, 40%, 75%, 70% and 50%) in Kura, Garko, Tudun Wada, Chiromawa, Karfi and Tamburawa have a farm size of 0.40 – 2.0 hectares while 25%, 15% and 10% each of the respondents in Tudun Wada, Garko, Kura and Tamburawa respectively have a farm size of above 8 hectares. From the results of the study, manual method of farm operation is the most common practice among the farmers but mechanized method of farm operation is also practiced with 5% of the respondents in Kura and Tudun Wada engaged in mechanized farming only while 40%, 20%, 25%, 25%, 20% and 15% Of the farmers in Kura, Garko, Tudun Wada, Chiromawa, Karfi and Tamburawa practice both manual and mechanized methods of farm operation. However, 55%, 80%, 70%, 75%, 80% and 85% of the respondents from these rice clusters practice solely manual method of farm operation.

Farming is the major occupation of respondents across the rice clusters. 85% of the respondents in Kura and Garko, 90% in Tudun Wada, Chiromawa and Tamburawa as well as 70% of respondents in Karfi have farming as their major occupation. In Kura, Garko and Karfi, 15% of the respondents are engaged in trading as their major occupation. Other occupations engaged in by the respondents include livestock rearing and others.

**Table 1: Socio-economic features of rice farmers**

Variable	Kura		Garko		T/Wada		Chiromawa		Karfi		Tamburawa	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
<b>Age Category</b>												
20-25	5	25	0	0	1	5	8	40	2	10	2	10
26-35	4	20	6	30	4	20	4	20	7	35	7	35
36-40	2	10	5	25	2	10	2	10	5	25	2	10
41-45	4	20	4	20	6	30	3	15	3	15	5	25
46-50	2	10	3	15	7	35	2	10	2	10	2	10
51 and above	3	15	2	10	0	0	1	5	1	5	2	10
<b>Gender</b>												
Male	19	95	19	95	19	95	20	100	19	95	17	85
Female	1	5	1	5	1	5	0	0	1	5	3	15
<b>Marital Status</b>												
Single	4	20	0	0	2	10	6	30	2	10	0	0
Married	15	75	20	100	18	90	14	70	18	90	20	100
Divorced/separated	1	5	0	0	0	0	0	0	0	0	0	0
<b>Years in Operation</b>												
Under 1 year	0	0	0	0	0	0	2	10	1	5	0	0
1-5 years	0	0	1	5	1	5	3	15	1	5	2	10
6-10 years	7	35	2	10	4	20	4	20	6	30	4	20
11-15 years	6	30	7	35	4	20	4	20	4	20	4	20
16-20 years	4	20	4	20	5	25	3	15	6	30	6	30
Above 20 years	3	15	6	30	6	30	4	20	2	10	4	20
<b>Household size</b>												
1-5	8	40	7	35	7	35	7	35	5	25	7	35
6-10	1	5	4	20	5	25	8	40	9	45	3	15
11-20	10	50	6	30	7	35	4	20	5	25	8	40
Above 20	1	5	3	15	1	5	1	5	1	5	2	10

**Table 1: Socio-economic features of rice farmers (Contd.)**

Variable	Kura		Garko		T/Wada		Chiromawa		Karfi		Tamburawa	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
<b>Literacy level</b>												
Primary Education	2	10	5	25	4	20	4	20	3	15	3	15
Secondary Education	7	35	7	35	4	20	5	25	9	45	5	25
Higher Education	4	20	7	35	2	10	6	30	5	25	3	15
No formal Education	7	35	1	5	10	50	5	25	3	15	9	45
<b>Household Income (N)</b>												
Under 50, 000	10	50	11	52	8	40	13	65	15	75	10	50
51, 000-100, 000	3	15	4	20	3	15	4	20	2	10	5	25
101, 000-200,000	2	10	0	0	3	15	3	15	0	0	0	0
201, 000-300, 000	1	5	0	0	0	0	0	0	1	5	0	0
301, 000-400, 000	1	5	2	10	1	5	0	0	0	0	1	5
401, 000-500, 000	1	5	1	5	1	5	0	0	1	5	2	10
Above 500,000	2	10	2	10	4	20	0	0	1	5	2	10
<b>Total Farm size(hectares)</b>												
0.40 – 2.0	8	40	11	55	8	40	15	75	14	70	10	50
2.10 – 4.0	5	25	2	10	2	10	4	20	3	15	5	25
4.10 – 6.0	4	20	1	5	4	20	0	0	1	5	1	5
6.10 – 8.0	1	5	3	15	1	5	1	5	1	5	2	10
Above 8.0	2	10	3	15	5	25	0	0	1	5	2	10
<b>Nature of Farm Operation</b>												
Mechanized	1	5	0	0	1	5	0	0	0	0	0	0
Manual	11	55	16	80	14	70	15	75	16	80	17	85
Both	8	40	4	20	5	25	5	25	4	20	3	15
<b>Major Occupation</b>												
Farming	17	85	17	85	18	90	18	90	14	70	18	90
Livestock rearing	0	0	0	0	1	5	0	0	2	10	0	0
Trading	3	15	3	15	0	0	2	10	3	15	1	5
Others	0	0	0	0	1	5	0	0	1	5	1	5

## 4.2 Background Information on Post Harvest Operation

The table below summarizes the information obtained on post harvest operation. Result of the study revealed that the common method of rice threshing in the study area is the manual method. Farmers in Garko, Tudun Wada and Tamburawa use only the manual method of rice threshing while 19% of the respondents in Kura use the manual mechanized method in addition to the 95% of the respondents that employ the manual method. In Chiromawa and Karfi, the situation is similar with that of Kura where 15% of the respondents also employ the manual mechanized method of rice threshing in addition to the 85% of respondents that use the manual method. The major reason for using the manual method of rice threshing is the availability as well as convenience. Affordability of the technology is also one of the reasons for using the manual method.

Some of the changes in threshing method used over the last two seasons include; the use of drums in place of stick where 10% and 5% of respondents in Kura and Garko explained. Improvement in technical skill through extension is also another change recorded according to the farmers in Kura, Garko, Tudun Wada and Tamburawa where 10%, 5%, 25%, and 10% of the respondents in these rice clusters explained. In Chiromawa, 15% of the respondents gave increase in the cost of rice threshing as the change in threshing over the last two seasons. Some of the farmers in Chiromawa and karfi mentioned availability of labour and enhanced productivity as the changes in threshing method used over last two seasons for example, with the use of drums more output is now obtainable.

Some of the rice farmers in the study area are willing to adopt a more efficient method of rice threshing while others are not willing to adopt. Chiromawa has the highest number of farmers that are willing to adopt a new technology, 100% of its farmers are willing to adopt a more efficient threshing technology when compared with 35% of the farmers in Karfi that are not willing to adopt more efficient rice threshing technology. Kura has 95% of its farmers willing to adopt a new technology, Garko has 75%, Tudun Wada and Tamburawa have 70% and 90% of its farmers respectively. Majority of the farmers in all the rice clusters agreed that increase in productivity is the major reason for willingness to adopt a more efficient rice threshing technology. Other reasons for the adoption of a more efficient rice threshing technology include ease of usage, cheapness of the technology and also time saving.

The cost of threshing 100kg bag of paddy also varies. The cheapest rate is in Tudun Wada where it cost N100 to thresh 100kg of raw paddy. Garko has the most expensive rate of threshing 100 kg bag of paddy (N300). Karfi and Tamburawa charge N200/bag while the rate is N150/bag in Chiromawa. The minimum average cost of threshing a hectare of land is N9884 obtainable in Kura and Karfi while the maximum cost of threshing a hectare of land is N24,710 obtainable in Tudun Wada, Chiromawa and Karfi. The cost per hectare in Garko is N17, 297. Most of the respondents in the study area are willing to pay more for an efficient rice threshing technology. About 95% of respondents in Garko are willing to pay more for an efficient threshing technology while Chiromawa has the least percentage (65%) of those willing to pay more for an efficient rice threshing technology. The amount willing to pay/bag range from N334 in Garko to N557 in Chiromawa and N23,968.70/hectare in Chiromawa to N39,947.92 in Kura and Tudun Wada. Farmers in Garko, Karfi and Tamburawa are not willing to add more per hectare.

**Table 2: Background information on post harvest operation**

Variable	Kura		Garko		T/Wada		Chiromawa		Karfi		Tamburawa	
<b>Methods of rice threshing</b>												
Manual Mechanized	1	5	0	0	0	0	3	15	3	15	0	0
Manual	19	95	20	100	20	100	17	85	17	85	20	100
Others	0		0	0	0	0	0	0	0	0	0	0
<b>Reasons for using the methods</b>												
Convenience ( Skill)	10	50	6	30	4	20	8	40	7	35	4	20
Availability of the equipment	14	70	16	80	16	80	10	50	16	80	17	85
Affordability of the technology	3	15	0	0	1	5	4	20	3	15	0	0
Others	0	0	0	0	2	10	0	0	1	5	0	0
<b>Changes in threshing method used over last two seasons</b>												
Use of drums in place of stick	2	10	1	5	0	0	0	0	0	0	0	0
Improvement in technical skill through extension	2	10	1	5	5	25	0	0	0	0	2	10
Increase in cost of threshing	0	0	0	0	0	0	3	15	0	0	0	0
Availability of labour	0	0	0	0	0	0	1	5	0	0	0	0
Enhanced productivity	0	0	0	0	0	0	4	20	3	15	0	0
<b>Willingness to Adopt a more efficient threshing technology</b>												
Willing	19	95	15	75	14	70	20	100	13	65	18	90
Not Willing	1	5	5	25	6	30	0	0	7	35	2	10
<b>Reasons for adoption</b>												
Easier to use	4	20	2	10	2	10	8	40	5	25	6	30
Cheaper to use	1	5	1	5	1	5	6	30	1	5	2	10
Saves time	1	5	2	10	1	5	1	5	1	5	7	35
Increase productivity	14	70	10	50	13	65	11	55	7	35	6	30
Average Cost of threshing a 100kg bag of paddy ( Naira)	100		300		100		150		200		200	
Average Cost of threshing (naira/hectare)	9884.00		17297.00		24710.00		24710.00		9884.00		24710.00	
<b>Willingness to pay more for a more efficient threshing</b>												
Yes	16	80	19	95	17	85	14	65	18	90	17	85
No	4	20	1	5	3	15	6	30	2	10	3	15
Average amount willing to pay more for an efficient threshing <b>per 100Kg bag</b>	477		334		477		557		371		418	
Average amount willing to pay more for efficient threshing <b>per hectare</b>	39947.92		0.00		39947.92		23968.70		0.00		0.00	

### 4.3 Number of Productive Plots Available to Farmers

Table 3 below shows the number of productive plots available to the farmers, there is a variation in the number of productive plots across the rice clusters. Only Karfi and Tamburawa share common major productive plots, with 40% and 30% of the farmers owning 3 productive plots. 35% of farmers in Kura have one productive plot when compared with 35% of respondents in Garko that have 3 productive plots. Majority of the farmers (40%) in Tudun Wada have 2 productive plots while 35% of respondents in Chiromawa have 3 productive plots.

**Table 3: Number of Productive plots available to farmers**

Variable	Kura		Garko		T/Wada		Chiromawa		Karfi		Tamburawa	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
<b>No. of plots</b>												
1	7	35	1	5	2	10	3	15	5	25	1	5
2	5	25	5	25	8	40	4	20	4	20	5	25
3	2	10	7	35	5	25	5	25	8	40	6	30
4	2	10	5	25	2	10	7	35	1	5	2	10
5	3	15	0	0	1	5	1	5	0	0	4	20
Above 5	1	5	2	10	2	10	0	0	2	10	2	10

### 4.4 Average Size of Productive Plots

The table below shows the distribution of average size of productive plots across the rice clusters. Farmers in Tudun Wada have the largest average productive plot size of 2.63 hectares while the farmers in Kura have the smallest average productive plot size of 0.27 hectares. The largest productive plot size in Garko is 2.02 hectares and 0.99 hectares as the smallest productive plot size. Chiromawa has 0.68 and 0.40 hectares as the largest and smallest productive plot sizes. Farmers in Tamburawa have 1.40 and 0.57 hectares as the largest and smallest productive plot sizes respectively.

**Table 4: Average Size of productive plots available to farmer**

Plots	Average size of plots in acres					
	Kura	Garko	T/Wada	Chiromawa	Karfi	Tamburawa
1	0.94	1.40	1.40	0.65	1.04	1.34
2	0.73	1.59	1.72	0.57	1.20	1.40
3	0.81	1.47	1.36	0.54	1.21	1.11
4	0.53	0.99	2.63	0.68	1.21	0.61
5	0.27	1.21	2.56	0.40	0.81	0.57
Above 5	0.61	2.02	60.10	-	0.40	0.81

#### 4.4.1 Average Number of Productive Plots Allocated for Rice Production

The above table represents the distribution of productive plots allocated for rice production. Farmers in the study area allocate a minimum of one productive plot and a maximum of above 5 productive plots for rice production. In Kura and Karfi, 45% and 40% respectively allocate only one productive plot for rice production while 45% and 35% in Tamburawa and Garko allocate 3 productive plots for rice production. The highest number of plots allocated for rice production is in Tudun Wada where

60% is allocated to 2 productive plots for rice production. Only 5 % farmers in Tudun Wada, Chiromawa, Karfi and Tamburawa allocate more than 5 productive plots for rice production.

**Table 5: Average No. of productive plots allocated for rice production**

Variable	Kura		Garko		T/Wada		Chiromawa		Karfi		Tamburawa	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
<b>No. of plots</b>												
1	9	45	3	15	6	30	7	35	8	40	1	5
2	7	35	5	25	12	60	7	35	3	15	4	20
3	2	10	7	35	1	5	5	25	7	35	9	45
4	1	5	5	25	0	0	0	0	1	5	2	10
5	1	5	0	0	0	0	1	5	0	0	3	15
Above 5	0	0	0	0	1	5	0	0	1	5	1	5

#### 4.4.2 Average quantity threshed (manual method) and losses incurred per hectare during the last cropping season

Table 6 provide information with regards to quantity threshed per acre and hectare as well as the losses obtained during rice threshing using manual threshing method in the study area. Rice threshing is done intensively in all the rice clusters. The highest number of bags threshed per acre is in Tudun Wada with an average of 29.1bags/acre translating into 67.8/hectare. Tamburawa has the least number of bags threshed per acre with an average of 20.9 bags/acre or 52.38/hectare. Losses are also incurred during threshing with farmers in Tudun Wada incurring the highest loss of 5.5 bags per hectare while farmers in Karfi incurred the minimum loss, an average of 3.38 bags per hectare.

**Table 6: Average farm size, output threshed and losses obtained using manual threshing method in the last cropping season.**

Clusters	Average Quantity Threshed per acre ( 100kg bag)	Average Quantity threshed per Ha ( 100kg bag)	Average loss incurred per Ha ( 100kg bags)
Kura	25.9	64.75	5.18 (8%)
Garko	28.4	71	4.26(6%)
T/Wada	29.1	67.8	5.5 (8%)
Chiromawa	22.9	57.25	4.0 (5%)
Karfi	22.5	56.25	3.38 (6%)
Tamburawa	20.9	52.38	4.52 (8%)

#### 4.5 Average Cost of Labour in Rice Threshing using Manual Method

Labour is an important component in rice threshing; however there is a variation in the use of labour in the study area. Table 7 above shows the use and cost of labour in all the rice clusters per hectare. Averages of 18-21 people are used in providing labour for rice threshing. Tudun Wada and Chiromawa use more people in rice threshing (21) when compared with 18 people per hectare used in Kura, Karfi and Tamburawa. In Garko, 20 people are used for rice threshing. Using the manual method of rice threshing, average number of hours spent per hectare in Garko and Tudun Wada is 6 hours while the number of hours spent per hectare in Kura,

Chiromawa, Karfi and Tamburawa is 5 hours. Rice threshing per hectare in Kura, Garko and Tudun Wada is done for 2 days but in Chiromawa, Karfi and Tamburawa, rice threshing per hectare is finished in 2.5 days

The average rate per person per day also varies between the rice clusters. The rate paid per person in Kura is the highest (N700) while Tamburawa has the least rate of N400 per person per day. The rate is N442 in Garko and N470 in Tudun Wada. Chiromawa and Karfi have N414 and N420 per person per day respectively. The highest estimated total cost of threshing a hectare is N25, 200 obtainable in Kura while the least cost of rice threshing is N17, 680 obtained in Garko. Cost of rice threshing per hectare in Tudun Wada is N19, 700 and N21, 735 in Chiromawa. The estimated cost of rice threshing in Karfi is N18, 900.

**Table 7: Average Cost of labour in threshing per Ha (Manual Method)**

Statistics	Kura	Garko	T/Wada	Chiromawa	Karfi	Tamburawa
Average no. of people used	18	20	21	21	18	18
Average Hours spent per day	5	6	6	5	5	5
Average No. of days spent	2	2	2	2.5	2.5	2.5
Average Rate/person per day	700	442	470	414	420	400
Estimated Total cost	25,200	17,680	19,740	21,735	18,900	18,000

#### 4.4 Average Cost of Winnowing per Hectare using Manual Method.

Table 8 below shows the cost of winnowing per hectare using manual method. An average number of 5-6 people are used for winnowing utilizing 6.5-7.5 hours. Garko, Tudun wada and Tamburawa employ 6 people for winnowing while Kura, Chiromawa and Karfi employ 5 people. An average of 7.5 hours is used in winnowing a hectare of land in Kura and Tudun Wada, 7 hours per hectare is used in Garko, Karfi and Tamburawa while Chiromawa uses a minimum of 6.5 hours in winnowing rice per hectare. The number of days used in winnowing also varies, an average of 2-3 days are used for winnowing with Karfi and Tamburawa using 3 days. Kura and Tudun Wada use only 2 days while Garko and Chiromawa use 2.5 days for winnowing.

The average rate paid per person per day also varies, ranging from N524-N700 per person per day. Garko pays the highest (N700) per person while Tamburawa pays the least (N524) per person per day. The rate charged per 100kg bag of paddy also varies. The highest fee charged is in Garko and Tamburawa where N60 is charged for winnowing a 100kg bag of paddy. TKura, Tudun Wada, Chiromawa and Karfi all charge N50 per 100kg bag of paddy. There is also a variation in estimated total cost of winnowing across the rice clusters. The minimum cost of winnowing rice per hectare is N6, 400 in Kura while the highest cost per hectare is N10, 500 in Garko. Tudun Wada has N7, 296 per hectare and Tamurawa has a total cost of N9,432 per hectare.

**Table 8: Average Cost of labour in winnowing per Ha (Manual Method)**

Statistics	Kura	Garko	T/Wada	Chiromawa	Karfi	Tamburawa
Average no. of people used	5	6	6	5	5	6
Average Hours spent per day	7.5	7	7.5	6.5	7	7
Average No. of days spent	2	2.5	2	2.5	3	3
Average Rate/person per day	640	700	606	573	563	524
Rate per 100kg bag	50	60	50	50	50	60
Estimated Total cost	6400	10500	7296	7163	8445	9432



#### 4.5 Average Cost of Additional inputs per Hectare

Additional inputs are also recorded in rice threshing in across the rice clusters. Such inputs includes; value of food given to the people, value of rice given out as gift as well as the value of clothing given out after threshing and winnowing. These increase the total cost of threshing. However, results from the study revealed that only food is served to the women threshers in all the rice clusters. The cost of food varies across the clusters, ranging between N1, 350 in Karfi to N2, 400 in Garko. The cost of food in Kura is N1, 620 and N2, 100 in Tudun Wada. Chiromawa and Tamburawa have N1, 575 and N2, 160 respectively.

**Table 9: Use and average Cost of additional inputs per Ha in threshing**

Input	Kura	Garko	T/Wada	Chiromawa	Karfi	Tamburawa
Average Value of Food	1620	2400	2100	1575	1350	2160
Average value of Rice	-	-	-	-	-	-
Average value of clothes	-	-	-	-	-	-

#### 4.5.1 Average cost of additional variable inputs used in winnowing per hectare

Table 10 below shows additional inputs associated with rice winnowing. In addition to value of food given out, rice is also given out as gift to the women. The value of food and rice given out also varies. The value of rice is between N800- N960 across the rice clusters. The value is N800 in Kura, Chiromawa and Karfi and N960 in Garko, Tudun Wada and Tamburawa. The value for food is N250 in Kura, Chiromawama and Karfi and N300 in Garko, Tudun Wada and Tamburawa.

**Table 10: Cost of additional variable inputs used in winnowing**

Input	Kura	Garko	T/Wada	Chiromawa	Karfi	Tamburawa
Average value Rice	800	960	960	800	800	960
Average value of food	250	300	300	250	250	300

#### 4.6 Ownership of Threshing Equipment among Farmers

The equipment used in threshing includes trampoline, drum, cement bag mats and sticks. Some of the farmers in the study area own their own threshing equipment while other farmers do not own any of the threshing equipment. Table 11 shows the distribution of ownership of threshing equipment in the study area. 50% and 55% of the farmers in Kura and Karfi respectively do not own any threshing equipment. The most common equipment owned by farmers in the study area are trampoline and drum, with 40% of farmers in Garko owning trampoline while 30% of the respondents in Tamburawa own drums. Only 5% of the respondents in Garko own sticks.

**Table 11: Ownership of threshing equipment among Farmers**

Equipment	Kura		Garko		T/Wada		Chiromawa		Karfi		Tamburawa	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Tampoline	4	20	8	40	5	25	3	15	2	10	2	10
Drum	4	20	7	35	4	20	4	20	4	20	6	30
Cement Bag	2	10	0	0	2	10	5	25	3	15	2	10
Stick	0	0	1	5	0	0	0	0	0	0	0	0
Don't have any	10	50	4	20	9	45	8	40	11	55	10	50

#### 4.7 Value of Fixed Assets for Threshing Owned by Farmers

There is a variation in the value of fixed asset in the study area. The value of sticks used in rice threshing which is only owned by farmers in Garko is the least (N200) followed by cement bag mats whose value range between N400 in Tamburawa to N600 in Tudun Wada. There is also a variation in the value of trampoline ranging from a minimum of N1, 200 in Tudun Wada to a maximum of N1, 500 in Tamburawa depending on the quantity owned. Value of drums used in threshing rice also varies across the rice clusters which also depend on the number owned by the farmers. The average value of drum in Tudun Wada is N1, 000 while the average value of the drum in Garko is N2, 000. The life span of the equipment also varies. The trampolines have an expected lifespan of 3-5 years and 4-5 years for the drum. The cement bag mats has the least lifespan of 1 year which is uniform in all the rice clusters.

**Table 12: Average Quantity and value of fixed asset for threshing owned by farmers**

Cluster	Asset	Mean Quantity	Mean value(N)	Mean Expected life span
<b>Kura</b>				
	Tampoline	3	1400	3
	Drum	2	1100	5
	Stick	-	-	-
	Cement bag mat	2	500	1
<b>Garko</b>				
	Tampoline	2	1300	3
	Drum	3	2000	4
	Stick	2	200	1
	Cement bag mat	-	-	-
<b>T/Wada</b>				
	Tampoline	3	1200	3
	Drum	4	1000	4
	Stick	-	-	-
	Cement bag mat	2	600	1
<b>Chiromawa</b>				
	Tampoline	4	1250	4
	Drum	3	1150	4
	Stick	-	-	-
	Cement bag mat	3	500	1
<b>Karfi</b>				
	Tampoline	3	1300	5
	Drum	2	1600	4
	Stick	-	-	-
	Cement bag mat	2	500	1
<b>Tamburawa</b>				
	Tampoline	4	1500	5
	Drum	3	1200	4
	Stick	-	-	-
	Cement bag mat	3	400	1

Average Quantity and value of fixed asset for winnowing: Majority of the farmers in all the clusters do not have winnowing equipment, such equipment /tools are owned by the winnowers (service providers).

#### 4.8 Consultation on Matters Related to Threshing among Farmers

Most of the farmers in the study area do not consult on matters related to threshing. About 80% of farmers in Karfi do not consult on issues relating to threshing while 35% of farmers in Kura and Chiromawa do consult on issues relating to rice threshing. About 30% of respondents in Garko, Tudun Wada and Tamburawa also do some level of consultation on matters relating to rice threshing. The table below is the distribution on the level of consultation by farmers in the study area.

**Table 13: Consultation on matters of threshing among farmers**

Variable	Kura		Garko		T/wada		Chiromawa		Karfi		Tamburawa	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Consult	7	35	6	30	6	30	7	35	4	20	6	30
*Do not consult	13	65	14	70	14	70	13	65	16	80	14	70

\* Those who do not consult gave the following reasons; have adequate knowledge and skill on threshing and lack of access to information on threshing.

#### 4.9 People Consulted on Issues Relating to Rice Threshing

Extension agents, Neighbours and co- farmers are those consulted on issues relating to rice threshing. Some of the respondents in all the rice clusters did not respond to this question but majority that responded consult co-farmers on the issue. 55% of respondents in Kura did not respond to this question but 5% of the respondents consult co-farmers on issues relating to rice threshing. However in Tudun Wada, 50% of the respondents also consult co-farmers while 25% consult extension agents. In Garko, 40% of respondents consult their co-farmers and 40% consult extension agents on issues relating to rice threshing. Areas of consultation are generally on issues related to method of threshing to use such as use of tampoline or cement bags and ways of decreasing loss of paddy during threshing.

**Table 14: People Consulted on matters of threshing among farmers**

Those Consulted	Kura		Garko		T/wada		Chiromawa		Karfi		Tamburawa	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Co-farmers	5	25	8	40	10	50	2	10	5	25	4	20
Neighbors	0	0	0	0	0	0	0	0	2	10	2	10
Extension agents	4	20	8	40	5	25	1	5	4	20	2	10
No response	11	55	4	20	5	25	17	85	9	45	12	60

Areas of consultation are generally on issues related to method of threshing to use such as use of tampoline or cement bags and ways of decreasing loss of paddy during threshing.

Frequency of consulting co-farmers and neighbors on matters relating to threshing is rare in all the clusters and very rare in the case of extension agents.

#### 4.9.1 Information on Radio Listening and Television Watching Among Farmers

Even though farmers are busy with farming activities, they still find time to listen to various local, national and international radio stations. All the respondents in Kura, Garko, Tudun Wada, Karfi and Tamburawa are radio listeners, only 10% of the respondents in Chiromawa do not listen to radio. Some of the stations listened includes; Radio Kano AM and FM which is the popular station listened to by farmers in all the rice clusters closely followed by Freedom FM. Other stations listened to are BBC and VOA Hausa services, pyramid FM and FRCN Kaduna. Some of the farmers listen to all of these stations.

**Table 15: Radio (general listening) among farmers**

Variable	Kura		Garko		T/Wada		Chiromawa		Karfi		Tamburawa	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
<b>Listening of Radio for General purpose</b>												
Listen	20	1000	20	1000	20	1000	18	90	20	1000	20	1000
Do not Listen	20	1000	20	1000	20	1000	2	10	20	1000	20	1000
<b>Stations listen</b>												
Radio Kano AM and FM	5	25	6	30	3	15	6	30	6	30	5	25
Freedom FM	0	0	3	15	3	15	2	10	4	20	4	20
BBC and VOA Hausa services	3	15	2	10	2	10	2	10	2	10	1	5
Jigawa	0	0	1	5	0	0	0	0	0	0	0	0
Pyramid FM	0	0	0	0	0	0	0	0	0	0	2	10
FRCN Kaduna	0	0	0	0	2	10	0	0	1	5	2	10
All of the above	12	60	8	40	10	50	8	40	7	35	6	30
No response	0	0	0	0	0	0	2	10	0	0	0	0
<b>Reasons for listening to radio</b>												
Generally they listen to news and Hausa Programs especially those related to agriculture., politics and drama												
<b>Favourite day for listening to radio</b>												
Everday	15	75	16	80	11	55	15	75	20	100	18	90
Weekend	5	25	4	20	9	45	0	0	0	0	0	0
Wednesday and Friday	0	0	0	0	0	0	3	15	0	0	2	10
No response	0	0	0	0	0	0	2	20	0	0	0	0
<b>Favourite time for listening to radio</b>												
Late Evening hours, afternoon and early morning hours												
<b>Television watching</b>												
Generally Not regular due to lack of electricity and most of them do not have TV sets.												

The reasons for listening to radio according to the farmers are to be current on happenings around Nigeria and abroad. They are also interested in listening to agric related programmes and politics inclusive. Majority of respondents also listen to the radio everyday while others listen only during the weekend and other middle of the week. The favourite time for listening to radio is early morning, afternoon and late evening hours. Television watching is generally not popular because of epileptic power supply and most of these farmers do not own television sets.

#### 4.10 Attitude of communication with extension agents and other development facilitators

The relationship of farmers with extension agents and other developmental facilitators in the study area is mainly cordial even though some of the farmers did not respond to this question, about 50% of respondents in Chiromawa did not respond while 90% of respondents in Tamburawa said the relationship is a cordial one. Some of the respondents in Kura, Garko and Tudun Wada described the relationship as unfriendly. In Tudun Wada, 35% of respondents described the relationship as being attentive and active.

**Table 16: Farmers' Attitude of Communication with extension agents and other development facilitators**

Variable	Kura		Garko		T/Wada		Chiromawa		Karfi		Tamburawa	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Attentive and Active	3	15	3	15	7	35	5	25	5	25	2	10
Cordial	14	70	9	45	7	35	5	25	15	75	18	90
Unfriendly	3	15	5	25	4	20	0	0	0	0	0	0
No response	0	0	3	15	2	10	10	50	0	0	0	0

##### 4.10.1 Adoption of manual mechanized thresher among farmers and labour displacement

Table 17 and 18 shows the distribution of farmers willing to adopt a manual mechanized thresher as well as the issue of labour displacement. In Karfi, 80% of the respondents are aware that the manual mechanized thresher will displace labour 40% of the respondents in Garko are not aware of the labour displacement. In Kura, Garko and Tamburawa, 65% of respondents are aware of labour displacement by the manual mechanized thresher.

Even though farmers are aware about the issue of labour displacement by the manual mechanized thresher, majority of respondents are willing to adopt. All the respondents (100%) in Chiromawa and Tamburawa are willing to adopt the thresher. Only 10% of the respondents in both Kura and Karfi are not willing to adopt the manual mechanized rice thresher.

**Table 17: Wide Scale Adoption of Manual mechanized thresher and labour displacement**

Variable	Kura		Garko		T/Wada		Chiromawa		Karfi		Tamburawa	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Yes	13	65	12	60	13	65	14	70	16	80	13	65
No	7	35	8	40	7	35	6	30	4	20	7	35

**Table 18: Adoption of Manual –mechanized rice thresher among farmers**

Variable	Kura		Garko		T/Wada		Chiromawa		Karfi		Tamburawa	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Ad opt	18	90	19	95	19	95	20	100	18	90	20	100
Will not adopt	2	10	1	5	1	5	0	0	2	10	0	0

#### 4.11 Major constrains in rice threshing

There are numerous problems associated with rice threshing. Some of these problems include; high cost of threshing, loss of grains during threshing, inadequate labour and lack of modern equipment for rice threshing. Other problems such as drudgery of the manual method and inadequate tools also exist. However, results from the study revealed that 20%-40% of respondents indicated that cost of threshing is their major constrain while 3%-20% mentioned inadequate labour as the major constrain in rice threshing. Lack of modern equipment constitute 2%-20% of constrains associated with rice threshing. Loss of grain is also a major constrain in rice threshing, this constitute 20% of respondents in Tudun Wada and Tamburawa.

**Table 19: Major Constraints in threshing**

Variable	Kura		Garko		T/Wada		Chiromawa		Karfi		Tamburawa	
	Freq	%	Freq	%	Fre q	%	Fre q	%	Freq	%	Fre q	%
Drudgery of the method	0	0	2	10	1	5	0	0	1	5	2	10
Inadequate tools	2	10	1	5	3	15	2	10	1	5	4	20
Lack of modern equipment	3	15	3	15	2	10	4	20	4	20	3	15
Inadequate labour	4	20	2	10	3	15	2	10	4	20	3	15
Loss of grains	0	0	3	15	4	20	3	15	3	15	4	20
High cost of threshing	8	40	6	30	5	25	6	30	5	25	4	20
No response	3	15	3	15	2	10	3	15	2	10	0	0

## 5.0 RESULTS AND DISCUSSIONS: RICE THRESHING SERVICE PROVIDERS

### 5.1 Socioeconomic Features of Rice Threshing Service Providers

Table 20 below is the distribution of socioeconomic features of respondents. The ages of respondents vary between the clusters; the minimum age of respondents in the study area is 20 years. Only 10% and 30% of the respondents in Kura and Tamburawa respectively have service providers between the ages of 20-25 years while the age of rice threshing service providers in the other rice clusters is above 26 years. Karfi and Tamburawa are the only rice clusters whose age of rice threshing service providers is above 50 years. Majority (30%) of respondents in Kura fall between 26-35 and 36-40 years age group. Garko has 40% each of its respondents falling within 36-40 and 41-45 years when compared with respondents in Tudun Wada where 50% of respondents have their ages in 26-35 years age group. The age of majority (30%) of respondents in Chiromawa is between 36-40 and 41-45 years.

Threshing is predominantly done by males in the entire rice clusters but a few women are also involved in rice threshing. Kura has 90% of its threshers as males with only 10% as females. The highest number of female participation in rice threshing is in Chiromawa where 30% of rice threshers are females. Garko, Tudun Wada, Karfi and Tamburawa have 20% female rice threshers. Majority of rice threshing service providers in the study area are married with very few that are single, divorced or separated. Tudun Wada has 90% of its respondent married and only 10% are divorced. Garko and Chiromawa have 20% of their respondents divorced while the remaining 80% are married.

There is also a variation in the years of experience as rice threshing service provider. The minimum is 1 year and the maximum is more than 20 years but only 10% of the respondents in Chiromawa have less than a years experience as a rice threshing service provider while in Tamburawa, the maximum years of experience is 15. Tudun Wada and Tamburawa has 40% of its respondents having more than 20 years experience providing service in rice threshing.

The size of household of respondents varies in the study area. This range, from 1-20. None of the service provider's household size is above 20 but majority of respondents in most of the rice clusters have a household size of 6-10. In Tamburawa, 70% of respondents have a household size of 1-5 while 60% of respondents in Kura and Karfi and 50% of respondents in Garko and Tudun Wada all have a household size of 6-10

Literacy level of the respondents is very low; most of the rice threshing service providers does not have any formal education but a few of them have primary, secondary or higher education. Majority (50%) of respondents in Tudun Wada and Chiromawa and 40% of respondents in Kura, Garko and Tamburawa do not have any formal education when compared with 30% of respondents in Karfi as well as 10% of respondents' in Garko and Chiromawa that have a higher education. Others have primary and secondary education

Majority of respondents in the study area have a household income below N50, 000, very few of the respondents have a household income above N50, 000. All the respondents (100%) in Kura, 90% and 80% in Tudun Wada, Garko and Chiromawa as well as 70% of respondents in Karfi and Tamburawa all have a household income of below N50, 000 but Karfi has 10% of its respondents having a house hold income above N200, 000. Tamburawa has 30% of its respondents with a household income of N51, 000-N100, 00.

The most common method of rice threshing is the manual method which is used in all the rice clusters. Only 10% of respondents in Tamburawa use the manual mechanized method of rice threshing. All the other rice clusters solely use the manual method of rice threshing. The preponderance of manual method among rice threshers is related to the availability and cheapness of the tools used by the technology. Drums and sticks are the common tools and such are available in the local markets. Threshers are generally aware of manual-mechanized threshers and mechanized threshers as alternative technologies which were used by some few large scale farms in the past but are currently not available in the area.

Rice threshing is a seasonal occupation and it is the major occupation of majority of the respondents during the season and in the off-season period they are engaged in other occupation such as livestock rearing and trading. Garko has 80% of its respondents having rice threshing as their major occupation while Tamburawa and Kura/Tudun Wada have 70% and 60% respectively. Majority (60%) of respondents in Karfi are engaged in livestock rearing as their major occupation. The same applies to 40% of respondents in Chiromawa. In all the clusters most of the rice threshers interviewed are also engaged in rice production at a small-scale level.

Rice threshing service providers also use additional labour from household members in rice threshing. The number used varies across the rice clusters but household members used range from 1-6, 90% of respondents in Tudun Wada, 80% in Garko and 70% in Kura/Karfi also utilize the same number. But in Chiromawa and Tamburawa, 40% of respondents utilize 4-6 household members in rice threshing. None of the service provider is a member of thresher's cooperatives in all the rice clusters. They are not yet formally organized as service providers but they generally see themselves as part and parcel of the rice farmers association since most of them are also farmers. All the service providers in rice threshing in all the rice clusters threshed only rice in the last cropping season and it means they are not involved in the threshing of other crops. The production of rice is dominant in the clusters and other crops are not significant during the rice harvesting season.

There is a variation in the daily income of service providers obtained from rice threshing services. The range is from N100 to above N500 but only 40 and 20% of respondents in Chiromawa and Karfi respectively had a daily income above N500. Majority of respondents in Tudun Wada and Karfi had a daily income in the range of N301-N400. A daily income in the range of N100-N200 is also obtained among 30% of respondents in Garko and Tudun Wada, while 40% of the respondents in Tamburawa had a daily income in the range of N201-N300. The seasonal income from last years cropping season also vary but it ranges from less than N10, 000 to above N50, 000 but only 10% of respondents in Tamburawa had a seasonal income above N50,000. Majority of respondents, 60% in Tamburawa, 50% in Kura, Karfi and Chiromawa had a seasonal income of less than N10, 000 in last years cropping season. However, 60% of respondents in Tudun Wada and 50% of the respondents in Garko had a seasonal income in the range of N10, 000-N20, 000 in last the years cropping season.



**Table 20: Socioeconomic features of rice threshing service providers**

Variable	Kura		Garko		T/Wada		Chiromawa		Karfi		Tamburawa	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
<b>Age Range</b>												
20-25	1	10	0	0	0	0	0	0	0	0	3	30
26-35	3	30	2	20	5	50	2	20	2	20	2	20
36-40	3	30	4	40	1	10	3	30	4	40	3	30
41-45	2	20	4	40	3	30	3	30	3	30	1	10
46-50	1	10	0	0	1	10	2	20	0	0	0	0
51 and above	0	0	0	0	0	0	0	0	1	10	1	10
<b>Gender</b>												
Male	9	90	8	80	8	80	7	70	8	80	8	80
Female	1	10	2	20	2	20	3	30	2	20	2	20
<b>Marital Status</b>												
Single	1	10	0	0	0	0	1	10	1	10	2	20
Married	8	80	8	80	9	90	7	70	8	80	8	80
Divorced/separated	1	10	2	20	1	10	2	20	1	10	0	0
<b>Years in Operation</b>												
Under 1 year	0	0	0	0	0	0	1	10	0	0	0	0
1-5 years	0	0	0	0	0	0	0	0	1	10	4	40
6-10 years	3	30	7	70	4	40	4	40	1	10	5	50
11-15 years	5	50	2	20	2	20	2	20	4	40	1	10
16-20 years	2	20	1	10	4	40	3	30	4	40	0	0
<b>Household size</b>												
1-5	3	30	2	20	3	30	4	40	2	20	7	70
6-10	6	60	5	50	5	50	4	40	6	60	2	20
11-20	1	10	3	30	2	20	2	20	2	20	1	10
Above 20	0	0	0	0	0	0	0	0	0	0	0	0
<b>Literacy level</b>												
Primary Education	3	30	3	30	3	30	1	10	2	20	4	40
Secondary Education	3	30	2	20	2	20	3	30	2	20	2	20
Higher Education	0	0	1	10	0	0	1	10	3	30	0	0
No formal Education	4	40	4	40	5	50	5	50	3	30	4	40
<b>Household Income (N)</b>												
Under 50, 000	10	100	8	80	9	90	8	80	7	70	7	70
51, 000-100, 000	0	0	2	20	1	10	1	10	2	20	3	30
101, 000-200,000	0	0	0	0	0	0	1	10	0	0	0	0
201, 000-300, 000	0	0	0	0	0	0	0	0	1	10	0	0
<b>Religion</b>												
Islam	10	100	10	100	10	100	10	100	10	100	10	100
Christianity	0	0	0	0	0	0	0	0	0	0	0	0
<b>Method of threshing</b>												
Manual mechanized	0	0	0	0	0	0	0	0	0	0	1	10
Manual	10	100	10	100	10	100	10	100	10	100	9	90
<b>Major Occupation</b>												
Rice Threshing	6	60	8	80	6	60	4	40	2	20	7	70
Livestock rearing	3	30	0	0	1	10	4	40	6	60	2	20
Trading	1	10	2	20	3	30	2	20	2	20	1	10
Other Occupation	0	0	0	0	0	0	0	0	0	0	0	0

**Table 20: Socioeconomic features of rice threshing service providers (Contd.)**

Variable	Kura		Garko		T/Wada		Chiromawa		Karfi		Tamburawa	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
<b>Number of household members contributing to threshing</b>												
1-3	7		8		9		6		7		6	60
4-6	3		2		1		4		3		4	40
7-9	0	0	0	0	0	0	0	0	0	0	0	0
10 and above	0	0	0	0	0	0	0	0	0	0	0	0
<b>Membership of threshers cooperative</b>												
Yes	0	0	0	0	0	0	0	0	0	0	0	0
No	10	100	10	100	10	100	10	100	10	100	10	100
<b>Main crops threshed last season</b>												
Rice	10	100	10	100	10	100	10	100	10	100	10	100
Wheat	0	0	0	0	0	0	0	0	0	0	0	0
Maize	0	0	0	0	0	0	0	0	0	0	0	0
Sorghum	0	0	0	0	0	0	0	0	0	0	0	0
Millet	0	0	0	0	0	0	0	0	0	0	0	0
Others	0	0	0	0	0	0	0	0	0	0	0	0
<b>Daily Income from rice threshing last season</b>												
100-200	2	20	3	30	3	30	0	0	1	10	2	20
201-300	3	30	1	10	2	20	2	20	2	20	4	40
301-400	3	30	3	30	4	40	0	0	4	40	2	20
401-500	2	20	1	10	1	10	2	20	1	10	1	10
501 and above	0	0	0	0	0	0	4	40	2	20	0	0
<b>Seasonal Income from rice threshing (last season)</b>												
Less than 10,000	5	50	3	30	3	30	6	60	5	50	6	60
10,000 – 20,000	4	40	5	50	6	60	2	20	4	40	1	10
21,000 -30,000	0	0	0	0	0	0	0	0	0	0	0	0
31,000 – 40,000	0	0	0	0	0	0	0	0	0	0	0	0
41,000-50,00	1	10	0	0	1	10	0	0	1	10	1	10
Above 50,000	0	0	0	0	0	0	0	0	0	0	1	10

## 5.2 Background Information on Threshing Services Offered

Table 21 provides background information on threshing services offered in the study area. Results of the study revealed that the common method of threshing rice in the study area is the manual method but few of the rice threshing service providers use the manual mechanized method in rice threshing. Only 30% of respondents in Garko use the manual mechanized method of rice threshing, but 90% of respondents in Kura, Karfi, Tudun Wada, Chiromawa and Tamburawa use the manual method in threshing rice. The major reason for using this method according to the service providers is availability of the equipment and tools; other reasons are convenience of the method in terms of skill and affordability of the technology. Majority of the service providers in rice threshing also believe that changes have taken place in rice threshing over the last two cropping seasons while some of them believe that changes have not taken place. The changes generally include increase in demand for threshing services, increase in fees charged for threshing and improvement in the efficiency of the manual threshing method as a result of using better equipment such as drums and trampoline. Some of the reasons for these changes include; increase in income among rice farmers, increase in production and more knowledge and skill about threshing among the service providers

Majority of respondents are willing to adopt manual mechanized rice thresher while others are not willing to adopt the technology, 40% of the respondents in Chiromawa and 20% of respondents in Garko and Tamburawa are not willing to adopt the manual mechanized rice thresher. In Kura, 100% of respondents are willing to adopt the manual mechanized rice thresher while 90% of Respondents in Karfi and 80% in Garko and Tamburawa are all willing to adopt the new technology. The major reason given for those willing to adopt the technology is increase in the efficiency of rice threshing. They generally believe that manual-mechanized thresher will give better output in terms of quality and yield. Other reasons for adoption include; ease of operation, affordability of the technology and time saving. A few of the service providers also mentioned increase in income as one of the reasons for adopting the manual mechanized rice thresher.

Different amounts are charged for threshing. The average amounts charged per hectare vary from N18, 532.50 – N37, 065. The highest fee charged per hectare is N37, 065 in Tudun Wada and Tamburawa but the fee charged per hectare in Kura, Garko, Chiromawa and Karfi is N18, 532.50

Majority of respondents are willing to decrease the fees they charged for threshing with the adoption of manual-mechanized thresher as indicated by 80% in Kura and Garko, 90 % in Tudun Wada, 40 % in Chiromawa, 70 % in Karfi and 50 % in Tamburawa. The expected decrease per hectare is N2, 710.69 in Garko which is the lowest in all the clusters, N3, 012.15 in Tudun Wada, N3, 387.74 in Kura and Karfi and N3, 872.06 in Chiromawa and Tamburawa. Some of the service providers will increase fees charged for threshing with the adoption of manual mechanized thresher and the expected increase per hectare vary across the clusters with the highest average increase of N5,868.83 per hectare obtained in Kura and Karfi and N2347.45 per hectare in Tudun Wada. Average charge for threshing a hectare of paddy using the manual method varies across the clusters, the highest charge of N37, 065 was obtained in Tudun Wada and Tamburawa and the lowest charge of N18, 532.50 was obtained in the other clusters.

Those who will increase the fees charged refer to the expected higher costs in terms of investment (higher price of purchasing the equipment) and operation (cost of fueling) of the manual-mechanized thresher as their reason and those that will decrease the fees charged refer to the expected efficiency in terms of less labour requirement and more output per unit time as their reasons.

Rice threshing is dominated by men but rice winnowing is done entirely by women. Threshing of rice is a tedious and labour intensive activity. The threshing of other crops such as millet, sorghum and groundnut are female dominated because it is less tedious and intensive.

The mode of operation is not the same in the rice clusters but Kura and Garko share the same mode of operation where threshers operate as individual (60%), which means fees and other issues are decided on individual basis. Chiromawa, Tudun Wada, Karfi and Tamburawa share a common mode of operation where rice threshers operate as group and as such threshing fees and other decisions are taken by the group. Group threshing in Chiromawa constitutes 90%, 80% in Tudun Wada and 70% in Karfi and Tudun Wada. Those that thresh rice in groups differ in the number of people per group. The number of people per group is 1 to above 10. Majority (50%) of the threshing groups in Tudun Wada, Chiromawa and Tamburawa have more than 10 people per group while 30% of threshing groups in Kura,

Chiromawa and Karfi have 6-10 people per group. Only 10% of respondents in Tamburawa have 1-5 people in a threshing group.

**Table 21: Background information on threshing services offered**

	Kura		Garko		T/wada		Chiromawa		Karfi		Tamburawa	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
<b>Methods of rice threshing last cropping season</b>												
Manual	9	90	7	70	9	90	9	90	9	90	9	90
Manual mechanized	1	10	3	30	1	10	1	10	1	10	1	10
Reasons for using the methods above												
Convenience ( in terms of skill)	3	30	1	10	1	10	3	30	4	40	2	20
Availability of the equipment	5	50	8	80	8	80	9	90	6	60	8	80
Affordability of the technology	1	10	2	20	2	20	3	30	1	10	0	
<b>Changes in threshing method in the last two seasons</b>												
Changes	4	40	3	30	3	30	1	10	2	20	1	10
No Changes	6	60	7	70	7	70	9	90	8	80	9	90
<b>Reasons for changes in threshing methods</b>												
Increase in income	4	40	3	30	1	10	0	0	0	0	1	10
Increase production	0	0	0	0	0		0	0	1	10	0	0
More Knowledge	0	0	0	0	1	10	1	10	0	0	0	0
No response	6	60	7	70	9	90	9	90	9	90	9	90
<b>Willingness to adopt manual mechanized Threshing Technology</b>												
Adopt	10	100	8	80	10	100	6	60	9	90	8	80
Not adopt	0	0	2	20	0	0	4	40	1	10	2	20
Reasons for adoption												
Easier	0	0	2	20	1	10	4	40	4	40	1	10
Cheaper	0	0	1	10	0	0	4	40	3	30	1	10
Saves time	4	40	1	10	3	30	0	0	2	20	3	30
Increase income	1	10	1	10	0	0	0	0	0	0	0	0
Increase efficiency	5	50	5	50	6	60	2	20	1	0	5	50
Average charges for threshing per hectare	18532.5		18532.5		37065		18532.5		18532.5		37065	
<b>Change in fees charge with adoption of new technology</b>												
Increase fees	2	20	0	0	1	10	2	20	2	20	3	30
Decrease fees	8	80	8	80	9	90	4	40	7	70	5	50
No response	0	0	2	20	0	0	4	40	1	10	2	20

**Table 21: Background information on threshing services offered (Contd.)**

	Kura		Garko		T/wada		Chiromawa		Karfi		Tamburawa	
Average amount of increase in charges per hectare threshed	5868.625				5806.85		2347.45		5868.625		3911.593	
Average amount of decrease in charges per hectare threshed	3387.741		2710.687		3012.149		3872.057		3387.741		3872.057	
<b>Gender Involvement in threshing</b>												
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Men	10	100	10	100	10	100	10	100	10	100	10	100
Women	0	0	0	0	0	0	0	0	0	0	0	0
<b>Gender Involvement in winnowing</b>												
Men	0	0	0	0	0	0	0	0	0	0	0	0
Women	10	100	10	100	10	100	10	100	10	100	10	100
<b>Mode of operation</b>												
Individual threshing unit	6	60	6	60	2	20	1	10	3	30	3	30
Group threshing unit	4	40	4	40	8	80	9	90	7	70	7	70
<b>Number of people per group</b>												
1-5	0	0	0	0	0	0	0	0	0	0	1	10
6-10	3	30	2	20	2	20	3	30	3	30	1	10
Above 10	1	10	2	20	5	50	5	50	3	30	5	50
No response	6	60	6	60	3	30	2	20	4	40	3	30

### 5.3 Average Hectare Threshes and Losses Incurred Using Manual Threshing Method

Table 22 above shows the quantity of rice threshed per hectare and also losses incurred during threshing using manual method. Average hectares threshed last season by service providers interviewed vary from 4.4 hectares in Kura, Chiromawa and Karfi to 10.6 hectares in Tudun Wada. The quantities of rice threshed also vary; the minimum average quantity threshed is 36.3 bags in Tudun Wada and Karfi while the maximum average quantity threshed is 79.1 bags in Tamburawa. Losses are also incurred during threshing using manual method. The highest loss was 9.2 bags per hectare obtained in Karfi while the minimum loss incurred was 3.8 bags per hectare in Chiromawa. The percentage loss may depend on the quality of the paddy in terms of its water content, the drier the paddy the less may be the losses. It may also depends on the quality and adequacy of threshing equipment used and the skills of the threshers, for instance the wider the trampoline use the less the possibilities of loss through splitting of grains.

**Table 22: Average hectare threshed, output obtained and losses obtained using manual threshing method**

Clusters	Average hectare threshed	Quantity threshed (100kg bags)	Average loss incurred ( 100kg bags)
Kura	4.4	41.2	4.9
Garko	7.1	60.5	5.8
T/Wada	3.6	36.3	6.8
Chiromawa	4.4	51.9	3.8
Karfi	4.4	36.3	9.2
Tamburawa	10.6	79.1	4.8

### 5.4 Ownership of Threshing Equipment among Service Providers

Equipment used in rice threshing owned by service providers includes Trampoline, drum, cement bag mats and sticks. Only 10% of the service providers in Garko own cement bag mats but majority of the service providers in all the rice clusters own sticks, Trampoline and drums. Table 23 below shows the distribution of ownership of threshing equipment in the study area.

**Table 23: Ownership of threshing equipment among service providers**

Equipment	Kura		Garko		T/Wada		Chiromawa		Karfi		Tamburawa	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Trampoline	9	90	7	70	8	80	9	90	10	100	9	90
Drum	7	70	8	80	7	70	10	100	7	70	9	90
Cement Bag	0	-	1	10	0	-	0	0	0	0	0	0
Stick	10	100	9	90	10	100	10	100	10	100	10	100

### 5.5 Average Quantity and Value of Fixed Assets Used for Threshing

Tables 24 above provide information on quantity of equipment owned by rice threshers as well as the value of the threshing equipment. The quantity and value of trampoline vary, from N767 in Kura to N1, 416 in Tamburawa while the value of drum also range from N800 in Tudun Wada to N2800 in Karfi. Value for the stick is N500 in Garko and N600 in Chiromawa. Expected life spans of the equipment and tools vary, Trampoline has a life span of 1.5-2.5 years, the drum has a life span of 2.5 to 5 years but the stick has only 1 year as its life span. Drum, Trampoline and stick are the

equipment generally used by service providers in threshing of rice across the clusters. A typical service provider is expected to invest in the purchase of such equipment and tools. Most service providers also hired the equipment especially drums in addition to what they owned as individuals or group. The differences in the value indicated a variation in quality, size and type of the tools and equipment used by the service providers across the clusters.

**Table24: Average Quantity and value of fixed asset for threshing**

Cluster	Asset	Mean Quantity	Mean Purchase value(N)	Mean Expected life span (Years)
<b>Kura</b>				
	Trampoline	4	767	2
	Drum	5	1040	2.5
	Stick	-	-	
<b>Garko</b>				
	Trampoline	5	1033	2.3
	Drum	6	2200	3.5
	Stick	2	500	1
<b>T/Wada</b>				
	Trampoline	3	1200	2
	Drum	4	800	4
	Stick	-	-	
<b>Chiromawa</b>				
	Trampoline	5	1050	2.5
	Drum	3	950	5
	Stick	5	600	
<b>Karfi</b>				
	Trampoline	2	1292	1.5
	Drum	3	2800	4
	Stick	-		
<b>Tamburawa</b>				
	Trampoline	3	1416	2
	Drum	4	1183	2.5
	Stick		-	

### 5.6 Average Quantity and Value of Fixed Assets for Winnowing

Equipment used in winnowing includes; calabashes and bowls, the equipment and tools are owned by the women that winnow rice. The quantities of the equipment and tools owned vary across the cluster, but it range from 1-3 for bowl and 2-4 for calabashes. The mean purchase value for the bowls is N60 in Kura and Garko, N200 in Karfi which is the highest and N150 in Chiromawa. The value of Calabash also varies across the clusters with the lowest value of N120 in Chiromawa to the highest value of N850 in Garko . The differences in value suggest a variation in size, type and quality of the calabashes used by the winnowers across the clusters.



**Table 25: Average Quantity and value of fixed asset for winnowing**

Cluster	Asset	Mean Quantity (No.)	Mean Purchase value(N)	Mean Expected life span ( years)
<b>Kura</b>				
	Calabash	4	350	6
	Bowl	1	60	1
<b>Garko</b>				
	Calabash	3	833	5
	Bowl	1	60	3
<b>T/Wada</b>				
	Calabash	4	215	6
	Bowl	2	90	3
<b>Chiromawa</b>				
	Calabash	2	120	1
	Bowl	3	150	1
<b>Karfi</b>				
	Calabash	3	123	4
	Bowl	2	200	1
<b>Tamburawa</b>				
	Calabash	2	125	2
	Bowl	-	-	-

## 5.7 Ownership Structure of Threshing Equipment

Table 26 above shows the ownership structure of threshing equipment. These equipment are either individually owned, group owned or even hired. Majority of the service providers do not own the equipment but rather hire the equipment. In Kura, Garko and Tudun Wada, 60% of respondents hire threshing equipment while 80% of respondents in Tamburawa and 40% in Kura, Tudun Wada and Chiromawa own threshing equipment individually. Majority of respondents (50%) in Chiromawa have a group ownership structure of threshing equipment. The cost of hiring a drum is N100 in Kura, Karfi and Chiromawa and N150 in Tudun Wada and Garko. Trampoline is generally hired at the rate of N100 per day across the clusters. In all the clusters is responsible for the payments of these hire costs and this is obtainable in all clusters.

**Table 26: Ownership Structure of threshing equipment**

Variable	Kura		Garko		T/wada		Chiromawa		Karfi		Tambura	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Individually owned	4	40	2	20	4	40	4	40	2	20	8	80
Group owned	0	0	2	20	0	0	5	50	3	30	1	10
Hired	6	60	6	60	6	60	1	10	5	50	1	10

## 5.8 Consultation on Matters of Threshing

Consultation on matters relating to rice threshing is not very common among service providers. 50%-90% of respondents in all the clusters do not consult anybody on issues related to rice threshing, but 10%- 50% of the service providers do consult other on issues related to rice threshing. Those who are not consulting gave the following reasons; some are not aware of who to consult, others claim they use traditional method which they have good knowledge of and thus no need for any consultation. Those who do consult indicated that they consult co-service providers on matters relating to fees to be charged for threshing a unit of output. The most reliable source of information in all the rice clusters are the co-threshers.

**Table 27: Consultation on matters of threshing**

Variable	Kura		Garko		T/wada		Chiromawa		Karfi		Tamburawa	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Consult	1	10	3	30	1	10	5	50	1	10	2	20
Do not consult	5	50	6	60	9	90	5	50	8	80	8	80
No response	4	40	1	10	0	0	0	0	1	10	0	0

Those who are not consulting give the following reasons; not aware of who to consult, they use traditional method which they have good knowledge of it and thus no need for consultation. Those who consult indicated that they consult co-service providers on matters relating to fees to be charged for threshing a unit of output.

Radio and threshing: Generally the most reliable sources of information are the co-threshers in all the clusters. Radio listening on matters related to threshing was not recorded in all the clusters.

## 5.9 Information on Radio Listening and Television Watching among Service Providers

Use of radio for general purpose other than rice threshing was found to be common among the threshers in all the clusters. Table 28 above provides information with regards to radio listening among service providers. Majority of respondents in all the rice clusters are radio listeners, however few of the respondents do not listen to radio. Some of the stations listened includes; Radio Kano AM and FM, Freedom FM. Other stations listened to are BBC and VOA Hausa services, pyramid FM and FRCN Kaduna. Majority of service providers listen to all the stations. The major reason for listening to radio is to be current on happenings around the world and also because of some of the Hausa programmes aired on these stations. Favourite day for listening to radio is through out the week in all the rice clusters except in Tudun Wada where some respondents indicated that Tuesdays are their favourite radio listening day. The favourite time for listening to radio according to the service providers in all the rice clusters is evening hours and early morning hours. The use of radio for disseminating information to service providers on post-harvest technologies and other related information may be effective in creating awareness and enhancing the possibilities of adoption of the technologies among the service providers.

Television watching is not as popular as radio listening. Most of the respondents (about 90%) across the rice clusters are not regular television viewers. Some few of the respondents are regular viewers of television. Favourite time for watching television is evening hours when there are resting at homes.

The favourite programmes for the television viewers are news and entertaining programmes. The reasons given for those that are not regular television viewers are lack of television sets and the epileptic power supply which does not allow regular viewing. In general television may not be a good channel of communicating information on post-harvest technologies and other related issues among service providers across the clusters.

**Table 28: Radio information**

Variable	Kura		Garko		T/Wada		Chiromawa		Karfi		Tamburawa	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
<b>Listening of Radio for General purpose</b>												
Listen	10	100	9	90	8	80	6	60	10	100	10	100
Do not Listen	0	0	1	10	2	20	4	40	0	0	0	0
<b>Stations listen</b>												
Radio Kano AM	2	20	2	20	1	10	2	20	2	20	2	20
Radio Kano FM	0	0	0	0	0		0	0	0		0	0
Freedom FM	2	20	2	20	2	20	1	0	2	20	1	10
BBC Hausa	0	0	0	-	1	10	0	0	1	10	1	10
Pyramid FM	0	0	0	0	1	10	0	0	0		0	0
FRCN Kaduna	0	0	1	10	0	0	0	0	1	10	2	20
All of the above	6	60	4	40	3	30	3	30	4	40	4	40
<b>Reasons for listening to radio</b>												
Generally winnowers listen to news and Hausa Programs												
<b>Favourite day for listening to radio</b>												
All days of the week in all clusters except in T/Wada where some indicated Tuesday as their favorite day.												
<b>Favourite time for listening to radio</b>												
Evening hours and early morning hours												
<b>Television watching</b>												
Regular	1	10	3	30	1	10	3	30	6	60	5	50
Not regular	9	90	7	70	9	90	7	70	4	40	5	50
<b>Favourite T.V Programmes</b>												
News, Entertainment programmes												
<b>Reasons for not watching T.V</b>												
Lack of TV set and for some lack of stable electricity as the reason for not watching TV.												
<b>Favourite day for watching T.V</b>												
Everyday												
<b>Favourite time for watching T.V</b>												
Evening hours are more convenient.												

### 5.10 Labour Displacement by Wide Scale Adoption of Manual Mechanized Thresher

Tables 29 and 30 above provides information with regards to labour displacement by wide scale adoption of manual mechanized thresher. Majority of the of respondents are of the opinion that adoption of the manual mechanized thresher will displace labour as indicatyed by 70% in Kura, 60% in Garko and Karfi and 100 % in Tamburawa. Those that will be most affected by labour displacement are men because they are the ones that dominate rice threshing business. While 30% in Kura, 40 % in Garko 20 % in Tudun Wada and 70% in Chiromawa of respondents are of the opinion that the adoption of the manual mechanized thresher will not displace labour.

**Table 29: Labour displacement by wide scale manual mechanized thresher adoption**

Variable	Kura		Garko		T/Wada		Chiromawa		Karfi		Tamburawa	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Labour will be displaced by Adoption	7	70	6	60	8	80	3	30	6	60	10	100
Labour will not be displaced by Adoption	3	30	4	40	2	20	7	70	4	40	0	0

**Table 30: Individuals most affected by labour displacement**

Gender	Response
Men	Men will be mostly affected because men generally dominate threshing business.
Women	

### 5.11 Major constraints associated with rice threshing

The service providers also mentioned constrains associated with rice threshing. Table 31 shows the distribution of constrains to rice threshing business as indicated by the service providers. Some of these constrains are; lack of modern equipment, inadequate and inefficient equipment, inadequate capital and inadequate during the rice harvesting season.

**Table 31: Major Constrains associated with rice threshing**

Constraints	Kura		Garko		T/Wada		Chiromawa		Karfi		Tamburawa	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Lack of Modern equipment	0	0	3	30	3	30	4	40	3	30	8	80
Inadequate and inefficient equipment	6	60	1	10	1	10	0	0	3	30	0	0
Inadequate capital	2	20	6	60	6	60	4	40	3	30	1	10
Inadequate labourers	2	20	0	0	0	0	2	20	1	10	1	10

### 5.12 Major constraints associated with rice winnowing

Table 32 shows the distribution of constrains associated with rice winnowing. Some of these constraints include; inefficient equipment and inadequate capital. From the table, 30%-70% mentioned inefficient equipment as their major constrain while only 20% of respondents in Chiromawa mentioned inadequate capital as a constrain in rice winnowing. Some of the service providers did not respond to this question. In the process of winnowing the equipment used are not efficient especially at the point of blowing where adequate air flow required cannot be generated and this stage is very critical in the whole process.

**Table 32: Major Constrains associated with rice winnowing**

Constraints	Kura		Garko		T/Wada		Chiromawa		Karfi		Tamburawa	
	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
inefficient equipment	7	70	4	40	6	60	4	40	6	60	3	30
Inadequate capital	0	0	0	0	0	0	2	20	0	0	0	0
Inadequate tools	0	0	3	30	1	10	0		1	10	3	30
No response	3	30	3	30	3	30	4	40	3	30	4	40

### **5.13 Costs and Return Analysis of rice Threshing Business in the Clusters**

Table 33 shows the costs and return analysis of a typical threshing unit in the six rice clusters studied. Rice threshing as a business requires some level of investment in fixed assets. Majority of the threshers uses drums and trampoline as the equipment for threshing. The harvested rice is left in the field for three to four days to dry further before it is threshed. A farmer will hire the services of threshers who will come as a group to thresh the rice taking an average of 2 to 3 days for a group of between 10 to 21 threshers putting between 5-6 man-hours of performance per day. The costs involve in threshing business include initial investment in the purchase of drums and trampoline and it also include operational costs such as the costs of transportation to and from the farm. Food and water are provided by the farmer as indicated by the threshers in all the clusters. The highest average costs of investment of N18, 984 for a threshing unit was obtained in Garko and the least of N6, 800 was obtained in Tudun Wada. The highest operational cost of N3, 050 was obtained in Tamburawa and the least of N2, 240 was obtained in Kura. In terms of net return or profit the highest profit of N22, 960 was obtained in Kura and the least of N 14,950 was obtained in Tamburawa. In general rice threshing business is a profitable business.

**Table 33. Cost and Return Analysis of Threshing Service Business per Ha of Paddy Rice Field Threshed ( In Naira)**

	Kura			Garko			T/Wda			
	Quantity	Unit cost	Total cost	Quantity	Unit cost	Total cost	Quantity	Unit cost	Total cost	
Variables										
Fixed Inputs										
Drum	5	1040	5,200	6	2200	13,200	4	800.00	3,200	
Trampoline	4	767	3,068	5	1033	5,165	3	1,200	3,600	
<b>Total fixed costs of investment of a threshing unit</b>	<b>8,268</b>			<b>18,365</b>			<b>6,800</b>			
Variable inputs										
Average Number of threshers used	18	-	-	20			21			
Average Number of days spent ( 5hrs of performance per day)	2	-	-	2	-	-	2	-	-	
Transportation cost per person per day( incurred)	18 persons x 2 days	40 per day	<b>1,440</b>	20 persons x 2 days	30 per day	<b>1,200</b>	21 persons x 2 days	40 per day	<b>1,680</b>	
Hire of drum	2	100 per day	<b>400</b>	2	150 per day	<b>600</b>	2	150 per day	<b>600</b>	

Hire of Trampoline	2	100 per day	<b>400</b>	3	100 per day	<b>600</b>	2	150 per day	<b>600</b>	
<b>Total operational costs per hectare</b>	<b>2,240</b>			<b>2,400</b>			<b>2,880</b>			
Returns										
Rate per person per day	-	700	-		442	-	-	470	-	
<b>Estimated Total fees charged (Gross returns)</b>	-	-	<b>25,200</b>	-	-	<b>17,680</b>	-	-	<b>19,740</b>	
<b>Net profit (Gross returns minus Total operational costs)</b>	<b>22,960</b>			<b>15,280</b>			<b>16,860</b>			



Table33 Continued.

	Chiromawa			Karfi			Tamburawa			
	Quantity	Unit cost	Total cost	Quantity	Unit cost	Total cost	Quantity	Unit cost	Total cost	
Variables										
Fixed Inputs										
Drum	5	950	<b>4,750</b>	3	2800	<b>8,400</b>	4	1183	<b>4,732</b>	
Trampoline	3	1050	<b>3,150</b>	2	1292	<b>2,584</b>	3	1,416	<b>4,248</b>	
<b>Total fixed costs of investment of a threshing unit</b>	<b>7900</b>			<b>10,984</b>			<b>8,980</b>			
Variable inputs										
Average Number of threshers used	21	-	-	18	-	-	19	-	-	
Average Number of days spent ( 5hrs of performance per day)	2.5	-	-	2.5	-	-	2.5	-	-	
Transportation cost per person per day( incurred)*	21 persons x 2.5 days	30 per day	<b>1,575</b>	18 persons x 2.5 days	40 per day	<b>1,800</b>	18persons x 2.5 days	40 per day	<b>1,800</b>	
Hire of drum	2	100 per	<b>500</b>	2	100 per	<b>500</b>	2	100 per	<b>500</b>	

		day			day			day		
Hire of Trampoline	2	100 per day	<b>500</b>	3	100 per day	<b>500</b>	2	150 per day	<b>750</b>	
<b>Total operational costs per hectare</b>	<b>2,575</b>			<b>2,800</b>			<b>3,050</b>			
Returns										
Rate per person per day	-	414	-		420	-	-	400	-	
<b>Estimated Total fees charged (Gross returns)</b>	-	-	<b>21,735</b>	-	-	<b>18,900</b>	-	-	<b>18,000</b>	
<b>Net profit (Gross returns minus Total operational costs)</b>	<b>19,160</b>			<b>16,100</b>			<b>14,950</b>			



## 6.0 Conclusion and Recommendation

### 6.1 Summary and Conclusion

The study was carried out in Kano-Kura rice production and processing corridor, specifically Kura, Garko, Tudun Wada, Chiromawa, Karfi and Tamburawa. Data were collected from both rice farmers and rice threshing service providers. Results from the study revealed that rice threshing is an important economic activity engaged in by male and female as well as young and old. Majority are married while very few are single, divorced or separated.

Both farmers and rice threshing service providers have few to many years of experience in rice farming and rice threshing. Household size varies within and between clusters. Literacy level of farmers and rice threshing service providers is very low but some of the respondents have primary and secondary education with very few of the farmers having higher education. Income level of farmers and service providers also vary.

The nature of farm operation in all the rice clusters is the manual method and the common method of threshing is the manual method but very few employ manual mechanized method for farm operation and rice threshing. Some of the major reasons given for using the manual method of rice threshing includes; Availability of the technology and convenience. Affordability of the technology is another reason. Some changes have also taken place in rice threshing over the last two decades.

Majority of farmers and rice threshing service providers are willing to adopt a more efficient rice threshing technology which might increase productivity and ease the hard work involved. However a few are not willing to adopt the technology. The fee charged for threshing a bag of paddy varies and some farmers are willing to pay more for an efficient rice thresher while others are not.

The average farm size, productive plots and number of productive plots allocated for rice production varies. There is also a variation in the quantity of rice threshed between the clusters. Losses are incurred during threshing, this also vary between clusters.

Cost of labour for threshing and winnowing in terms of number of people used, number of hours spent, number of days spent and rate per person is not the same for the clusters. Some of the farmers and rice threshing service providers own threshing equipment, the quantity of which varies across the rice clusters.

Consultation on issues related to rice threshing is common between farmers and service providers but co-farmers or co-service providers are those that are generally consulted followed by extension agents.

Radio listening is very common with rice farmers and rice service providers. Some of the stations listened to include radio Kano AM and FM, Freedom radio, BBC and VOA Hausa service and some others. Radio listening allow them to be current on happenings in the country and abroad. Television viewing is more popular with service providers than farmers; epileptic power supply and lack of television sets are some of the reasons why farmers do not watch T.V.

Some of the major constrains of rice threshing mentioned by farmers includes; Lack of modern equipment, inadequate tool, inadequate labour, high cost of threshing, loss of grains and drudgery of the manual method used. Some of these constrains

like inadequate tool, inadequate capital and inefficient equipment which are similar to that of rice threshing are also associated with rice winnowing.

The costs involve in threshing business include initial investment in the purchase of drums and trampoline and it also include operational costs such as the costs of transportation to and from the farm. Food and water are provided by the farmer as indicated by the threshers in all the clusters.

The highest average costs of investment of N18, 984 for a threshing unit was obtained in Garko and the least of N6, 800 was obtained in Tudun Wada. The highest operational cost of N3, 050 was obtained in Tamburawa and the least of N2, 240 was obtained in Kura. In terms of net return or profit the highest profit of N22, 960 was obtained in Kura and the least of N 14,950 was obtained in Tamburawa. In general rice threshing business is a profitable business.

## **6.2 Recommendation**

Based on the findings of the study, the following recommendations were made;

- Farmers and rice threshing service providers are aware of disadvantages of manual threshers; they should therefore be made to understand the advantages and benefits of a manual mechanized rice thresher.
- There is a need for identifying an efficient rice threshing technology that can be introduced to farmers and stakeholders.
- The identified technology should be introduced to both farmers, rice threshing service providers and other stakeholders through demonstrations.
- Farmers should be made to understand that some of the losses incurred during threshing using the manual method could be avoided using an efficient rice threshing technology.
- Financial analysis of the identified rice threshing technology should be conducted such that investors will have the available information on the viability of the business.
- Radio jingles can be used in introducing and promoting the manual mechanized threshers since both farmers and rice threshing service providers are regular radio listeners.



## Appendix I

### Variations in income, farm size, output threshed and losses obtained among farmers.

Paired Locations	Annual Income (Naira)			Plot size (Ha)			Quantity of Rice Threshed (Kg)			Quantity of Rice Loosed (Kg)		
	t	df	Sig. (2-tailed)	t	df	Sig. (2-tailed)	t	df	Sig. (2-tailed)	t	df	Sig. (2-tailed)
Kura - Tudun Wada	-0.3392	17	0.739	-1.3581	19	0.190	-0.5830	19	0.567	1.4431	19	0.165
Kura - Garko	-1.9986	19	0.060*	-1.8244	19	0.084**	-2.1648	19	0.043*	1.1799	19	0.253
Kura - Tamburawa	-2.3024	19	0.033*	-1.6391	19	0.118	-1.3730	19	0.186	2.3359	19	0.031*
Kura - Karfi	0.5048	19	0.620	-0.8501	19	0.406	0.6953	19	0.495	1.9443	19	0.067**
Kura - Chiromawa	0.1242	19	0.902	0.9722	19	0.343	1.3188	19	0.203	2.0797	19	0.051**
Tudun Wada - Garko	-2.0685	17	0.054**	0.6767	19	0.507	-0.4325	19	0.670	-0.5810	19	0.568
Tudun Wada - Tamburawa	-2.2047	17	0.042*	1.0429	19	0.310	-0.7960	19	0.436	-0.0051	19	0.996
Tudun Wada - Karfi	0.9384	17	0.361	1.0490	19	0.307	0.7870	19	0.441	0.0928	19	0.927
Tudun Wada - Chiromawa	0.7671	17	0.454	1.3750	19	0.185	0.9905	19	0.334	0.7251	19	0.477
Garko - Tamburawa	-0.4639	19	0.648	0.8995	19	0.380	-0.6818	19	0.504	0.6281	19	0.537
Garko - Karfi	2.2038	19	0.040*	1.5855	19	0.129	3.7521	19	0.001*	0.5962	19	0.558
Garko - Chiromawa	2.1252	19	0.047*	2.6542	19	0.016*	3.2387	19	0.004*	1.4511	19	0.163
Tamburawa - Karfi	2.1950	19	0.041*	0.4205	19	0.679	1.5187	19	0.145	0.1470	19	0.885
Tamburawa - Chiromawa	2.3514	19	0.030*	2.1470	19	0.045*	1.6607	19	0.113	0.8016	19	0.433
Karfi - Chiromawa	-0.4137	19	0.684	2.0687	19	0.052**	0.7051	19	0.489	0.4980	19	0.624

\* Significant at 5%

\*\* Significant at 10%

Results of the paired-clusters t-test revealed that annual income of rice farmers in both Kura and Tudun-wada clusters varied significantly compared to incomes of farmers in Garko and Tamburawa clusters. Also, the incomes of farmers in Garko and Tamburawa varied significantly from that of farmers in Karfi and chiromawa. This signifies that rice producers in the clusters have varied annual income.

The plot size allocated for rice production varied between Kura-Garko, Garko-Chiromawa, Tamburawa-Chiromawa and Karfi-Chiromawa. On the other hand, the variations in quantity of rice threshed were found to be significant between Kura-Garko, Garko\_Karfi and Garko-Chiromawa clusters. The total loss during threshing incurred in Kura varied significantly with that incurred in Tamburawa, Karfi and Chiromawa.

## Appendix II

### Variations in income and threshing charges per 100Kg bag among Service Providers

Paired Locations	Annual Income from threshing (Naira)			Charge per 100Kg Bag Threshed (naira)		
	t	df	Sig. (2-tailed)	t	df	Sig. (2-tailed)
Kura - Tudun Wada	-0.03328	9	0.974	0.9770	9	0.354
Kura - Garko	1.03183	7	0.336	1.0379	8	0.330
Kura - Tamburawa	-0.10237	8	0.921	1.4671	9	0.176
Kura - Karfi	0.28531	9	0.782	-0.2363	7	0.820
Kura - Chiromawa	2.14936	7	0.069**	-0.8782	9	0.403
Tudun Wada - Garko	1.21828	7	0.263	0.0966	8	0.925
Tudun Wada - Tamburawa	-0.19301	8	0.852	0.0254	9	0.980
Tudun Wada - Karfi	0.29066	9	0.778	-1.0589	7	0.325
Tudun Wada - Chiromawa	1.65776	7	0.141	-1.7315	9	0.117
Garko - Tamburawa	-1.04816	6	0.335	-0.1003	8	0.923
Garko - Karfi	-0.92291	7	0.387	-0.7539	6	0.479
Garko - Chiromawa	1.64607	6	0.151	-1.5290	8	0.165
Tamburawa - Karfi	-0.30533	8	0.768	0.7517	7	0.477
Tamburawa - Chiromawa	0.44331	6	0.673	-1.4724	9	0.175
Karfi - Chiromawa	1.51453	7	0.174	-0.6292	7	0.549

\* Significant at 5%

\*\* Significant at 10%

Generally, there is no significant difference in the total annual income of rice manual threshers across the clusters. Also, the charges per 100Kg bag of threshed rice did not exhibit significant variations across the clusters.