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LABOUR USE TYPES AND TECHNICAL EFFICIENCY AMONG SMALL-SCALE RICE FARMERS IN NIGERIA: EVIDENCE IN OBAFEMI OWODE LOCAL GOVERNMENT AREA OF OGUN STATE, NIGERIA

[1]A. E. OBAYELU, [1]S. O. AFOLAYAN, [2]O.O. AYODEJI AND [1]S.O. OSESEAMHEH

[1]Department of Agricultural Economics and Farm Management Federal University of Agriculture, Abeokuta, Nigeria
[2]Agricultural Economics and Environmental Policy Programme, Centre of Excellence in Agricultural Development and Sustainable Environment (CEADESE) FUNAAB

*__Corresponding Author__: obayelu@yahoo.com. **Tel**:+234

ABSTRACT

The limited capacity of the Nigerian rice sector to meet domestic demand has been attributed to the type of labour used, among several factors. Therefore, smallholder rice farmers' labour use type and technical efficiency (TE) in Obafemi Owode LGA, Ogun State, Nigeria, were examined. Using a well-structured questionnaire, a multistage sampling technique was used to collect data from 120 smallholder rice farmers. Data were analysed using Tobit regression and Stochastic Frontier Analysis (SFA). The results revealed that about 81% of the rice farmers were males; 97.5% were married with a mean age of 54 years; household size of 54 years and 4 persons. SFA showed 81.0% of the farmers had TE above 0.70, with a mean of 0.78. The TE was significantly ($p < 0.01$) influenced by farm size ($\beta = 0.907$), labour quantity ($\beta = 0.409$) and fertilizer ($\beta = -0.1289$). Family and hired labour ($\beta = - 0.102$; $p < 0.01$), hired labour ($\beta = - 0.201$; $p < 0.05$), marital status ($\beta = 0.115$; $p < 0.1$), household size ($\beta = - 0.033$; $p < 0.05$) and years of schooling ($\beta = - 0.013$; $p < 0.01$) significantly affect TE. The study concludes that the type of labour used influences the TE of rice farmers and recommends mastering the right combination of hired and family labour to improve TE.

Keywords: Human labour, production efficiency, rice production, Maximum Likelihood Estimation

INTRODUCTION

Rice (*Oryza sativa*) is a tropical crop cultivated in almost all parts of the country. It is a unique crop which requires a wide range of temperatures between 20 and 38°C during growth and a long period of sunshine (Mohapatra and Sahu, 2022). Producing and growing for sale and home consumption is also relatively easy. In some areas, there is a long tradition of rice growing, but for many, it is considered a luxury food for special occasions only. With the increased availability of rice, it has become part of the everyday diet of many people in Nigeria.

Rice is the second largest produced cereal in the world after wheat, it is a crop that cuts across regional, religious, cultural, national and international boundaries with very high demand. It is a major staple in several countries in Asia, the Caribbean and Latin America, and is becoming increasingly popular in Africa (OECD/FAO, 2021). Rice can be grown over a wide range of ecological conditions. In Nigeria, the prevalent types of rice production systems are rainfed upland, shallow swamp and inland valley swamp, irrigated lowland, and mangrove or tidal swamp where rice has been found to thrive very well (Singh *et al.,* 1997**;** Obianefo *et al*., 2019). However, Nigeria is yet to attain self -sufficiency in rice production since demand is higher than supply (Nkwazema, 2016). Rice demand rose at an average annual rate of 1.2%, attaining 481.6 million tonnes in 2017 (PwC, 2022). According to Foyeku and Rice Millers, Importers and Distributors Association of Nigeria (2019), Nigeria's annual rice demand in 2018 was 7 million metric tonnes, while only 56% of this demand was produced in Nigeria. Equally, the rice consumption rate in Nigeria has expanded by about four times the global consumption growth, accounting for almost 20% of consumption in Africa (PwC, 2022). The rising demand for rice in Nigeria has led to her continued dependence on importation to bridge the demand and preference gap for her teeming population (Otto *et al*., 2021). The limited capacity of the Nigerian rice sector to meet the domestic demand has been attributed to several factors; notable among them is the type of labour used.

Human labour is the only main source of labour available to smallholder farmers in Nigeria (Oluyole *et al*., 2013). Labour plays a critical role in agricultural production, especially in the rice sector, which is labour intensive. Labour is needed for various farm operations such as land preparation activities, seeding, weeding, pest control, harvesting and transportation. Studies have shown that labour accounts for about 75% of the total cost of production in most food crop enterprises (Panwa, 2017). Empirical evidence has revealed that labour significantly influences agricultural productivity and efficiency (Akinbile *et al*., 2006; Saka and Lawal, 2009; Seidu, 2012; Ismatul and Andriko, 2013; Khatri-Chhetri et al., 2023; Miassi et al., 2023)**.** Similar findings by Obianefo *et al.* (2020) and Mariko *et al.* (2021) also established a significant positive relationship between labour use and rice yield. Rice farmers will be technically efficient if they produce with maximum output from minimum quantity of inputs, and since labour is a significant input in rice production, especially among smallholders. It is pertinent to empirically investigate how labour type affects the technical efficiency of farmers. It is also important to note that most of the previous empirical findings, especially Khatri-Chhetri *et al.* (2023) and Miassi *et al.* (2023), used the quantity of labour used to determine technical efficiency; however, in this study, the types of labour, viz-a-viz family and hired labour and their combination were used to assess the farmers' technical efficiency.

To understand the roles of farm labour on rice production efficiency, this study assessed the effects of labour use types on the technical efficiency of rice production in Obafemi Owode Local Government Area of Ogun State. Specifically, this study describes the socioeconomic characteristics of rice farmers in the study area, identifies the various types of labour used in rice production, estimates the technical efficiency of rice production and analyzes the effects of labour

use types on the technical efficiency of rice production. This study was conducted with the objective of generating and providing farmers, extension workers, development institutions, rice industries, labour market and policymakers with valuable information that will assist in improving rice production efficiency.

METHODOLOGY

The study was conducted in Obafemi Owode Local Government Area of Ogun State, Nigeria, located in the southwest geo-political zone. It is bounded in the north by Osun and Oyo States, south by Lagos State, east by Ondo State and west by Benin Republic. The state has 20 Local Government Areas spread across four main agricultural zones (Ijebu, Egba, Yewa and Remo). The population is about 3,728,098 people, based on the 2006 National Population Commission. Its total land area is approximately 16,762 km^{2,} of which about 70% is suitable for farming. Abeokuta is the state capital and the headquarters of the Ogun-Osun River Basin Authority, which is in charge of the development of land and water resources for Lagos, Ogun and Oyo States. Agriculture is the major livelihood activity among the people of the state and crops such as rice, maize, yam, cassava and some fruits like cashew, mango, orange, pineapple are adaptable to its climate. There are eight (8) rice-producing Local Government Areas in the state. Five (5) of the eight Local Government Areas are known for growing upland rice, including Abeokuta North, Ewekoro, Yewa-South, Ifo, and Ijebu-north. At the same time, Yewa-north, Ogun Waterside, and Obafemi-Owode are recognized for growing both upland and lowland rice.

Obafemi Owode is a Local Government Area in Ogun State with her headquarters in Owode town. It is located at $6^{0}57$'N $3^{0}30$'E. This Local Government is bounded to the North by Odeda LGA and Oyo State, the East by Sagamu and Ikenne LGAs, and the South by Ifo LGA and Lagos State. It has an area of 1,410 km^2 and a population of 228,851 at the 2006 census (NPC, 2006) The Local Government is endowed with vast fertile land suitable for the cultivation of rice, cassava, maize and a wide variety of vegetables and is generally regarded as the land of *OFADA* rice.

Sampling Techniques and Sample Size

A multistage sampling procedure was used to select smallholder rice farmers for this study. Firstly, an agricultural zone (Ikenne) was purposively selected from Obafemi Owode LGA because rice production is dominant. The second stage involved random selection of two (2) out of four (2) blocks (Someke and Obafemi) from the zone. The third stage is the purposive selection of three (3) cells that are well-known for rice production from each of the selected blocks to make a total of six (6) cells (Owode, Oba, Kobape, Kajola, Ogunmakin, and Ajebo). Finally, twenty (20) rice farmers were randomly selected from each cell to give one hundred and twenty (120) rice farmers.

This study used primary data collected through a well-structured questionnaire. Data were collected on the socioeconomic characteristics of the farmers, method of acquisition of rice farmlands, quantity, variable and fixed inputs (such as labour, fertilizers, herbicides, seed, tractor services, hoes, cutlasses, sacks, and rice output). The data were analyzed using descriptive statistics, a Tobit regression model, and stochastic production frontier analysis.

The stochastic frontier production model was adopted to estimate the technical efficiency of small-scale rice production and the effect of labour on the rice farmers' production efficiency in the study area. This model is appropriate because agricultural production in general exhibits shocks, and hence there is a need to separate the influence of stochastic variables (random shocks and measurement errors) from resulting estimates of technical inefficiency (Battese, 1992). Aigner et al. (1977) and Mueesen and Broeck (1977) independently proposed the stochastic production frontier. The stochastic frontier model can be generally represented as in Equation 1:

$Yi = f(X_i; \beta_j) \exp(Vi - Ui)$ ---------- (1)

The functional form of this model adopted in estimating the level of technical efficiency is the Cobb (Bravo-Ureta and Evenson, 1994) specified as Equation 2:

$\ln Y_i = \beta_o + \beta_1 \ln S_1 + \beta_2 \ln S_2 + \beta_3 \ln S_3 + \beta_4 \ln S_4 + \beta_5 \ln S_5 + Vi - Ui$ ---------- (2)

Where:

ln = natural logarithm

$\beta_{0,} \beta_1$ -------- β_5 = parameters to be estimated

i = 1,2,3,4……n

Y = Rice output (kg)

S_1 = Farm size (Ha)

S_2 = Fertilizer (kg)

S_3 = Agrochemicals (litres)

S_4 = Quantity of seed (kg)

S_5 = Labour (man-days including family labour plus hired labour)

Vi = Symmetric error associated with uncontrollable factors related to the production process, such as we er factors beyond the control of the farmer

Ui = inefficiency component of error term

The inefficiency model as stated by Ahmadu and Erhabor (2012) as in Equation 3:

$$R = \alpha_0 + \alpha_1 F_1 + \alpha_2 F_2 + \alpha_3 F_3 + \alpha_4 F_4 + \alpha_5 F_5 + e_i \quad ----------(3)$$

Where

R = Technical inefficiency

F_1 = age of farmers (years)

F_2 = household size (persons)

F_3 = farming experience (years)

F_4 = education (years spent in school)

F_5 = access to credit (yes = 1, 0, otherwise)

e_i = error term

Tobit regression was used to analyze the effect of labour types on rice farmers' technical efficiency in the study area. It is specified as Equation 4:

$$Y_i = f(\beta_i Z_{ij} \mu_i)$$

----------(4)

The explicit form of Equation 5 is given as:

$$Y_i = \beta_0 + \beta_1 Z_1 + \beta_2 Z_2 + \beta_3 Z_3 + \beta_4 Z_4 + \beta_5 Z_5 + \beta_6 Z_6 + \beta_7 Z_7 + \beta_8 Z_8 + \beta_9 Z_9 + \beta_{10} Z_{10} + U \quad -(5)$$

Y_i = Y = technical efficiency index of ith farmer

β_1 ---- β_{10} = estimated coefficients of respective variables

Z_1 = Both family and hired labour (man-days)

Z_2 = Hired labour (man-days)

Z_3 = Age of respondents (years)

Z_4 = Sex (male=1, female=0)

Z_5 = Marital status (married =1, widowed =2)

Z_6 = Household size (persons)

Z_7 =Years of schooling (years)

Z_8 = Farm size (ha)

Z_9 = Farming experience (years)

μ_i = error term

RESULTS AND DISCUSSION

The result of the socio-economic characteristics of the respondents, (Table 1) showed that the majority (59.2%) of the respondents were above 50 years old, with the mean age of rice farmers being 54 years old. This implies that rice farming is dominated by middle age farmers. This corroborates the findings of Ibitoye *et al.* (2012), Kadiri *et al.* (2014) and Oyetunde-Usman and Olagunju (2019) who reported that rice farming is being practised by middle age classes, who are physically fit to withstand the stress and risks involved in rice production and are more mentally alert to embrace new techniques of rice production. Most (81.0%) of the respondents were male, indicating that rice production is male-dominated. This finding is consistent with the findings of Kadiri *et al.* (2014), Edet *et al.* (2019) and Sani *et al.* (2022)

who found that rice production was dominated by male farmers in their respective studies. The majority (97.5%) of the rice farmers were married, showing that they were people with high responsibilities and needed income to care for their family needs. This finding agrees with Edet *et al.* (2019). The average household size was 3 persons, and approximately 48.0% of the rice farmers had households ranging between 4 and 6 persons. This was very small compared to an average of 8 persons reported by Oyetunde-Usman and Olagunju (2019) in their studies. Almost (99.0%) all the respondents had a minimum of primary education which showed a low level of illiteracy among rice farmers in the study area with an average of 10 years of formal education. This is in line with the findings of Olasunkanmi *et al.* (2013), who found that 93.0% had a minimum of primary school education in the study area. Ojo *et al.* (2020) also reported a lower level of literacy for farmers in Nigeria with an average of 6 years of education while Sani *et al.* (2022) reported that about 64.0% of rice farmers in Sokoto State had no formal education. According to this report, there is a high probability that most rice farmers in the study area will easily access relevant information and adopt innovation to improve their production efficiency. Furthermore, 54.0% had a small farm size of 1 to 2 hectares with an average of 3 hectares. This small farm size might make mechanization difficult as a result also showed that about 82.0% did not have access to farm machinery, limiting rice output to the subsistence level. This corroborates the findings of Ibitoye *et al. (*2012) and Kadiri *et al.* (2014), who confirmed that about 53% of rice farmers in Ibaji cultivated between 1 and 3 hectares and 2.32 hectares cultivated in the Niger Delta Region of Nigeria, respectively. Edet *et al.* (2019) and Sani *et al.* (2022) also reported that the majority of rice farmers cultivated less than 3.5 hectares.

The result indicated that 84.0% of the respondents practice farming as their major occupation, which is not in line with the findings of Kadiri *et al.* (2014), who stated that 69.0% of rice farmers were part-time farmers. The average farming experience of rice farmers was 15 years and 61. 0% had spent more than 11 years farming (Table 1). This implies that rice farmers within the area have a high level of expertise in rice production and may also indicate high productivity. The majority (56.0%) of the rice farmers had no access to extension services. However, Ojo *et al.* (2020), observed that most rice farmers in the southwest had access to extension services.

About 75.0% of the rice farmers sourced their seeds from old stock and 97.0% cultivated *Ofada* rice (Table 1). About 50.8% of the rice farmers belong to a cooperative society, a veritable tool for capital formation and agricultural development. This also allows the farmers to produce at a lower cost and have control over price fluctuations. Access to credit was slightly high as 55.8% of the rice farmers had access to credit facilities compared to the findings of Oyetunde-Usman and Olagunju (2019), who reported that only 1.1% of agricultural households in Nigeria had access to credit. This suggests a possible increase in farmers' farm revenue. Half (50.8%) of the respondents sourced their finances from friends and relatives, while 30.0% sourced from agricultural banks. This is contrary to the findings of Edet *et al.* (2019), who reported that the majority of rice farmers sourced their credit from cooperative societies. Also, 44.0% of the rice farmers each acquired their farmlands through inheritance and lease/rent respectively (Table 1).

Table 1: Distribution of smallholder rice farmers by socioeconomic characteristics

Variables	Frequency	Percentages (%)	Mean
Age			
31-40	3	2.5	
41-50	46	38.3	
51-60	53	44.2	54
Above 60	18	15.0	
Sex			
Male	97	80.8	
Female	23	19.2	
Marital status			
Married	117	97.5	
Widowed	3	2.5	
Household size			
1-3	10	9.3	
4-6	51	47.7	3
Above 6	46	43.0	
Education			
≤ 0 (None)	1	0.83	
1-6 (Primary)	25	20.83	
7-12 (Secondary)	72	60.0	10
≥ 0 (Tertiary)	22	18.33	
Farm size			
1-2	64	54.3	
3-4	48	38.8	
≥ 5	8	6.9	3
Main occupation			
Yes	100	84.0	
No	20	16.0	
Farming experience			
≤ 10 yrs	47	38.7	
11-20yrs	46	38.7	
21-30yrs	20	16.8	15
≥ 31yrs	8	5.9	

Contact with extension agents		
Yes	52	44.2
No	67	55.8
Sources of seed		
ADP	1	0.8
Friends	25	20.8
Old stock	90	75.0
Purchase	4	3.3
Types of rice cultivated		
Ofada rice	116	96.7
Ofada and African rice	4	3.3
Membership of cooperative society		
Yes	61	50.8
No	59	49.2
Access to credit		
Yes	67	55.8
No	53	44.2
Sources of credit		
Cooperative	2	1.7
Bank	4	3.3
Friends & relatives	61	50.8
Agricultural bank	36	30.0
Money lender	17	14.2
Sources of farmland		
Inheritance	52	44.4
Purchase	16	11.1
Lease/rent from individual	52	44.4
Access to farm machinery		
Yes	22	18.3
No	98	81.7
Total	**120**	**100.0**

Source: Field survey, 2021

Constraints encountered by rice farmers

All the rice farmers (100%) were constrained financially; 99.2% experienced inadequate labour supply, and 91.7% experienced pest infestation, making them the three most essential constraints facing the smallholder rice farmers in the study area (Table 2). Other constraints include the poor transportation system (80%), lack of machinery (77.1%) and poor access to extension services (75.6%). This is similar to the findings of Adesiji *et al.* (2022), who reported poor access to processing equipment, lack of access to agricultural extension agents and inadequate government policies as the top three constraints encountered by rice entrepreneurs in Nigeria. Also, Gama *et al.* (2022) reported inadequate capital, cost of labour and inadequate extension services as the leading constraints rice farmers face in Kano State. Lack of labour by the farmers will lead to a decrease in the productivity and efficiency of rice farmers. Yiadom-Boakye *et al.* (2013) indicated that labour significantly influences agricultural productivity and efficiency. Pest infestation, on the other hand, results in poor yield, while bad farm roads lead to losses and the inability of the farmers to convey their farm produce from the farm to the markets.

Table 2: Distribution of smallholder rice farmers by constraints encountered

Constraints	Frequency	Percentages (%)
Pest infestations		
Yes	110	91.7
No	10	8.3
Lack of labour		
Yes	119	99.2
No	1	0.8
Lack of finance		
Yes	120	100.0
No	0	0.0
Disease infections		
Yes	29	24.2
No	91	75.8
Poor transportation		
Yes	96	80.0
No	24	20.0
Flooding		
Yes	28	23.5
No	92	76.5
Lack of farm machinery		
Yes	91	77.1
No	29	22.9
Poor access to extension services		
Yes	90	75.6
No	30	24.4
Total	**120**	**100.0**

Source: Field survey, 2021

Types of Labour used by the Respondents

The majority (55.0%) of the respondents used combined labour (family and hired) in their rice production enterprise (Table 3). This implies that farmers had to add family members to hired labour to meet the required labour on the farm. This suggests an inadequate supply of labour, which is one of the constraints identified by the respondents. This is contrary to the findings of Odetola and Adepoju (2022) that the majority of the farmers in Nigeria used hired labour.

Table 3: Distribution according to the types of labour used by the farmers

Variables	Frequency	Percentages (%)
Family labour only	2	1.7
Hired labour only	52	43.3
Family and Hired	66	55.0
Total	**120**	**100.0**

Source: Field survey, 2021

Estimate of the stochastic production frontier and the associated technical efficiency indices

Farm size ($\beta = 0.907$; $p < 0.01$) had a positive significant effect on technical efficiency (Table 4). The implication of this finding is that increase in land hectarage will invariably lead to an increase in rice output among the study area's smallholder farmers. This finding is consistent with the findings of Kadiri *et al.* (2014), and Oyetunde-Usman and Olagunju (2019), who reported that farm size was positive and significant to the technical efficiency of agricultural households. Also, Kusumaningsih (2023) found a positive relationship between the area harvested and the technical efficiency of rice farmers. However, Ugbagbe *et al.* (2017) found that the higher the farm size, the lower the output of soybeans.

Also, labour ($\beta = 0.409$; $p < 0.01$) had a positive significant effect on rice technical efficiency (TE). This implies that an increase in labour will invariably lead to an increase in the technical efficiency of rice among the smallholder farmers in the study area. This finding is consistent with the findings of Kadiri *et al.* (2014) and Ojo *et al.* (2020). Meanwhile, fertilizer ($\beta = -0.066$; $p < 0.01$) had a negative significant effect on rice TE (Table 4). This finding indicates that an increase in fertilizer application will invariably lead to a decrease in the TE of rice. Contrarily, Keghter et al. (2023) found that the quantity of fertilizer used ($\beta = 0.134$; $p < 0.01$) significantly affects the technical efficiency of rice farmers.

Table 4: Maximum likelihood estimates of parameters of stochastic frontier production and technical efficiency model for rice production

Variables	Parameter	Coefficient	Std. Err.	T-value
Constant	β_0	6.564	0.405	16.22
Farm size	β_1	0.907***	0.101	8.98
Fertilizer use	β_2	-0.066***	0.026	-2.51
Agro chemical	β_3	0.073	0.045	1.60
Quantity of seed	β_4	0.112	0.095	1.17
Labour	β_5	0.409***	0.023	17.48
Inefficiency model				
Intercept	α_0	2.034	0.213	9.549
Age	α_1	0.107***	0.021	5.095
Household size	α_2	0.006	0.137	0.044
Farming experience	α_3	0.120	0.115	1.044
Education	α_4	0.210	0.239	0.879
Access to credit	α_5	0.179	0.262	0.683
Diagnostic statistics				
Sigma squared ($\sum^2$)		0.130	0.023	
Lamda (λ)		4.601	0.053	
Gamma (γ)		0.065		
Log likelihood		17.401		
Mean of T.E		0.781		

Source: Field survey, 2021

Respondents' Range of Technical Efficiency

About 51.7% of the sampled rice farmers had an estimated technical efficiency above 0.80. Most (80.8%) farmers had technical efficiency above 0.70 (Table 5). This implies high technical efficiency among the smallholder rice producers in the study area. The mean technical efficiency of 0.78 obtained in this study compares favourably with the 0.75 reported by Ogundari (2008) for small-scale rice farmers in Nigeria compared to 0.70 and less than 0.85 reported by Ojo *et al.* (2020) in Southwest Nigeria and Obianefo *et al.* (2020) for rice farmers in Anambra State, Nigeria respectively. Also, Abiola *et al.* (2021) reported an average technical efficiency of 0.81 for farmers in North central Nigeria that farmers can increase their technical efficiency by 63.0% without any increment in the level of inputs used.

Table 5: Distribution of Respondents by Range of Technical Efficiency

Technical efficiency (T.E) Range	Frequency	Percentage (%)
< 0.50	10	8.3
0.51- 0.70	13	10.8
0.71 – 0.80	35	29.2
> 0.80	62	51.7
Total	120	100
Mean Technical Efficiency		**0.78**

Source: Field survey, 2021

Effects of Types of Labour Use on Technical Efficiency of Rice Farmers

The coefficients of both family and hired labour (β = -0.102), hired labour only (β = -0.201), and years of schooling (β = -0.013) were negative and significant at 1%, 5% and 5% respectively (Table 6), indicating an inverse relationship with technical efficiency, while the coefficient of marital status (β = 0.115), and household size (β = 0.033) were positive and significant at 10% level of significant, indicating a direct relationship with technical efficiency. These results imply that these variables are determinants of the technical efficiency of rice farmers in the study area. The coefficient of family and hired labour was negative and significant, implying that the more the farmer uses both family and hired labour, the less his/her technical efficiency in rice production. Only the coefficient of hired labour was negative and significant (Table 6), implying that the more the farmer uses hired labour the less his/her technical efficiency in rice production. This result agrees with the findings of (Olasunkanmi, 2013; Ayedun and Adeniyi, 2019) who observed in their studies that although hiring labour may increase the quantity of rice output, it does not necessarily increase their TE.

The coefficient of years of schooling was negative and significant, indicating that an increase in the years of schooling leads to a reduction in the technical efficiency of rice farmers. The coefficient of marital status was positive and significant, implying that married farmers have higher technical efficiency than their unmarried counterparts. The coefficient of household size (Z_6) was positive and significant (Table 6), indicating that an increase in household size leads to an increase in the technical efficiency of rice farmers. This is consistent with Msuya *et al.* (2008) and Mariano *et al.* (2010), who demonstrated that household size contributes greatly to rice productivity.

Table 6: Effects of labour use and other socioeconomic characteristics of rice farmers on technical efficiency

Technical efficiency	Coefficients	t- statistics	p>|t|
Both Family and Hire labour	-0.102***	-3.81	0.000
Hire labour	-0.201**	-2.15	0.034
Age	-0.004	-1.29	0.199
Sex	-0.003	-0.09	0.930
Marital status	0.115*	1.52	0.132
Household size	0.033*	1.59	0.116
Years of schooling	-0.013**	-2.79	0.006
Farm size	-0.002	-0.17	0.865
Farming exp	0.002	1.09	0.276
Constant	0.937***	5.55	0.000
Log likelihood	74.284***		0.0005

Source: Field survey, 2021; ***1%, **5%, *1%

CONCLUSION AND RECOMMENDATIONS

The study concluded that the use of hired labour, as well as combining both family and hired labour, lowered smallholder rice farmers´ technical efficiency. Hired labour type is relevant not only where family labour is inadequate but also when the much-desired transition from small-scale farming to commercial-level production by the expansion of production and income resources requires outsourcing for additional labour. It was recommended that rice farmers be trained on effective combination labour types and the use of alternative sources of human power that will give them maximum output with minimum use of inputs to meet the food security requirement of the country. The government can empower rural rice farmers with loans to reduce the cost imposed on them by the waged hired labour to increase their output from a minimum quantity of inputs in Nigeria.

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