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ANALYSIS OF LABOUR USE IN SMALLHOLDER IRRIGATED RICE FARMS IN KANO STATE, NIGERIA

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ABSTRACT
The study analyzed the determinant of labour use among irrigated smallholder rice farmers in Kano state, Nigeria. Multi-stage sampling technique was employed to select 211 respondents from three local governments in the study area. Primary data were collected using structured questionnaire and analyzed using descriptive statistics, partial factor productivity, and multiple regression. The results revealed that hired labour (adult male) was found to be the most used labour across the three LGAs of Kura, Bagwai and Warawa. The cost of labour for rice production in Kura is generally higher than that of Bagwai and Warawa for all farming activities. This is evident with the mean total cost of labour of Kura was ₦370,816 naira, this was followed by Bagwai (₦261,162) and Warawa (₦231,592). The results further shows that farm size (β=12.059; P<0.05) and farm income (β = 4.788; P<0.05) were all positive and significant, and wage rate (β = -2.091; P<0.05) has negative impact. Poor farm wages (labour payments) 92.3% ranked as the highest labour constraint to irrigated rice production in Kano state. Therefore, in order to sustain irrigated rice production in Kano state, the State government should therefore subsidize the price of farm inputs to enable farmers to increase their farm size for large scale production.

Keywords: Labour Use, Labour Productivity, Irrigated Rice Farms

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Introduction

The importance of the agricultural sector in bringing about economic growth and sustainable development of a nation like Nigeria cannot be underestimated. The Nigerian economy had substantially depended on agriculture as a source of food products, raw materials for industrial sector and foreign exchange earnings (Oloungbebe, Peter, Olatoye, 2024). Jonathan, Ezekiel and Yusuf (2020) in their opinion stated that agriculture resource has been an important sector in the Nigerian economy in the past decades, and is still a major sector despite the oil boom; basically, it provides employment opportunities for the teeming population, eradicates poverty and contributes to the growth of the economy. Olajide, Akinlabi, and Tijani, (2016) opined that a strong and efficient agricultural sector would enable a country to feed its growing population, generate employment, earn foreign exchange and provide raw materials for industries.

Over the years, however, the relative contribution of the Nigeria's agricultural sector has been declining. Agriculture contributed 41.2% to GDP in 1970, but this had dropped to 20.6% in 1980. Although it rose to 37% in 1990, it had fallen to 27% in 2000. New figures based on the rebased GDP show that agriculture's contribution to GDP had fallen further to 23.8% in 2010, 20.2% in 2014 and 21.42% in 2020 (Central Bank of Nigeria, 2019). The country has moved from being self-sufficient in food production to become an importer of food. In 1981, the value of Nigeria's imported food and live animals was N1.8 billion, but this had surged phenomenally to N1.4 trillion by 2018 (Central Bank of Nigeria, 2019). This decline has been attributed to the neglect of agricultural sector in pursuit of oil revenue, with its attendance mass movement of economically active population who hitherto engaged in agricultural sector to non-farm sector.

In Nigeria, labour is a major constraint in food crop production (Sadiq et al, 2021). The availability of labour has been found to have impact on planting precision, better weed control, timely harvesting and crop processing (Oluyole & Lawal, 2013). Labour plays important economic and social roles in any economy. It is one of the key factors of production as well as a source of livelihood to billions of people worldwide (FAO, 2020). Nigeria's agricultural production is highly labour intensive. Over 90% of non-mechanized production systems depend on human labour, and for mechanized production systems, between 50 and 60% of the tasks depend on human labour (Edohen & Ikelegbe, 2018). Human labour is about the only form of farm labour available to small holder rice farmers in Kano State and Nigeria. Human labour contributes over 80% of total domestic agricultural output, it therefore means that, human labour accounts for domestic food supplies in Kano State and Nigeria in general (Olawepo & Ibrahim, 2019).

The importance of food crop and agricultural production to the world requires the efforts of farm labour suppliers. The efforts, as observed from some researchers were apparently hindered due to some factors such as migration, wage rate, farm income, age composition, barrier to adoption of technology and effect of diseases on farm labour suppliers. According to Tanko, Yong and Islam (2020), Nigeria's food deficient situation has been worsened by declining farm labour productivity owing to inefficient production techniques, poor resource base and insufficient farm labour supply among others.

By any estimate, the bulk of the food and fibre produced in Nigeria is from the rain fed agriculture, (Ingawa, 2015). Although irrigated farming accounts for only about 18% of the cultivated area in developing world, it produces about 40% of the value of agricultural output (Cai & Xiong, 2017). Irrigation therefore, holds the key for sustainable farming practice to meet our food self-sufficiency and security needs. Most of the increase in local rice production in Nigeria has been attributed to irrigation farming embarked on in 10 pilot states namely; Niger,

Kebbi, Sokoto, Kano, Zamfara, Bauchi, Jigawa Katsina, Kogi and Gombe. Considering that Nigeria is well endowed with water and land resources for irrigation farming, utilization of these resources is expected to close the demand supply gap of rice in the country.

However, human labour is about the only form of farm labour available to most farmers in Nigeria. This form of labour accounts for up to 80% of total farm power and constitute between 80 and 90% of the cost of production in many farming systems. The smallholder rice farmers contribute the largest proportion of total domestic rice output in their area. Continuous supply of rice to meet need of ever-growing population anchors very auspiciously on use of farm labour. Thus, the hope of improving rice production with irrigation projects warrants understanding of the factors that determine demand for labour in rice production.

Aim and Objectives of the Study

The broad aim of this study is to analyze the use of labour among irrigated smallholder rice farmers in Kano state, Nigeria. The specific objectives of the study are to:

i. Describe the socio-economic characteristics of irrigated rice farmers.
ii. Describe the forms of labour used for farm operations in irrigated rice production.
iii. Analyze the determinants of demand for labour among irrigated rice farmers.
iv. Describe the constraints to labour use in irrigated rice production.

Materials and Methods

1 Study Area

The study was conducted in Kano state which is among the 36 states of Nigeria located in the North-Western of the country. The population of the state based on the 2006 National Population Census was 9.4 million, with a 3.5% rate of annual population growth. The state lies between longitudes 8° 45 E and 12° 05 E and latitudes 10° 30 N and 13° 02 N and as such is part of the Sudano-Sahelian zone of Nigeria. The highest elevation is generally about 650m above sea level but extend up to 1000m above mean sea level at Rishi hills (Olofin, 2014). The climate is the tropical wet and dry type with daily mean high temperature 30°C to lowest 24ºC. The main drainage and hydrology of the state is made up of two major rivers; Kano and Challawa contributing water to the main drainage system Hadejia River system (Aliyu, 2021). Two main types of cultivated ecosystems were identified in Kano state; rain-fed and irrigation types. Rain-fed agro-ecosystem is mostly practiced and characterized by open vast expanse of land made up of sandy loam soil displaying ridges covers approximately 16,688km2 of the Kano landscape with the cultivated crops mainly millet, maize, rice, cowpea, sorghum and groundnuts (Aliyu,2021). From the 3 agricultural zones, three LGA were selected (Bagwai, Kura and Warawa), each from the 3 zones.

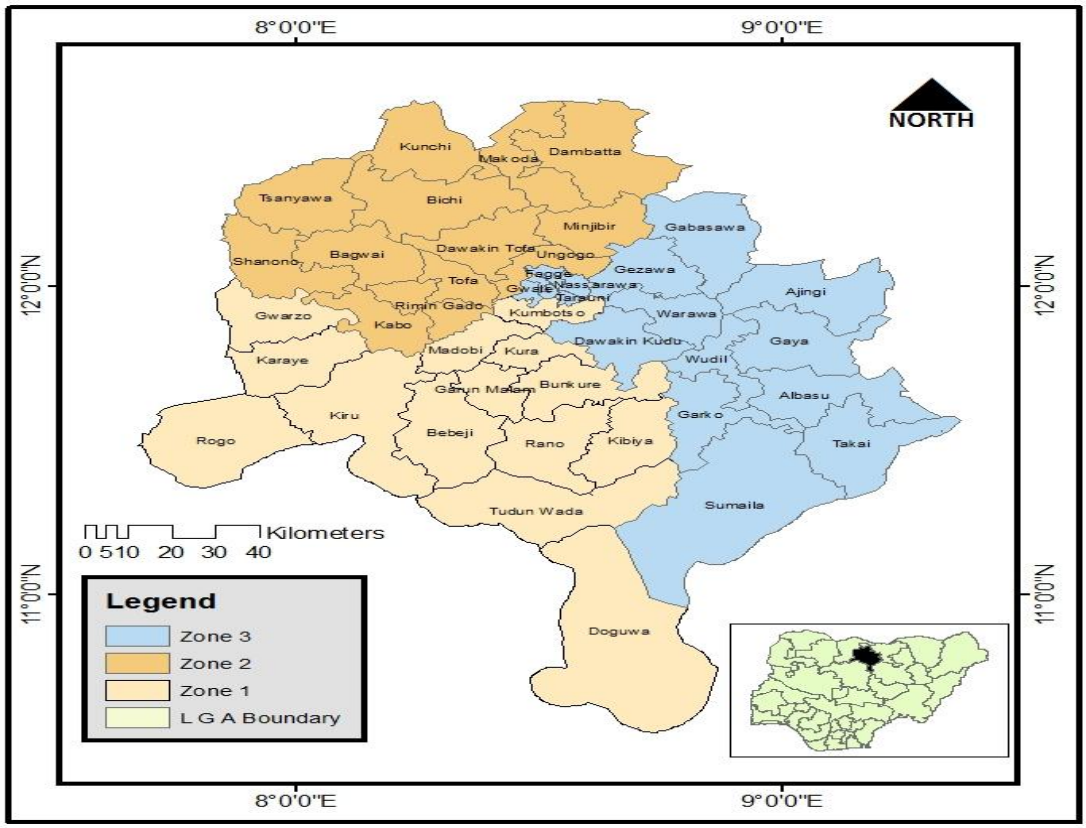


Figure 1: Map of the Study Area

2 Sampling Techniques

This study employed multi stage sampling techniques for selecting the respondents. The first stage was the purposive selection of three (3) LGA (Bagwai, Kura and Warawa LGA in Kano State) The choice of these areas was essentially on the basis of their potentials for irrigated rice production. Stage two: this stage involved purposive sampling of three villages in each of the three LGAs due to high number of farmers registered with Kano State Agricultural and Rural Development Authority (KNARDA) as well as Rice Farmers Association of Nigeria (RIFAN). In Bagwai LGA, the villages that were selected are Kanyu, kwajirawa and Sokidabula. In Kura LGA, the villages that were selected are Bugau, Karfi and Angolas III. While in Warawa LGA, the villages that were selected are: Katarkawa, Gishiri Wuya and Laraba. Finally, Raosoft calculator was used to obtain a total number of 211 respondents from the population obtained during the recognace survey.

Table 1: summary of the sampling procedure of irrigated rice farmers

Lacal Government	RIFAN in villages	Sample Frame	% of popullation	Sample Size
	Bagau	60	12.80	27
Kura	Angolas III	48	10.43	22
	Karfi	40	8.53	18
	Katarkawa	72	15.64	33
Warawa	Gishiri Wuya	53	11.37	24
	Laraba	42	9.00	19
	Kanyu	50	10.90	23
Bagwai	Kwajrawa	55	11.85	25
	Sokidabula	44	9.48	20
		464	100	211

Source: Reconnaissance survey, 2021.

3 Method of Data Analysis

Descriptive statistics were used to achieve objective i, ii and v Descriptive statistics such as frequency distribution, percentage, and means were employed in describing the socio-economic characteristics of farmers, as well as to identify the constraints faced by farmers in the supply of labour.

A Multiple regression model was used to achieve objective iii. The regression model is specified as follows:

$Y= a+b_1x_1+b_2x_2+b_3x_3+b_4x_4+b_5x_5+b_6x_6+b_7x_7+b_8x_8+b_9x_9+e$……(1)

Where:

Y = The vector of dependent variable and it represent the quantity of labour (man-days) used for the rice production in the study area.

α = constant

i = Number of respondents rice farmers

X = the vector of explanatory variable

b_1-n= regression coefficients

X_1 = Farming Experience

X_2 = Farm Size

X_3 = Household Size

X_4 = Wage Rate

X_5 = Farm Income

X_6 = Amount of Credit Obtained

U = Stochastic error term

Analysis of Variance (ANOVA) is a statistical method used to analyze the differences between the means of two or more groups or treatments. It is often used to determine whether there are any statistically significant differences between the means of different groups. ANOVA compares the variation between group means to the variation within the groups. If the variation between group means is significantly larger than the variation within groups, it suggests a significant difference between the means of the groups. ANOVA in this

study was used to analyze the variation in cost of labour for rice production across the LGA under study.

Results And Discussions

Information on Socio-economic Characteristics of the Rice Farmers

These socio-economic characteristics are farming experience, household size of rice farmers, farm size, amount of credits, income from irrigated rice farming.

The result in Table 2 revealed that 36.0% of rice farmers had 11-20 years of experience in rice production. The maximum farming experience observed was 50 years while the minimum was 3 years with a mean of 23 years. This result shows that majority of the farmers are experienced in rice production. The high level of experience may contribute to their ability to use resources more efficiently in their production. However, according to Ajani, (2014) farming experience is an important factor determining both the productivity and the production level in farming activities.

Data in Table 2 shows that majority 60.7% of the farmers had household size that ranged between 6-10 persons, followed by 22.7% with 1-5 persons respectively. The mean household size was 8 persons. This indicates that higher number of members of the household contributes to family labour against the task of hiring labour for all activities in rice production, from land preparation to winnowing which increases significantly to labour cost. Therefore, additional family labour means that some labour activities can be shared which leads to a reduction in cost of production, as well as efficiency in production. This is in line with findings of Nwalieji (2016) that mean household size was 8 persons in a study carried out in Anambra State.

Table 2 shows that 29.4% of the rice farmers household devoted between 0.5– 1.1 ha of land to rice production in 2019, 49.8% of the rice famers devoted 1.11– 1.71ha of land to rice production in the same year, 16.1% devoted 1.71 – 2.3 ha of land to rice production, 2.8% devoted between 2.31 – 2.9 ha with a minimum of 0.5, maximum of 3.50 and an average of 1.76ha to rice production in 2019. This implies that small scale rice production characterizes the enterprise in the study area. This is consistent with the findings of Nwalieji (2016) who reveals that farmers in Anambra State had less than 2 hectares and the mean total rice farm land owned was 1.5.

Table 2 indicates that 11.8% of the rice farmers obtained credit of ₦30,000-₦164,000 while 10.9% of the rice farmers got between ₦164,100-₦298,000 and 28.4% of the rice farmers obtained between ₦298,100-₦432,000. However, this indicates that a large percentage of the farmers in the study area obtained credits amount ranging between ₦298,100-₦432,000. The above level of income could bring about low capacity of the rice farmers to expand their farming enterprise.

Table 2 shows that 10.5% of the rice farmers earned between 60,000-288000 from rice production in 2019, 39.6% of the rice farmers earned between 288001-516000, and 23.4% of the rice farmers earned between 516001-744000, 18.2% of the rice farmers earned between 744001-972000, while only 8.3% of the rice farmers earned between 972001-1200000 from rice production in 2019. However, most of the farm household earns less than five hundred thousand naira (750,000) in a year from rice production. This low income could be due to the nature of farming in the study location (small scale farming), as most of the farmers are still peasants farmers.

Table 2: Socio-economic characteristics of the Rice Farmers (n-211)

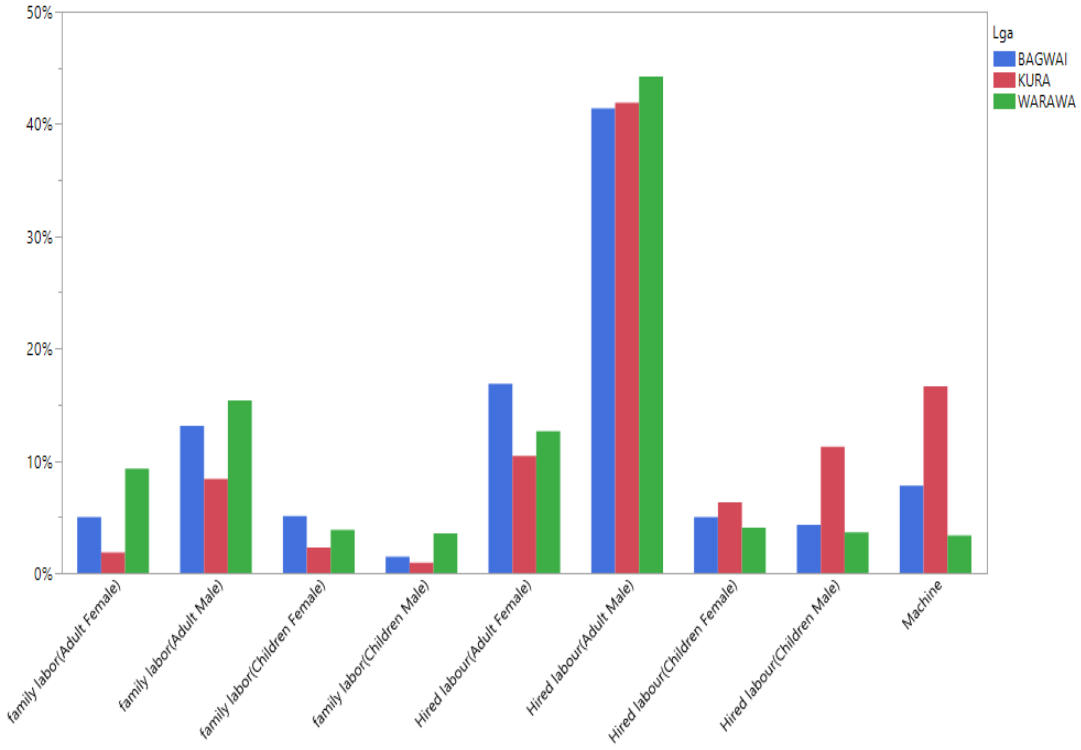
Variables	Frequency	Percentage	Mean
Farming Experience (Years)			
1-10	29	13.7	23.6
11-20	76	36.0	
21-30	52	24.6	
31-40	39	18.5	
41-50	15	7.1	
Household size (No of persons)			
1-5	48	22.7	8
6-10	128	60.7	
11-15	22	10.4	
16-20	10	4.7	
21 -25	3	1.4	
Farm Size (ha)			
0.5 – 1.1	62	29.4	1.4076
1.11 – 1.7	105	49.8	
1.71 – 2.3	34	16.1	
2.31 – 2.9	6	2.8	
2.91 – 3.5	4	1.9	
Amount of Credit Obtained (₦)			
30000-164000	25	11.8	375238
164100-298000	23	10.9	
298100- 432000	60	28.4	
432100-566000	42	19.9	
566100-700000	61	28.9	
Income from Rice			
60,000-288000	33	10.5	313,000
288001-516000	124	39.6	
516001-744000	73	23.4	
744001-972000	58	18.2	
972001-1200000	26	8.3	

Source: Field Survey, 2021

Forms of Labour Used

The result in Figure 2 shows the forms of labour used by the rice farmers for their operations. According the result, the most used form of labour used is hired labour (male and female). This followed by family labour. The large household size is an added advantage to the famers because it supply them labour for their farming operations. The result is in agreement with that expressed by Sadiq *et al*. (2022) who reported that hired labour commonly used among farmers for farm operations.

Figure 2: Forms of Labour used for Different Farming Activities 'D'



Variation in Cost of Labour for Rice Production Across the LGA

The result in Table 3 shows that the cost of labour for rice production in Kura LGA is generally higher than that of Bagwai and Warawa LGAs for all farming activities. This is evident with the mean total cost of labour of Kura was ₦370,816 with a standard deviation of ₦87,533. This was followed by Bagwai (₦261,162±₦57,400) and Warawa (₦231,592±₦41,780). The differences in the cost of labour between Bagwai and Warawa for each farming activities are in such a way that some activities have a mean cost in Bagwai that are higher than that of Warawa and vice versa. Farming activities that have higher mean cost of labour in Bagwai than Warawa include cost of harrowing, cost of seedling planting, cost of transplanting, cost of agrochemical spraying, cost of weeding, cost of weeding, cost of harvesting, cost of threshing, cost of sieving, cost of bagging and cost of transportation. All the variations between the cost of labour were of statistical significance ($P<0.05$). Therefore, indicating that farmers spend different amount on labour in the three LGAs. This is in line with the findings of Ben-Chendo, Lawal and Osuji, (2017) who found that labour constituted the highest cost component of total variable cost of paddy rice production in Kaduna state.

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Table 3: Variation in Cost of Labour for Rice Production across the LGAs

Cost of Labour (₦)	Bagwai	Kura	Warawa	ANOVA	
	Mean±SD	Mean±SD	Mean±SD	F	Sig.
Cost of Ploughing	73970.59±26577.95	92313.43±34071.32	76013.16±24017.49	8.400	.000
Cost of harrowing	45000.00±14887.64	55507.46±16902.01	43052.63±14097.65	13.146	.002
Cost of seedling planting	2191.18±546.56	3201.49±1333.20	1736.84±506.45	52.093	.000
Cost of transplanting	43360.29±11086.11	81641.79±20549.06	28684.21±4991.22	287.545	.002
Cost of 1st fertilizer application	3342.65±617.73	4834.33±922.54	3372.37±551.99	98.248	.000
Cost of 2nd fertilizer the application	3342.65±617.73	4834.33±922.54	3372.37±551.99	98.248	.000
Cost of agrochemical spraying	4073.53±1316.56	5992.54±2921.31	3335.53±1173.00	34.769	.000
Cost of weeding	15511.76±4340.08	20225.37±6552.36	13585.53±4268.79	30.945	.001
Cost of Harvesting	20719.40±8188.58	31373.13±21673.08	17611.84±5868.33	19.748	.000
Cost of threshing	18750.00±5993.47	25402.99±11242.59	16118.42±4890.72	26.428	.000
Cost of sieving	9117.65±3323.50	16432.84±6289.06	6447.37±1738.92	108.345	.003
Cost of bagging	4586.76±959.15	7258.21±1117.51	4051.32±1134.25	175.879	.000
Cost of Transportation	17500.00±4233.84	21798.51±7050.18	14210.53±4475.31	35.673	.001
Total Cost of Labour	261162±57400	370816±87533	231592±41780	90.553	.000

Determinants of Demand for Labour in the Study Area

In table 4, the results of the Logit regression analysis revealed that R-square value is 0.46 which implies that the parameters regressed are accountable for 46% variation in the demand for labour (p-value = .004) which is a good fit. The table 8 shows that out of the six variables investigated, three variables were found to have significantly affected demand for labour among the rice farmers. The significant variables were wage rate (β= -0.048, p-value= 0.038), farm income (β= 0.359, p-value=0.000) and farm size (β=1.460, p-value=0.000), However, Wage rate negatively affected demand for labour. This is because wage rate determines the extent to which labour could be used. When wage rate is low, more labour could be employed and vice versa. The negative sign complied with the *a priori* expectation and it indicates that as the wage rate decreases, this will give the farmers an opportunity to use more labour.

Farm income also significantly and positively affected demand for labour. Increase in farmers' income enables farmers to employ more labour for farm activities; this is because farmers with high income will be able to pay labour than the farmers with low income (Ojo *et al*. 2020). The positive sign shows that as farmers' income increases, labour use also increases. Farm size was also found to be significantly affecting demand for labour. This is because extent to which labour would be used is determined by the size of the farm. Large sized farms would require more labour than small sized farms and *vice-versa*. The positive sign of the coefficient of the variable indicate that as farm size increases, labour demand also increases

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Table 4: Determinants of Demand for Labour

Variables	Coefficients (B)	Std. Error	T	Sig.
(constant)	0.677	0.438	1.547	0.124
Farming Experience	0.037	0.009	4.251	0.090
Farm size	1.460	0.121	12.059	0.000**
Household size	-0.042	0.019	2.171	0.075
Wage rate	-0.048	0.023	-2.091	0.038*
Farm income	0.359	0.075	4.788	0.000**
Amount of credit obtained	1.057	0.000	1.798	0.074

Source: Field Survey2019. *, **, ***, significant at 10%,5% and 1% level of probability respectively.

Constraints Faced in Accessing Labour by the Rice Farmers

Table 5 shows the distribution of various causes of constraints to labour supply in rice farming in the study area. Poor farm wages (labour payments) 92.3% ranked as the highest labour inhibitor in the study area, followed by improved non-farm income (90%) that reduce labour supply when needed most. High wage rate during peak periods (89.6%) is also a constraint faced in accessing labour. The demand for labour is normally very high and expensive during the peak period of land clearing, ridging, harvesting, processing, weeding and ploughing in the study area, these led to labour shortage in rice farming in the study area. Other constraints are dwindling farm income (80.1%), schooling of children (79.6%), seasonal migration (24.6%), of labour to the urban sector in search of promising non-farm employment activities and poor road network (10.4%) were other labour inhibitors in the area. This finding can be supported by the study of Nmadu and Akinola (2015) which reported that the most serious constraints faced by farm labour supply are level of farm/family income and high wage rate.

Table 5: Constraint faced in Accessing Labour

S/No	Constraints	Frequency	Percentage	Rank
i.	Labour Payment	194	92.3	1st
ii.	Improved Non-farm income	190	90.0	2nd
iii.	High wage rates during peak periods	189	89.6	3rd
iv.	Dwindling farm income	169	80.1	4th
v.	Schooling of Children	168	79.6	5th
vi.	Seasonal Migration	52	24.6	6th
vii.	Poor road network	22	10.4	7th

Source: Field Survey: 2021

Conclusion

The attempt of Nigeria and Kano in particular to be self-sufficient in rice production implies understanding certain factors responsible for the supply and demand for labour and labour productivity. Findings of this study revealed that both male and female labour carried out specific farm operation with male labour predominantly used for these farm activities in the study area. The cost of labour for rice production in Kura is generally higher than that of Bagwai

and Warawa for all farming activities. The study further shows that farm size and farm income were all positive and were significant determinants of demand for labour and wage rate has negative impact. Poor farm wages (labour payments) was ranked as the highest labour constraint to irrigated rice production in Kano state. Therefore, in order to sustain irrigated rice production in Kano state, the State government should therefore subsidize the price of farm inputs to enable farmers to increase their farm size for large scale production. Also, farm credit is an incentive to boost labour use in rice production; hence modalities to ease credit supply should be implemented *by* all stakeholders for irrigated rice farmers in the State.

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